

# Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

REG. U. S. PAT. OFF.

Vol. IV Copyright, 1923 R. D. P. Co. Inc. CHICAGO, ILL., SATURDAY, FEBRUARY 24, 1923 No. 7

## INSURES BETTER MUSIC

### ASKS FEDERAL QUIZ TO UNEARTH TRUSTS

WHITE WANTS ACTION BY TRADE BOARD

Would Have Contracts, Patent Ownerships Brought Under Spot Light of Commission

By L. M. Lamm

WASHINGTON.—Representative White of Maine has introduced a resolution in the House calling for an investigation by the Federal Trade Commission of Radio activities. Mr. White states that he believes that there will be no opposition to the resolution in the committee and he is of the opinion that it can be passed at the present session of Congress. The resolution, which has been referred to the House committee on Merchant Marine and Fisheries, is as follows:

"Resolved: That the Federal Trade Commission be, and it is hereby, requested to investigate and to report to the House of Representatives at the convening of the Sixty-Eighth Congress or as soon thereafter as practicable, the facts relating to:

"(A) The ownership of patents covering Radio apparatus used in interstate and foreign commerce and to all assignments or other contracts concerning such patents;

"(B) Contracts, leases or agreements in whatsoever form the same may be, the purpose, tendency, or effect of which is to control or restrict the manufacture, sale, resale, or use within the United States of such Radio apparatus, or to control or fix the price thereof;

"(C) Contracts, leases or agreements in whatsoever form the same may be, the pur-

(Continued on page 2)

### FAIR SEX BROADCASTS ENTERTAINMENT FOR FANS OF NORTH, SOUTH AND EAST



Mary Brumby, head of the Mandolin club, Agnes Scott College, Decatur, Ga., led her fair troubadours at WSB, the Atlanta Journal, recently

Below is Mme. Jacquet, distinguished Parisian harpist. She is often heard on CKAC, La Presse, there. The famous Erard harp she plays was given her as a prize when she was sixteen years old

At our right is Ethel Payne, charming young soloist often heard on the air at that most famous of all international stations, WOR, L. Bamberger and Company, Newark, N. J.

### LATEST DEVICE SPELLS 'FINIS' ON DISTORTION

"Glow-Discharge" Microphone Declared One of Most Important Radio Feats

Reproduces Near Perfect

Westinghouse Plans Installation of Thomas Invention in All Four Plants

E. PITTSBURGH, PA.—A diaphragmless "glow-discharge" microphone, said to be almost perfect in its reproduction of musical and voice sounds, has just been announced as perfected by Dr. Phillips Thomas, research engineer with the Westinghouse Electric company of this city. The perfecting of the microphone, which has been used in trials for the past several months at Station KDKA here, is claimed to be one of the most important developments in Radio since broadcasting the voice became popular, inasmuch as it will eliminate virtually all distortion in broadcast- (Continued on page 2)

### BETTER CONCERTS, CUT PLANTS—FANS

"We Pay for Programs," Listeners-in Decide—Irritated at Station Interferences

NEW YORK.—Better programs and fewer broadcasting stations were the demands voiced by thousands of Radiophans in all parts of the country in answer to a questionnaire recently sent out by the National Radio Chamber of Commerce, it has been announced by that organization. The questionnaire was designed to learn what improvements are necessary to further extend the industry.

It was stated that listeners in are becoming more and more impatient with the interference between stations. The novelty having gone from Radio, patrons now are demanding first-class service in every respect, especially since it is becoming recognized that they themselves are paying for programs in one way or another.

### Hawaii Hears WHAZ, Distance 5,500 Miles

Rensselaer Polytechnic Institute's Station Claims World's Record

TROY, N. Y.—According to letters received by the Rensselaer Polytechnic Institute's Radio broadcasting station, WHAZ, a new world's record has been established for Radiophone reception of concert programs. Three different communities in Hawaii, with Radio receiving stations, have been reported by letters stating that a clear reception of both music and speech had been established at an approximate distance of 5,500 miles. This station is the largest broadcasting station of any educational institution in the country, and in the amateur transatlantic tests in December, Troy was heard both in England and France. The mail reports have just come in from Hilo, Wailuku and Halku in the Hawaiian Islands, the writer in each enumerating program numbers and messages which were heard.



**PERFECT MICROPHONE**

(Continued from page 1)

ing formerly caused by mechanical resonance of every diaphragm microphone transmitter. It fills a need which has long been felt at every broadcasting station, and because of its obvious advantages over every other microphone now in use, including the condenser microphone, the Westinghouse company has announced plans for installing the new device at all of its plants, which are KDKA, WJZ, WBZ, and KYW. Other stations are also considering the use of the device.

**Research Work a Classic**

The development of the new microphone required much research and many unsuccessful attempts with other styles of transmitters. This work by Dr. Thomas is classic in the realm of scientific research and will go down in the annals of electrical history.

Briefly, the carbon granule microphone, such as in use on practically every wire telephone, was discarded because of the packing of the granules and the distortion created from this. Secondly, a moving coil or "electrodynamical" transmitter was constructed. However, it was found that the resonance frequency, that is, the "tune," of the moving coil and connecting wires entered into the reproduction of the voice and music, so that this style of microphone was considered unsatisfactory also.

**Condenser Type a Failure**

Next the condenser microphone, designed primarily for the measurement of sound intensities, was tried out and met such success that it is still in practical use at hundreds of the leading Radiophone broadcasting stations. The condenser style, although undoubtedly the best yet of any microphone employing a diaphragm, still had two serious disadvantages. Its diaphragm sagged very much with use and varying atmospheric conditions, and a very high degree of amplification was required for its satisfactory operation.

**Eliminate Diaphragm**

It was then decided to attempt to reproduce the sound waves electrically by one of the several ways not necessitating the use of a diaphragm. At this stage in the development, Dr. Thomas was possessed with the idea of using the phenomenon of the great change in potential across a so-called "glowing discharge" at reduced pressures of air when a change in the length of the discharge path occurred. He believed somewhat of the same effect might be present in air at atmospheric pressure and went to work on this idea as a means of making a diaphragmless "glow-discharge" microphone. In telling of his work Dr. Thomas says:

**Inventor Tells of Work**

"A calculation showed that this effect would afford ample sensitivity at reasonable impedance, were it to be even one-hundredth as great in open air. Tentative tests were made along this line, which seemed to show that the sensitivity in open air would not be sufficient for the purpose; also it was necessary to use a diaphragm. The writer, however, was able to show that the discharge impedance could be varied directly, without the intermediary diaphragm, by pressure variation from sound waves reaching the discharge path.

**Origin of Name "Glow-Discharge"**

"The direct current glow discharge, at low pressure, is a fairly well-known form of ionization conduction. Little has been published, however, on its characteristics in open air. Since the new microphone makes use of such a discharge as its variable impedance, a brief description of the phenomenon is thought to be desirable.

"The application of moderately high direct potential between two electrodes separated a short distance in air, with enough series resistance to prevent formation of the usual type of heavy current arc, will cause the establishment of a peculiar low current, high voltage discharge, having a characteristic glowing appearance, from which is derived the name 'glow-discharge.'

**Nature of Discharge**

"The order of current is from one to 20 milliamperes or more, at voltages ranging from 200 to 1,000 volts. Such a discharge, when produced between electrodes of certain metals, of which copper is one of the best, is remarkably quiet and steady to the unaided ear and eye. The discharge path is very similar to that produced at low air pressure.

"The development was completed by the working out of a low current, high voltage rectifier, with resistance-capacity filters, which permits the discharge to be struck or started by flashover, and maintains its current practically independent of discharge impedance. Units substantially of this construction have been used in the regular broadcasting programs of Station KDKA for several months."

**Winnipeg New "Scalp" for WCAH Station, Columbus**

COLUMBUS, O.—Winnipeg, capital of the province of Manitoba, Canada, is one of the new distances made by Station WCAH of the Entekin Electric Company, Columbus, it has been announced by C. A. Entekin, proprietor. WCAH now has the record of being heard in 27 states in the Union and two provinces of Canada.

**\$100 FLEWELLING PRIZE CONTEST RULES**

1. Contest is open to all Radiophans, whether or not they are subscribers to Radio Digest, Illustrated. The contest is open now and will close February 24 at midnight. Awards will be announced in the March 17 issue of this publication.
2. The object is to locate and award prizes on a competitive basis for the best Flewelling circuit receiving set entered.
3. Prizes are: First, \$40.00; Second, \$25.00; Third, \$10.00; Fourth to Eighth (five prizes) inclusive, \$5.00 each.
4. In event of a tie, equal prizes will be awarded each tying contestant.
5. Judges will be the Technical Staff of Radio Digest.
6. To enter the contest send working drawings and diagrams together with an article of from 1,500 to 2,500 words in length describing the making and operation of an actual Flewelling circuit receiving set. The article should tell: (a) how to make the set, (b) how to operate it, (c) helpful suggestions for getting maximum results, (d) actual airline broadcasting station receiving range using only one tube, first employing only an indoor aerial but no ground, second, using a ground but no aerial, and third, if available, using only a loop aerial. Other combinations and notations on the antenna system used will be considered in the award of prizes.
7. In sending material for consideration in the contest, exclusive publication rights are automatically given to Radio Digest, Illustrated. All articles published, but not awarded prizes, will be paid for at regular space rates. Unused manuscripts will be returned to contestants on request.
8. In deciding the winners of the contest the judges reserve the right to call for any set entered to be sent in for examination and test. Tubes, A and B batteries and phones will not be required in sets sent in for testing.
9. Manuscripts will be judged from the standpoints of neatness, clarity of expression, completeness, and actual tried success of the set described.
10. Originality in the use of various parts of apparatus other than shown by Radio Digest in the Flewelling circuit heretofore, is encouraged and even recommended. See Rule 6, however, for method to be used in determining the range.

**Army Net on Paying Basis**

WASHINGTON.—After a year's operation, the army Radio service has now reached the point where it is operating on a paying basis, giving good service on all official communications in and out of Washington. While perhaps not comparable to commercial Radio traffic systems, the signal corps Radio traffic curve, the plotting of which began in January, 1921, has risen by about \$1,000 a month. In December it reached the value of \$6,200 for the month. This is solely on

official war and other departmental Radio traffic between stations of the army Radio net; the army handles no commercial or naval messages.

During December the returns for traffic handled, when figured at commercial rates, exceeded the costs for personnel and maintenance of the whole net, including sixty stations.

Radio waves vary up to thousands of meters in length. They travel in all directions and through all mediums.

**END DATE NEAR IN PRIZE SET CONTEST**

**FLEWELLING FANS FLOOD MAIL WITH ENTRIES**

Letters Show How Improvements Have Been Made in Circuit—Last Call for Contestants

**By the Contest Editor**

As this edition of Radio Digest goes to press, manuscripts, photographs and drawings to be entered in the \$100.00 Flewelling Set Prize Contest continue to arrive with every mail. The few remaining days before the closing date of the contest, midnight of February 24, it is believed will yield many more contributions from aspiring Flewelling fans.

Marked ingenuity and clever assemblies are shown by many of the amateurs who have already submitted papers. And the results they claim! It seems that Radio Digest can be congratulated without a doubt for having made the discovery of E. T. Flewelling and his truly "flivver" super circuit.

**Fans Improve Circuit**

It is also interesting to note the changes and modifications in the circuit which are shown by some of the contestants. Greater results than with the average Flewelling receiver are claimed by some of the fans who have made distinct changes in the original circuit.

Well, now a word to the eleventh-hour contestants. The date of the issue for which this is being written marks the close of the contest. Papers received after midnight, Saturday, February 24, cannot be considered in the contest. So mail in your papers today, after carefully reading the rules of the contest which are given in full on this page.

**Preliminary Injunction Granted in Tube Suits**

**Judge A. N. Hand Gives Decisions in Patent War**

NEW YORK.—Judge Augustus N. Hand, in the United States District Court for the Southern District of New York, has handed down decisions, granting preliminary injunctions in three suits brought by the Radio Corporation of America for alleged infringement of the De Forest audion patents by the manufacture and sale of vacuum tubes for Radio purposes.

The first of the suits was that against the La France Import and Sales Company, Inc., and others who are manufacturing and selling a vacuum tube known as the "La France" detector and amplifier.

The second suit was against Harry Rosenthal and others who are manufacturing and selling a vacuum tube detector and amplifier known as the "Perfection" tube.

The third suit was against the Radio Guild, Inc., a dealer in the "Perfection" tubes.

One of the principal defenses urged upon the court for a denial of the preliminary injunction motions was that the Radio Corporation of America had no right to maintain the suit because the De Forest Radio Telephone and Telegraph Company was the owner of the De Forest audion patents. This defense was overruled by Judge Hand for the present, in granting the preliminary injunctions.

**ASKS FEDERAL QUIZ**

(Continued from page 1)

pose, tendency or effect of which is to give exclusive rights or special privileges in the reception and transmission in interstate or foreign commerce of messages by Radio, and

"(D) Such other facts as, in the opinion of the commission, may aid the House of Representatives in determining whether in the foregoing respects or otherwise the antitrust statutes of the United States have been or now are being violated by any person, company or corporation subject to the jurisdiction of the United States."

**New Tropical Station Opens Direct Route to Honduras**

WASHINGTON.—The opening of the new Tegucigalpa station of the Tropical Radio Telegraph on December 1 provided the first direct communication from the United States to Honduras. Previous to date the only available route was via All-America Cables to La Libertad in El Salvador and thence over the land lines of that government and those of Honduras.

The new station is equipped with the latest type of tube transmitters, with a power of 20 kilowatts and a normal operating range of 1,500 to 2,000 miles.

The Navy Department has begun the publication of the Communication Bulletin, issued in the interests of increasing the efficiency of Naval Communications, especially through greater rapidity and accuracy in handling messages by Radio.

**CONTENTS**

Radio Digest, Illustrated, Volume 4, Number 7, published Chicago, Illinois, February 24, 1923. Published weekly by Radio Digest Publishing Company, 123 West Madison Street, Chicago, Illinois. Subscription rates, yearly, Five Dollars; Foreign, Six Dollars; single copies, Ten Cents. Entered as second-class matter April 27, 1922, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.

"All the Live News of Radio".....1 to 6  
 Flewelling Prize Contest Rules..... 2  
 Receiving Records Contest..... 4  
 Yank Plant Entertains Brazil..... 5  
 Book Reviews..... 6  
 The "How" of the Simplified Super Circuit, Part IV—Theory of Operation, by E. T. Flewelling... 7  
 Radiophone Broadcasting Stations, Part II, Station Schedules Continued..... 8  
 Editorials; Condensed by Diectric; Indigest, Humor Column..... 10  
 A-B-C Lessons for Radio Beginners, Chapter VIII—A Crystal Detector Receiver, by Arthur G. Mohaupt ..... 11  
 Honeycomb Mounting on Cabinet Top; Five Other Kinks..... 12  
 Reinartz Panel Set Design for Compactness, Part III—Construction of Cabinet, by H. J. Marx... 13  
 The Roils Royce of Radio Receiving Sets, R. D.-73; The Reader's View; About Radio Parts..... 14  
 Questions and Answers ..... 15  
 Radio Illustrated, a Page of Pictures..... 16

**Looking Ahead**

Sets Submitted in the Flewelling \$100.00 Prize Contest will be shown soon. Judging from the unique designs submitted, the descriptions of these sets will be interesting reading for all fans who have been experimenting with the Radio Flivver. Watch for the series.

Another Fine Article by E. T. Flewelling will appear in the March 3 issue of Radio Digest. Read his opinion on the theory of the circuit's operation, page 7, this issue.

Arthur G. Mohaupt Will Tell Radio Beginners next issue how the vacuum tube works. Chapter Eight of his splendid series for beginners appears on page 11. Read it and keep on with the series.

An Interview with Jackie Coogan should interest the young readers of Radio Digest. Watch for this feature in an early issue.

More Pictures of Popular Artists at All the Well-Known Stations are assured for readers of Radio Digest. Every issue features some of the singers, musicians, readers and other artists. You hear them nightly but like to see them, don't you?

Part III of the Only Sure-Fire Radiophone Station Directory will occupy pages 8 and 9 next week. Three consecutive issues gives the whole directory. Buy the Digest and know who you hear.

Newsstands Don't Always Have One Left

WHEN YOU WANT

**Radio Digest**

YOU WANT IT!

BE SURE OF YOUR WEEKLY COPY BY SUBSCRIBING NOW

SEND IN THE BLANK TODAY

Publisher, 123 West Madison St., Chicago, Illinois. 4-7

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

Name .....

Address .....

City ..... State .....

# ETHER UNITES TWO 'LOST' TEN YEARS

## CFCA'S MESSAGES BRING COUSINS TOGETHER

One Relative in Canada, Other in U. S., Search Vainly for Each Other—Radio Aids

TORONTO, ONT.—Two cousins-in-law who were lost to each other for ten long years, have been brought together by The Toronto Star's Radio station, CFCA.

In 1913 both left their native country of Northants, England. One went to Canada, the other to the United States. They lost almost complete trace of each other. He who cast his lot with the land of the Stars and Stripes, heard the other had located in Toronto. He in Toronto understood his cousin was somewhere in the United States.

And with nothing more definite than this to work on, the latest scientific agency of communication—Radio—was harnessed to try to put the two cousins in touch with each other. It was the first time on record that such an attempt was made, and the Star's station, CFCA, has the unique distinction of being the one through which the experiment was successfully carried out.

### Asked Aid of Radio

A request to endeavor to locate his relative came from Walter L. Hales, of Orange, Massachusetts. He had heard R. J. Fleming and Controller Singer speak from the Star's station on New Year's night, and was impressed with the wonderful medium offered by Radio for "putting across" a message. He said he wanted to ask a favor—that CFCA tell the world about his desire to find his wife's cousin, Leonard Stanway, who came from Wellington, Northants, England.

"Perhaps I am asking too much of you," he wrote, "but I thought this would be a new way of finding our long lost friends, if you would be so kind."

A brief announcement was made on two evenings, after the end of the regular program. Yesterday Mr. Stanway got in touch with the Star. A friend of his, who has a Radio set, had heard the announcement, and had passed on the message to him. Eagerly he inquired for his cousin's address, and got it.

### Cousins Reunited.

Mr. Stanway has been living in Toronto ever since he left England. He had been very anxious to learn of the whereabouts of his relatives in the States, but to no avail. Every track proved to be false. And here was an alleged message from his cousin right out of the clouds. He seemed to think it incredible.

"You bet I'll lose no time in communicating with my cousin now," said Mr. Stanway. He read the address over two or three times, while the Star's representative checked it with that appearing on the letterhead of the relative in Orange, Mass.

A wire was sent forthwith to Walter L. Hales, Orange, Mass., informing him of the finding of his cousin, Leonard Stanway, in Toronto, as a result of the message broadcast by the Star.

## Hundreds Miss Speech, so Babson Repeats by Radio

BOSTON, MASS.—Roger W. Babson, the "Wizard of Statistics," whose services and that of his organization are employed by big financiers all over the world, takes to Radio like a duck takes to water. Finding that some 3,000 people braved a recent heavy snowstorm to hear his lecture "The Business Outlook for 1923," only to be turned away because there were no more seats, he repeated the lecture by Radio from WNAC, the Shepard Stores station, in the hope that a majority of these, as well as other interested Radiophans might hear it. He is the man who is building a community church and auditorium in Wellesley, Massachusetts, near his offices, which will have services for different denominations conducted entirely by Radio.

## PROBLEMS OF WORLD DISCUSSED BY JUDGE

COLUMBUS, O.—"Our World Problems" was the subject of an address broadcast recently by Chief Justice C. T. Marshall, of the Ohio Supreme Court, from Station WBAV, the Erner & Hopkins company. Judge Marshall's talk covered many vital questions rising from the present-day situation in Europe, touching upon the important phases of world unrest as they affect America.

## WCX FOSTERS WORLD'S LARGEST BIBLE CLASS

DETROIT.—WCX, the Detroit Free Press station, has one of the largest Sunday School classes in the world. Every Thursday afternoon Dr. Gaius Glen Atkins of the First Congregational church explains the International Sunday School lessons. That thousands are listening in is shown by the responses received expressing appreciation, from all over the United States and Canada.

## HEARS CHICAGO IN MID-OCEAN



Transmission across 2,465 miles of the Atlantic ocean, from Chicago to a Europe-bound ship without any prearrangements, is the enviable record of the Drake Hotel station, WDAP, Chicago. Miss Florence McDonald, sister of the president of the Chicago Radio laboratories, made the receptions aboard the liner. On the last day Miss McDonald Radioed to Chicago that messages sent from there at 2:00 A. M. were received at 7:00 A. M., in broad daylight, the difference being due to passage of the ship into various time bands. Two days out she reported reception was being made with but one tube, both amplifiers being broken. Under directions from Chicago and help from the Radio officers aboard the S. S. Berengaria she continued listening in with the aid of two British tubes fitted into the American set's sockets © P. & A.

## Daugherty's Kin Claims Amateur Distance Mark

WASHINGTON C. H., O.—H. E. Daugherty, of this city, and a nephew of Harry M. Daugherty, attorney general of the United States, has a claim to having the champion amateur long-distance trans-

mitter in Ohio. Word has been received that the signals sent out by Mr. Daugherty on the night of November 19, were picked up in Manchester, England, an airline distance of about 3,500 miles. The feat of Mr. Daugherty, just made known through letters received from England, is attracting widespread attention.

# WILL SLANG OF AIR INVADE 'WEBSTER'?

## HIEROGLYPHICS SEEN IN FUTURE VOCABULARY

Abbreviated Messages When Translated Really Make Good Sense for Layman Listener

By A. K. Chenoweth

COLUMBUS, O. — Page the orthodox grammarian!

There is danger that even the modern slang of conversation will be revolutionized and given added stimulus toward lower depths of abbreviated phraseology, if Radio messages become common means of communication, students and professors of Ohio State university claim.

Prof. Charles A. Wright, of the department of electrical engineering at the university, raises the question if amateur Radio operators increase in number, will their abbreviations slip into common usage and thus become a part of the American vocabulary?

### Light on the Hieroglyphics

As an example of what might be thrown at a person during informal conversation with one of these fellows, cards received at Robinson laboratory broadcasting station are submitted as evidence. One from San Juan, Porto Rico, reads: "U wr wkg 2 EL. Am I rite? Wold like to hr fm u. Congratulations OM." By way of interpretation, the following may be noted: OM means "old man," wkg "working"; wr, "were"; U, "you"; hr, "hear"; rite "right."

Another card from an operator in Fort Worth, Texas, says: "Ur C. W. sigs hrd hr Sept. 13 Vy QSA and steady. Called u but N. D. Hv u ever hrd me?" QSA is the international abbreviation for "loud." ND means "nothing doing." Otherwise, the message is very convincing to the average reader, is it not?

## PICK EXPERT TO TEACH TECH COURSE IN RADIO

Massachusetts 'U' Extension Officials Select Henry B. Phillips

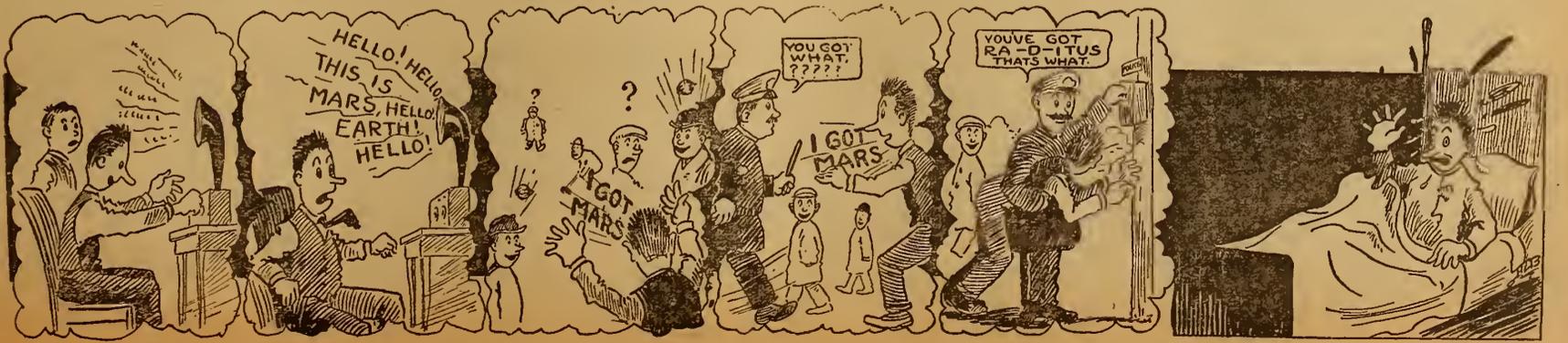
CAMBRIDGE, MASS.—Henry Bayard Phillips of the Massachusetts Institute of Technology, a widely known Radio expert, has been selected by the division of university extension, State Department of Education of Massachusetts, to conduct an advanced course in Radio reception and transmission. Classes will be held in the evening at the Technology buildings, and the course will comprise ten lessons. In this course Prof. Phillips plans to discuss the comparative value of commercial apparatus and circuits, explaining clearly and simply the theory and practice of the latest types of circuits. The following subjects will be studied: Advantages of Regeneration; Value of Super Regeneration; Audio Frequency and Radio Frequency Amplification; Commercial Apparatus; Transmitters; Heterodyne Methods; Reflex Circuits. The course is open to all persons resident in the state who have previously studied Radio.

## Europe Hears 125 Plants in Trans-Atlantic Tests

HARTFORD, CONN.—During the recent transatlantic tests no fewer than 125 individual amateur Radio stations in the United States were heard by Europeans, whereas only 24 stations were heard during the entire test last year. Some of the stations were heard 4,000 miles or more. The majority of the stations are located in Connecticut, Maine, Massachusetts, New Jersey and New York, although several are in the Middle West and West.

Many of the developments in Radio have come from boys building and experimenting with sets in the attics of their homes.

## THE ANTENNA BROTHERS Spir L. and Lew P. Marconi Almost Did It, Too



# 750 BROADCASTERS AS FIELD TIGHTENS

STATIONS INCREASE MANY TIMES IN YEAR

Month Brings Fewer New-Comers Than Quitters—Seven New Plants During Week

**By Carl H. Buttman**  
WASHINGTON.—For the first time since broadcasting began in September, 1921, fewer new stations were licensed during the past month than dropped out, indicating that the field for broadcasting is practically filled. This is not to be wondered at, officials point out, because the "saturation point" has been reached. Many fans say, "well, there are enough anyway; we don't want any more; let the better ones survive."

Today, there are 570 broadcasting stations, 28 of which are Class B or 400-meter plants, the balance being on the more popular 360-meter wave. On January 1 there were 576, showing a loss of six during the month. While there were 28 new stations licensed in January, 34 old ones failed to renew their licenses.

**Sixteen Times as Many as Year Ago**  
On the first of February last year, there were but 36 stations licensed in the new pastime of broadcasting. Today, there are almost 16 times that number. Many people believe that this is far too many, particularly since they are not very well distributed on the 360-meter wave.

The Radio bill, however, provides for the distribution of a large number of new waves, which should aid in decreasing the interference. Competition is creeping into the game. The best equipped stations giving the best service to the fans will probably become the permanent ones in the long run, it is believed.

**Seven New Broadcasters Within Week**  
Within the past week, seven new broadcasters were licensed, and two Class A stations were transferred to Class B, allowing them to use the 400-meter wave. The following are the new 360-meter plants:

WRAV, Antioch College, Yellow Spring, O.; WQAO, Calvary Baptist Church, New York, N. Y.; WPAZ, Dr. John R. Koch, Charleston, W. Va.; KFCV, Fred Mahaffey, Jr., Houston, Tex.; WRAJ, M. H. Pickering Co., Pittsburgh, Pa.; WQAR, Press Publishing Co., Muncie, Ind.; WSA, Sprague, B. S., Elect. Co., Marietta, O., 25 watts.

Transferred from Class A to Class B Stations on 400 Meters:  
KFI, Earle C. Anthony, Inc., Los Angeles, Calif.; KPO, Hale Bros., Inc., San Francisco, Calif.

**Broadcasters Which Have Stopped**  
The thirty-four broadcasters which have not renewed licenses, and consequently were deleted from the records of the Commerce Department during January follow:

WLAO, Anthracite Radio Shop, Scranton, Pa.; KZY, Atlantic-Pacific Radio Supply Co., San Francisco, Calif.; WNAJ, Benson Co., Chicago, Ill.; KFBN, Borch Radio Corp., Oakland, Calif.; WOE, Buckeye Radio Service Co., Akron, O.; KDYO, Carlson & Simpson, San Diego, Calif.; WPE, Central Radio Co., Inc., Kansas City, Mo., (Relicensed at Independence, Mo., Jan. 5th); KFBM, Cook & Foster, Astoria, Ore.; WSX, Erie Radio Co., Erie, Pa.; KDZW, Claude W. Gerdes, San Francisco, Calif.; KFAC, Glendale Daily Press, Glendale, Calif.; WDAQ, Hartman-Riker Elec. & Mach. Co., Brownsville, Pa.; WKAZ, Landau's Music & Jewelry Co., Wilkes-Barre, Pa.; WKAD, Charles Loeff, East Providence, R. I.; WBAJ, Marshall-Gerkin Co., Toledo, O.; KVQ, James McClatchy, Sacramento, Calif.; WDAV, Muskogee Daily Phoenix, Muskogee, Okla.; KDZP, Newberry Elec. Corp., Los Angeles, Calif.; KFC, Northern Radio & Elec. Co., Seattle, Wash.; WBAB, Andrew J. Potter, Syracuse, N. Y.; WAAX, Radio Service Corp., Crafton, Pa.; KYY, Radio Telephone Shop, San Francisco, Calif.; WNAG, Rathert Radio & Elec. Co., Cresco, Ia.; WGAS, Ray-Di-Co. Organization, Chicago, Ill.; WFO, Rike Kumler Co., Dayton, O.; WPJ, St. Joseph's College, Phila., Pa.; KFBQ, Savage Elec. Co., Prescott, Ariz.; WHW, Stuart W. Seeley, East Lansing, Mich.; WSN, Ship Owners' Radio Service, Inc., Norfolk, Va.; KJC, Standard Radio Co., Los Angeles, Calif.; WCAQ, Tri-State Radio Mfg. & Supply Co., Defiance, O.; WJAL, Victor Radio Corp., Portland, Me.; WNAH, Wilkes-Barre Radio Repair Shop, Wilkes-Barre, Pa.; WAJU, Yankton College, Yankton, S. D.

## RECEIVING RECORDS? SEND 'EM IN—

**By the Contest Editor**  
SEVENTEEN records were made during the last week. Receiving Records Contest aspirants need to produce real mileages now to have the honor accorded them of a place in the published list of record holders.

The new records, miles distance covered, and record holders are:

Station	Miles Away	Record Holder
KDFM—2025	F. B. Steer	Cleveland, O.
KDYU—1525	T. S. Wildman	Nichols, Ia.
RGV—3700	M. C. Bidwell	Grimnell, Ia.
KNJ—1400	Chas. Smith	Weston, W. Va.
KYY—2500	J. R. Purcell	Port Jervis, N. Y.
WDAQ—2375	M. C. Bidwell	Grimnell, Ia.
WHAZ—2550	H. Wilbert	San Francisco, Calif.
WKY—2400	R. Bartholomew	Garrochales, Porto Rico.
WLAL—1300	Perkins Benneyan	Fresno, Calif.
WLW—3675	M. C. Bidwell	Grimnell, Ia.
WLW—1900	Perkins Benneyan	Fresno, Calif.
WMAQ—1300	R. T. Andrea	Cobalt, Ont., Can.
WMAQ—1850	R. Rowe	Santa Clara, Calif.
WMB—1300	R. Hastings	Atchison, Kan.
WNAQ—1000	R. T. Andrea	Cobalt, Ont., Can.
WOAS—1275	L. Hull	Eureka, Kan.
WPAC—1225	R. T. Andrea	Cobalt, Ont., Can.

## Youthful Radio Operator Almost Hanged by Wires

**NEW YORK.**—A most peculiar accident happened to Clifford Webster, aged 14, of this city recently while he was fixing his antenna in the attic of his home. He was placing the wires in position near the attic window, when his feet became entangled and he stumbled forward headforemost through the open window. The result was that the wires slipped from around his ankles to his neck, and he hung there, half-strangled, until some of the other inmates of the house, who had heard the commotion above, rushed upstairs and released him. A doctor was called and after some time managed to revive the lad. The boy is said to be in a half-conscious condition at his home.

## Naval Plants Raise Rates

**WASHINGTON.**—The Naval Communications Service has doubled its Radio commercial rates. After April 1, all naval stations requested to handle commercial messages will charge at the rate of 12 cents a word. It is believed that this will relieve the Department from further criticism. Emergency Commercial Service will be continued, however, where there are no other facilities.

## DAYTON Superior Products

ACCURATE, EFFICIENT AND BEAUTIFUL IN APPEARANCE

Dealers write for attractive discounts to

**WERNES & PATCH**  
Masonic Temple, Chicago, Ill.

# FRANCE SUCCUMBS TO BROADCAST BUG

SEND "RADIOLA" CONCERTS FROM NEUILLY

Plant Operates Daily on 1,565-Meter Wave Length—Celebrated Artists Perform

**NEW YORK.**—France has succumbed to the lure of broadcasting, and daily concerts from a powerful station situated at Neuilly, on the outskirts of Paris are on the air. These concerts are given by celebrated French artists and have become known as the "Radiola" concerts.

The actual broadcasting station at Neuilly operates on a wave length of 1,565 meters, and a power output of two kilowatts in the aerial is utilized. The transmitting apparatus is actuated under the remote control principle, the studio where the artists perform being located in Paris in the offices of the Societe Francaise Radio-Electrique, owners of the station. The studio follows general practice in this country, the walls and floors being heavily draped in order to kill any possibility of sound echoes entering the microphones.

**Description of Plant**  
The aerial at the transmitting station is supported between two steel masts, each 200 feet high. It has five wires supported on suitable spreaders. The transmitting apparatus is contained in four large metal panels. The first contains the modulating tubes, the next has the rectifying valves for supplying the plate current of the tubes, and the third panel contains the oscillating tubes. These three panels are erected so that they are practically one unit.

The fourth panel contains the tuning elements—inductance and capacity for controlling the wave lengths radiated. The first concert was given on November 6, but recently daily concerts have been undertaken. These are given every evening between the hours of 8:45 and 10 o'clock Greenwich mean time.

**TELMACO**  
**RADIO SUPPLIES STORES**  
Prompt Service—Quality Goods—Priced Right  
Radio Division  
**TELEPHONE MAINTENANCE CO.**  
20 S. Wells St. Franklin 3986  
5206 W. Madison, Austin 7041. 1122 E. 47th St.  
Look for the TELMACO Sign

**Radio Tubes Repaired**  
UV 200—C 300.....\$3.00  
UV 201—C 301..... 3.50  
WD 11—or VT 2..... 4.00  
The right filament and proper vacuum. All tubes guaranteed as good as new. Mark plainly. Pack carefully.  
**Radio Supply and Repair Co.**  
125 WEST LAKE ST., CHICAGO, ILL.  
Repair returns 15 days after receipt.

# DAILY RADIO PROGRAM FOR SOUTH SEA CRUISE

WWJ to Entertain Passengers on Detroit News' Tropical Trip

**DETROIT.**—One of the features of the specially conducted cruise to the tropics by the Detroit News in March will be a Radio program conducted daily from the studio of WWJ, the Detroit News broadcasting station here. A special receiving set is being prepared for this trip by the News Radio experts. This set is to be installed on the United Fruit Company's big steamer, Pastores, just before it sails March 3. Officials of the company will install special antennae to care for requirements of the set.

It is expected that WWJ, the Detroit News station, will be heard all the way down to the islands. Of course the steamer entertainments will not be confined to those sent out by the News. Programs from stations in New York, Texas and the South generally, will be received daily. However, special attention will be given to WWJ and its bulletins. In this manner the voyagers will be in touch with Detroit every minute in the day.

4V. Peanut Tubes with Adapter.....	\$2.75
Improved Radio Detector Tubes.....	2.50
Improved Radio Amplifiers.....	3.00
3 Coil Mounts (Regular \$5.00 value)....	3.45
Reinartz Air Core Coils and Diagrams..	2.00
\$10.00 Automatic Head Phones, long range receivers, pair.....	5.50
2 Slide Tuning Coils, \$5.00 value.....	1.75
Complete Radio Receiving Outfit, 4 Tube Reflex, Panel Wired and Ready to Use—3 Radio—3 Audio....	\$55.00

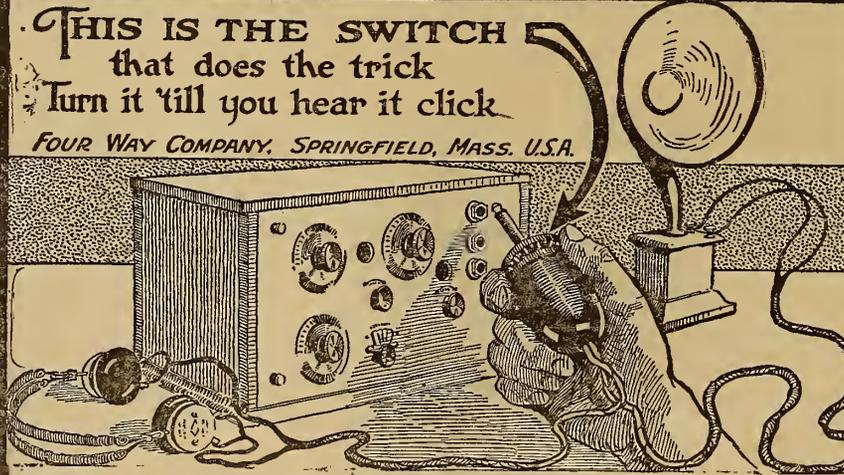
Sent on receipt of price, prepaid.  
**LUX MFG. CO.** 125 W. Lake St. Chicago, Ill.

# Radio Distances Easily Read

Use Cram's Detailed Radio Map covering the United States and Canada. Just one hundred miles to the inch. Map plate 30x20 inches, on sheet 34x28 inches. Latest call numbers at sides and bottom. Used by Radio Digest and other Radio Experts. Radio Districts and headquarters and time divisions. New edition now ready. Ideal for the purpose.

POSTPAID  
Pocket Form .....\$0.35  
Heavy Paper in Tube..... .50  
Wall Style Wooden Rollers.... 1.50  
On Heavy Board for Tacks.... 6.75  
Special quantity prices to trade and advertisers  
**The George F. Cram Co.**  
111 N. MARKET STREET  
DEPT. RD CHICAGO, ILL.

**THIS IS THE SWITCH that does the trick**  
Turn it 'till you hear it click  
**FOUR WAY COMPANY, SPRINGFIELD, MASS. U.S.A.**



—the latest and greatest improvement in Radio! \$ **1.50**

Ask Your DEALER

**FOUR WAY COMPANY**  
DEPT. C, SPRINGFIELD, MASS.

Turn 1: Head Set  
Turn 2: Loud Speaker  
Turn 3: Both in Series  
Turn 4: Both in Parallel

**ATWATER KENT**  
DEALERS: WRITE FOR DISCOUNTS  
**HUDSON-ROSS**  
123 W. Madison St. Chicago

# YANK STATION ENTERTAINS BRAZIL



Directly above is the ex-mayor of Rio de Janeiro, Dr. Carlos Sampaio, and his family, enjoying opera broadcasts from SPC, the only broadcasting station in Brazil. To the right is the observation tower on the crest of Mt. Corcovado, near which is located the 153-foot antenna. At the left, above, is shown a close-up view of SPC's antenna masts which at times are hidden in thick clouds. Below is a sweeping view of Botofogo Bay which the station overlooks from its mountain peak indicated in the distance by the letters "SPC." The station is reached by the Corcovado rack railway, one of the cars of which is shown in the photo at the right. The trip only takes 30 minutes © K & H.

## Yank Station, Capping Brazilian Mountain, Wins Coffee Land People

SPC Selects Unique Location Atop "Corcovada", 2,000 Feet Above Sea Level—Antenna Vanishes in Clouds—Artists "See" Audience Below in Rio de Janeiro

By Aaron Burrell

Brazil, that progressive South American republic which is now celebrating the one hundredth anniversary of its Declaration of Independence by holding centennial celebrations in the beautiful city of Rio de Janeiro, is being entertained by a Yankee Radiophone broadcasting station licensed as SPC.

The necessary governmental concession to erect and operate a short wave experimental station during the centennial due to the world-wide reputation of American broadcasting stations, was easily secured by L. A. Osbourne, head executive of the Westinghouse International company, who was in Brazil while the feature attractions of the centennial were being made. Mr. Osbourne also secured the co-operation of the Brazilian Light and Traction company in finding a location and later in rendering program and operating assistance.

### Select "Corcovado" Location

Entering the beautiful city of Rio de Janeiro the most impressive sight is the exquisite mountainous background of the city, and particularly "Corcovado" an almost perpendicular mountain with its summit over 2,000 feet above sea level.

"Why erect high masts when such a mountain is so near by?" queried the Radio engineers.

"Can we get the location?"

This question was answered in the affirmative by F. A. Huntress, general manager of the Tramway Light and Power company who own the cog wheel railway that climbs "Corcovado." He also assured the engineers that his company would be able to supply current on the mountain top for the Radio outfit.

The party set out to explore the mountain crest. The first 2,000 feet of ascent,

or five-mile ride from Rio de Janeiro, was made in 30 minutes, and the final climb of 125 feet, by following the foot-path to the circular observation tower on the top.

A quick survey of the available space on the crest disclosed a narrow path about 120 feet long, leading to a concrete parapet on the edge of the precipice.

### Engineers See Practical Use

The crest of Corcovado had always been used as an observation point, but the Radio engineers saw more than mere scenery—they had a view of the prospective invisible Radio audience in numerous ships at sea, and the million inhabitants of the capital city several thousand feet below.

The mountain ranges and their peaks, while beautiful to look upon, were viewed as obstacles to be overcome in broadcasting to the distant cities and towns in Brazil. The tropical vegetation also suggested the climatic differences from the United States where these engineers had been active in developing several large stations.

### Start Broadcasting; Send Opera

The call letters "SPC" were assigned to the station, and the first concert was broadcast. This concert was heard by many local stations, and three days later the S. S. American Legion, 151 miles out at sea reported hearing the signals clearly. The S. S. West Neres 175 miles out received the signals with one tube only.

The first week of broadcasting completely captured the Southern Republic. The Grand Opera House, rivaling any in the United States from point of architecture, has been equipped with a microphone, connected by direct wire to SPC's mountain top station, and both afternoon and evening performances are now broadcast.

A line has also been connected to the Monroe mansion for broadcasting from Rio. The mountain top studio, in the same building with the operating room, is duplicate in size and arrangement of KDKA at East Pittsburgh, Pa.

### Artists Can't Help but See Audience

The artists whose concerts are broadcast in the United States find it difficult to visualize their audience. Those who give concerts from SPC's mountain top, after looking out to the ships at sea and in the harbor at Rio, with a million population at their feet, as well as viewing the centennial buildings and the presidential palaces, can easily visualize the world as an amphitheater and the mountain top as the stage.

## ASKS FOR CIVIL RULE OF RADIO IN CHICAGO

Alderman Includes "Silent Night" for City in Appeal

CHICAGO.—Radio regulation may be undertaken by the city council for the benefit of Chicago's great army of Radiophans if an order introduced recently by Alderman John Toman is passed.

The order calls for the drafting and submission of an ordinance providing for the licensing of Radio broadcasting stations and other regulations, one of the chief purposes of the ordinance to be the establishment of a "silent night." This is desired by Radiophans, Alderman Toman says, in order that they may have at least one night a week for long distance receiving.

The order was referred to the committee on gas, oil and electricity.

Even though it is prohibited to sell Radio receiving sets in Brazil, the twenty millions of Brazilians now have an opportunity to listen in to the broadcasting through the various receiving sets at the Centennial Exposition. Several loud speakers have been installed in the exposition grounds—one outside of the Monroe Palace and another outside of the American Building. The President of Brazil and his official family listen in through a very attractive receiving station installed in the President's palace.

### SPC Has Unique Position

SPC has a unique position in the broadcasting field. At various times the station and antennae are in or above the clouds. Rio de Janeiro is practically on the boundary line between the temperate and torrid zones. The climate is varied by the mountain range Serra do Mar which runs along the coast. The dry season has now changed to the warm and wet season with its subsequent tropical storms. Precautions have been taken to prevent electrical interference.

The observances and records of SPC will, therefore, assist in studying the peculiarities of the air as far as Radio telephony is concerned. The experiences of this station in penetrating the equator and the torrid zone, when co-related with the data being compiled by other stations and close students of the new science, will no doubt result in listing peculiarities of the atmosphere unknown to science today.

In this it will parallel the study of the peculiarities of the ocean bottom which were a closed secret before the laying of the first Atlantic cable by Cyrus Field.

## MAY CALL PLANTS IN FIGHT FOR BILL

STATIONS TO APPEAL FOR LISTENERS' AID

Plan to Arouse Attention to Issues' Plight May Save It from Discard

By L. M. Lamm

WASHINGTON.—An appeal to broadcasting stations to call the attention of their listeners in to the desperate plight of the White Federal Radio control bill and urge them to demand action by the Senate at this session is contemplated as a means of overcoming the obstacles being encountered by this legislation which is designed to bring about regulation of broadcasting activities.

Urgent appeals from a majority of the two million or more enthusiasts to their congressmen and senators will, it is felt, have its effect.

### Plan May Save Bill

This plan, together with the reference of the bill to the Senate Interstate Commerce Committee a few days ago served to revive interest in the White bill in Congress, despite predictions made previously that the measure was dead so far as this session was concerned.

If the measure should ever reach the stage of committee hearings, the House members who handled the legislation in that body are expected to appear before the Senate committee and make a vigorous fight against the objections raised to the licensing features of the bill.

## SEEKS FEDERAL GRIP ON COMMUNICATIONS

WASHINGTON.—Representative Sinclair of North Dakota has introduced an interesting bill in the House of Representatives "to secure to the United States a monopoly of electrical means for the transmission of intelligence for hire; to provide for the acquisition by the Post Office Department of the telephone and telegraph network; and to license certain telephone lines, Radio and telegraph agencies." The bill has been referred to the House Committee on Interstate and Foreign Commerce.

## U. S. WARNS AGAINST ETHER FOOLISHNESS

WASHINGTON.—Operators of broadcasting stations are warned by the Radio section of the Department of Commerce not to communicate with other stations, receiving included, by either telegraphy or telephony as broadcasting licenses do not permit direct communication. Some stations have been guilty of acknowledging letters, telegrams and telephone calls. Suspension or revocation of the license is the penalty. Owners are cautioned to observe the rules else their station licenses may be endangered.

## U. S. MAY USE AIR PHOTO INVENTION

### LIFTS VEIL FROM RECENT SECRET TESTS

High Officials of Navy Consider Device After Transmission of Pictures from Station NOF

(Special to RADIO DIGEST)

WASHINGTON.—Plans for the utilization by the government for an invention for the Radio transmission of photographs, half-tones and other pictures are under consideration by high officials of the navy.

Secrecy regarding a demonstration on December 12 of the invention of C. Francis Jenkins, a Washington scientist, has just been removed by the group of navy officials before whom the tests were then made. Mr. Jenkins' apparatus was described some time ago in Radio Digest. Besides the various members of the navy department, there were present at the demonstration J. C. Edgerton, supervising Radio activities for the post office department, and John M. Joy, representing Will H. Hays and the amalgamated motion picture industry.

#### Send Picture Through NOF

During the demonstration photographs and drawings were broadcast through the ether from the Anacostia station, NOF, to the Jenkins laboratory. The sending unit was superintended by Commander A. Hoyt Taylor, in charge of the Anacostia station, while the rest of the officials witnessed the reception of the pictures on negative photographic plates at the Jenkins laboratory and watched their printing in the developing room.

Four pictures in all were broadcast. Two were photographs, one of President Harding and the other of Secretary of the Navy Denby. Two penciled sketches, one representing a map and the other comprising written and printed letters, were also sent. Although the original photographs were said to be of fair photographic quality only, the prints made from the receiving plate in the laboratory were pronounced quite clear, the heretofore impossible feat of broadcasting half-tones having been successfully accomplished.

#### Can be Used for Motion Pictures

About six minutes was consumed in receiving each picture, but Mr. Jenkins predicted this could be reduced to one-sixteenth of a second, the speed necessary to produce motion pictures.

A most interesting feature was a demonstration by one of Mr. Jenkins' assistants of his ability to identify the picture being sent by "sound." It had developed in earlier experiments that the picture impulses gave off a series of "groans" and that each picture had its characteristic "sound," which could be recognized after a few repetitions.

#### How Device Operates

The sending apparatus, consisting of a stereopticon like machine, projects the picture across a photo-electric cell in steady, downward sweeps. With each sweep the projected image is moved slightly to the side, only a thin slice of the image being drawn across the cell at one time. The varying intensity of light caused by the successive "slice" shadows caused correspondingly varying impulses to be broadcast.

At the receiving end an ordinary Radio receiver, on the diaphragm of which a tiny mirror is mounted, was used. Projected on the mirror was a strong beam of light. Vibrations of the mirror as it oscillated with the diaphragm caused the light beam to fluctuate across a filtering shutter, and thence through rotating prismatic rings onto the sensitive photographic plate. In this manner the light impulses are laid down side by side as they are received from the original picture.

### Air Talk Tells Fans Why

#### They Should Make Wills

BUFFALO, N. Y.—Make a Will Day was observed in Buffalo recently by Radio when S. Grove McClellan of the trust department of the Liberty Bank of Buffalo spoke from the Station WGR of the Federal Telephone and Telegraph company, on, "Why You Should Make a Will."

## DEALERS

WRITE FOR DISCOUNTS  
**DUNGAN RADIO CO.**  
Distributors  
68 WEST WASHINGTON ST., CHICAGO

1000-1500 MILES ON  
ONE-TUBE-ONE-CONTROL  
150-25,000 METERS

**NO** Rheostat, Storage Battery, Variocoupler, Variometer, 3-coil Mounting, Variable Inductance, Taps, Dead End Losses or Radio Frequency. Complete hook-up, cuts, instructions, everything. Price \$1.00. Nothing left for you to guess about. Build your own Receiver and save 50% or more and get better results. Radio Experimental Laboratory, Box 194 F, Berkeley, Cal.

## Book Reviews

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

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

**How to Retail Radio.** A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store-equipment and arrangement. Price, \$2.00.

**Radio First Aid.** Illustrated with working drawings and complete data as to the necessary equipment and cost of constructing from the simplest to the most modern Radio outfits at home. Price, \$1.

**The Radio Amateur's Handbook.** By A. Frederick Collins. A new revised edition of this book is just out. It is complete, authentic and informative work on Radio. Fully illustrated. Price, \$1.50.

**Vacuum Tube Receivers.** By O. F. Hessler. A book that tells how to make a simple set. How to make a cabinet. It includes a 27 by 36-inch layout blue print. Price, 75 cents.

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

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

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

**Letters of a Radio Engineer to His Son.** By John Mills. A series of interesting letters written to a boy. Each letter is full and complete and the most advanced student can skip over some of the letters and get just the information he desires. Price, \$2.00.

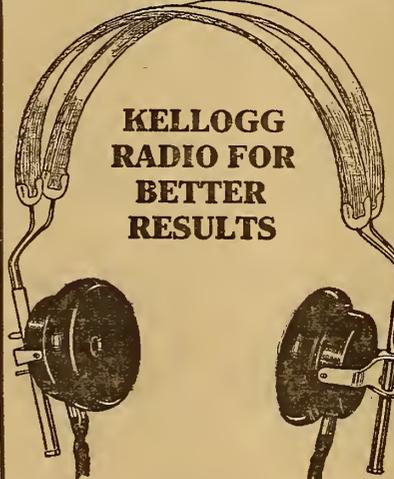
The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payments for books not accepted. Send money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

## RADIOPHANS ORGANIZE WCX RED APPLE CLUB

### WCX Gives Prizes to First Listener in Reporting

DETROIT.—The Red Apple club has been organized by WCX, the Detroit Free Press station here. The club was formed for the benefit of Radiophans in the Middle West, West and the South. The club holds a "frolic" every Tuesday evening from 11 to 12 o'clock midnight. At a recent entertainment a prize of a fountain pen was awarded the first listener from each state and Canadian province who wired in that he heard WCX. In a few minutes messages began coming from all parts of the country.

"Keep the Fleet Mobile" is the Navy's motto, based upon the theory that efficient and uninterrupted communication between all units of the Navy makes for mobility of our sea defense.



**KELLOGG RADIO FOR BETTER RESULTS**

**KELLOGG SWITCHBOARD & SUPPLY COMPANY**  
Chicago

## Make First Step to Cross Pacific

Vessel 120 Miles Off Coast of China Hears Amateur Broadcasts; U. S. Surprised

HARTFORD, CONN.—Not content with sending Radio waves across the Atlantic Ocean with the same power that it would take to heat the filament on a 100-watt light and having the voice heard, via Radiophone, by listeners in London, American amateurs have taken, unwittingly perhaps, the first step toward conquering the Pacific as well.

The best evidence that they are really capable of doing this is the report received by the American Radio Relay League headquarters here, that four west coast stations have been heard in Asiatic waters. American amateur signals have been heard now off the coast of every continent. What this will do toward linking up U. S. amateurs in a new bond of relationship with every country where Radio amateurs are to be found, is a problem which program Radio this next year may only hope to solve.

**Heard by Ship 120 Miles Off China**  
The reception of amateur signals by a ship operator 120 miles off the coast of China was one of the biggest surprises that developed during the transatlantic amateur tests.

Not only were the signals from U. S. stations heard clearly, but the operator, in a postal card mailed from San Francisco, stated that he could hear the signals a distance of twelve feet from the headset. The best previous record for amateur long distance transmission via the Pacific was Yokohama, 900 miles this side of the point where the amateur signals were heard.

**6ZZ and 6KA Rate as Stars**  
Of the stations heard off the coast of China, two were heard across both the Atlantic and Pacific Oceans during the transatlantic amateur test conducted under the auspices of the American Radio Relay League.

"With all due credit to the list of successful stations, we think 6ZZ and 6KA are the stars," said Kenneth B. Warner, league secretary, "for they are in the China list and they also got over to Europe, including all the long 2,500 mile drag over the Rockies and across the United States."

Radio is finding its way into college curricula. According to a report from Philadelphia the University of Pennsylvania plans courses in Radio this spring.

**DON'T** bore holes in your window or wall! Use "Hearwell" flat lead-in. One minute to install, no nails or tools required. Window shuts conspicuous. A unique device. (Patented.) Sample 50c in stamps. Dealers wanted, good discounts, quick seller. Hearwell Company, 53 Devonshire St., Boston, Mass.

**MAGNAVOXES**  
**\$29.95**  
LIMITED SUPPLY  
**FEDERAL SALES CO.**  
159 NORTH STATE STREET  
CHICAGO, ILL.

## WOAI STAND AGAINST "AIR CLUBS" PRAISED

Revoke "Guilty" Stations' Licenses, Fan Advocates

SAN ANTONIO, TEX.—Another Radiophan has expressed his approval of the anti-club policy of WOAI, as outlined recently by Ellis Chaney, vice president of the Southern Equipment Company, operators of WOAI. He is H. W. Tribble, of Rogers, Ark. Many Radiophans throughout the country have commended the stand WOAI has taken in the abolishment of station clubs and organizations as bore-some and uninteresting to the majority of Radio listeners.

Mr. Tribble writes as follows: "You are to be commended in the stand you have taken with regards to such Radio broadcast organizations as several now in existence and others. Such stations should have their licenses taken from them. If I understand it, the Radio laws require first-class entertainment, and that is only foolishness."

"Yours for better broadcasting,  
"H. W. TRIBBLE."

### Alexandra Carlisle and

#### Wm. A. Brady on Program

NEWARK, N. J.—Miss Alexandra Carlisle, the charming classic actress of international fame, and William A. Brady, the eminent theatrical manager, were the recent headliners on the program of the L. Bamberger & Company station, WOR, of Newark, N. J.

**FLEWELLING**  
ALL PARTS NECESSARY  
DEALERS: WRITE FOR DISCOUNTS  
**HUDSON-ROSS**  
123 W. Madison St. Chicago

**FORMICA**  
A Laminated Phenolic Condensation Product  
**SHEETS TUBES RODS**  
**RADIO PANELS**  
POLISHED BLACK FINISH  
CUT PERFECTLY SQUARE TO ANY SIZE

1/32" THICK	1/2¢ PER SQ. INCH
1/16" THICK	3/4¢ PER SQ. INCH
3/32" THICK	1¢ PER SQ. INCH
1/8" THICK	1 1/2¢ PER SQ. INCH
3/16" THICK	2¢ PER SQ. INCH
1/4" THICK	2 1/2¢ PER SQ. INCH
3/8" THICK	4¢ PER SQ. INCH
1/2" THICK	5 1/4¢ PER SQ. INCH

SEND FOR COMPLETE PRICE LIST  
PROMPT ATTENTION TO MAIL ORDERS  
DEALERS PRICES ON APPLICATION

**STARRETT MFG. CO.**  
519 SOUTH GREEN ST. CHICAGO



**The Superlative Inductance**  
Four years of careful attention to the details of manufacture of this type of inductance unit has yielded a product of unquestioned superiority. And with increased efficiency in manufacturing methods, moderate prices prevail for all sizes

Ask Your Dealer  
**Cotoco**  
"Built First to Last"

**COTO-COIL CO. PROVIDENCE**

# The "How" of the Simplified Super Circuit

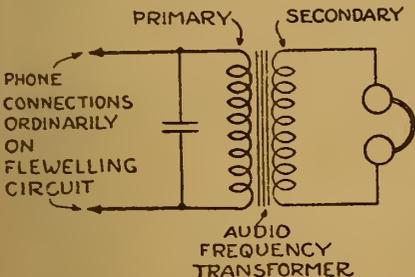
## Part IV—Theory of Operation

By E. T. Flewelling

THE next question that enters into our discussion seems to be the matter of capacity effects. Body capacity effects were found quite bothersome until one solution at least was found. The simple secret of this solution was in the removal of the phones from any direct connection with the plate circuit.

If the primary of an audio frequency transformer is hooked up in place of the phones and the phones are connected to the secondary of the transformer as shown in the diagram, it will be found that the body capacity effects are reduced to a point even less, perhaps, than that encountered with the usual set.

It is necessary however to use a transformer having about the right values. The writer in common with several fans,



however, has found that most audio frequency transformers will serve the purpose nicely. Note should be made that it is often, perhaps always, necessary to adjust the leads to compensate for this change which is of such marked advantage.

### Writer's Experiences in Reception

The writer has often been asked to tell what results he has had in the reception of broadcasts with the Flivver circuit. Modesty of course forbids any elaborate statement on this subject. As a rather typical case is occurring as I write this article I think that it might be of a little help to those not familiar with what the Flivver circuit is, if I speak of it.

With the phones on my head, above the sound of the typewriter, I am listening to an announcer from a broadcasting station trying to establish communication with a Miss McDonald, who is on board the S. S. Berengaria. The announcer states that last evening when he succeeded in reaching her, the Berengaria was 2240 miles off of New York, etc.

When it is considered that this is being done with a single tube Flivver circuit using a WD-11 tube with 45 volts on the plate, that no outside aerial is used and the circuit is operating on an only grounded 2-foot loop, and that the announcer says that he is at Station WCAP, The Drake Hotel, Chicago, it will be seen that the Flivver Circuit "gets there just the same."

### Hears Distant 20-Watt Plant

If the Flewelling Super is hooked up according to the detailed directions that have been given and is given the same amount of attention and care that the average Radio circuit is given, it will invariably perform in direct proportion to the skill of the operator, taking into consideration of course the fact that so many stations are operating transmitters that

differ so much from each other in the amount of power that they use.

It is useless to try to pick up a station a thousand miles away, if that station is only using a 5-watt transmitter. This reminds the writer of a case of reception that he accomplished with the 2-foot grounded loop and the Flivver a few nights ago that is greatly to the credit of both transmitter and receiver even though admittedly, it might have been a case of so-called freak reception. The transmitting station in question was picked up in Wakefield, Mass., with an audibility at least comfortable, and upon signing it was determined to be Station WOAG, The Apollo Theatre, Belvidere, Illinois. This plant was only using four 5-watt tubes, so all in all, the reception was most surely a very creditable performance.

### Advantage of Flivver Circuit

The circuit has the additional grid leaks to handle to be sure, but as these are partly responsible for the extraordinary sensitivity of the Flivver, one surely is willing to make these additional adjustments to get the extra advantages. The Flivver circuit has never been very particular about the kind of antenna it would function on, and for this reason has found its greatest field in the homes of those not able to have an outdoor aerial and others who take into consideration the financial side of their Radio investment. Of such people, the Flivver is not afraid, and will bring in the most surprising stations.

A popular question about the Flivver seems to be "How does it work?" While the writer does claim himself capable of outlining a bomb-proof theory, yet there are some interesting points to be considered. The following ideas are offered in the hope that the question will eventually be answered.

### Regenerative Set Distorts Sounds

Thousands of fans using regenerative receivers have wished that they could find a means of carrying regeneration beyond the present limits of their receivers. However, unless some other factor is present, it would be useless to do this, due to the distortion that is more or less present when regeneration is used and which increases as one uses more regeneration. In other words, the more regeneration, the more distortion. We wish for more sensitive receivers because our present ones (meaning the popular regenerative sets), when at their most sensitive point, are unable to give an undistorted reproduction of the incoming signal.

Two reasons at least exist to explain this. Regeneration is advanced too far, and the circuit is in or near the point of oscillating freely within itself, sometimes called a condition of "free and sustained oscillation," which if rectified, will result in the familiar howl.

It will be shown that the Flewelling Super is not able to go into this condition and therefore cannot howl, and that it is capable of bringing in a signal, without distortion, that is so very weak that the ordinary receiver is unable to indicate even the existence of it.

### Discussion of Theory Valuable

If we know how the Flewelling Super differs in its action and more or less what its action is, we will be better prepared to handle our set properly. Distasteful as it may be, a little discussion about the

theory of the circuit may be of some value to us.

In a Radio receiving circuit there is always regenerating if we place a coil of wire in the plate circuit or if the plate circuit is coupled back to the grid. Even a plain Radio frequency circuit using transformer coupling has a regenerative action in it due to the inductive effect of the primary winding of the R. F. transformer in the plate circuit of the tube.

The familiar tickler coil is an example of plate circuit coil. We know that as we bring it into closer coupling with the tuning inductance of our circuit, that we increase the regenerative effect.

We are also causing another effect that is of more value to our discussion. As we increase regeneration we are lowering, to say it roughly, the resistance of our circuit. This can be carried to the point where the effective resistance of the circuit is at a zero value.

When the point of zero resistance is reached, we are unable to hold it because such a condition allows other reactions to be set up in the circuit. The circuit will then go into either of two conditions, either where the prevailing condition is one of positive or where it is of negative influence. It might be on one side or the other of the zero point but is controllable

in this respect by the amount of regeneration that is used. We are interested mostly in the point where the circuit is in a condition of violent regeneration and is therefore easily influenced by any slight change that might enter into it from a case of positive resistance or negative resistance influence.

We are not interested in outlining the theory of super-regeneration, and, having placed our circuit in such a condition that it may be influenced by the slightest change, we will leave it for a moment.

### Grid Leak Controls Grid Charge

We are able, by proper manipulation of the grid leak (this is one way in which it may be done, especially when using a hard tube) to completely stop the tubes ability to function in the usual manner. This may be done at any rate of speed that we desire. If as in the case of the Flivver circuit, we block off the A and I batteries from their usual connection with the grid, the grid will take a negative charge from the filament of the tube by way of the space charge in the tube. This charge will build up to the point where it is so great that it blocks the plate circuit and the tube action is "paralyzed."

Now if a leak is provided for this grid charge, the latter will leak off, the tube

(Continued on page 9.)

# RADIO

## Manufacturer Direct to You

Lowest Prices      Highest Quality

Everything guaranteed as represented.  
Postage paid east of the Rockies.

### REINARTZ COMPLETE PARTS

Consists of one 23 plate condenser, one 11 plate condenser, one Reinartz Coil, one bakelite socket, 3 switch levers, contact points, vernier rheostat, 8 binding posts, 1 variable grid leak, 2 composition dials, 25 feet wire, mounting base board and 7x18 panel, together with construction diagram. All complete for only.....\$10.95

### FLEWELLING CIRCUIT COMPLETE PARTS

One 6x14 panel, one 23 plate condenser, three .006 Micon condensers, 2 honeycomb coils with mountings, one double adjustable bakelite coil mounting, one Freshman variable grid leak with condenser enclosed, one panel grid leak, one bakelite socket, one composition dial, 8 binding posts, 25 feet wire and construction diagram. Also one vernier rheostat. All complete for only.....\$11.95

- PHONE CONNECTORS (take 4 sets phones), 75 cent value.....42c
- VERNIER DIAL CONTROLS, 75 cent value.....42c
- W. D. 11 BAKELITE SOCKETS, 75 cent value.....60c
- 2 COIL MOUNTINGS, \$3.50 value.....\$2.65
- \$5.00 Value 3 COIL MOUNTS with small dials, cut to.....\$3.45

- |   |   |
|---|---|
| Switch Levers, taper Knob.....\$0.19    | Bezels .....\$0.13                        |
| Bakelite V. T. Sockets......42          | Super Crystals ..... .20                  |
| 2" Comp. Dials ..... .22                | Grewol Detectors ..... 1.50               |
| 3" Comp. Dials ..... .22                | Woodhorne Speaker ..... 7.50              |
| Small Space Bakelite Sockets......28    | Antenna Aerial Plug..... 1.50             |
| Phone Plugs ..... .41                   | Fourway Bakelite Plugs—                   |
| Hydrometers for Testing Battery......40 | The Plug with a dozen uses..... 1.50      |
| Buzzer Buttons ..... .19                | Glass Enclosed Crystal Detectors..... .65 |
| Series Parallel Switch......39          |   |

### BARRCHAS COILS

Used as REINARTZ INDUCTANCE, limited by all, equalled by none. \$2.50 value .....\$2.20

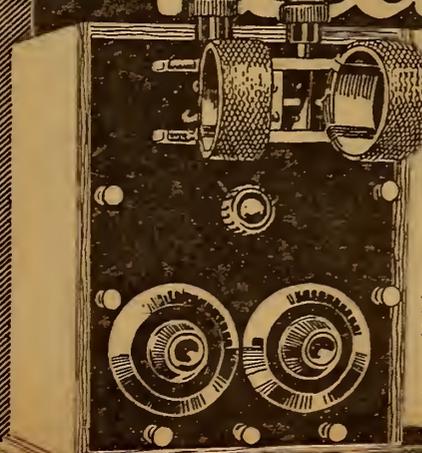
- BALDWIN TYPE C LOUD SPEAKING UNITS WITH LONG CORD.....\$4.85
- FRESHMAN VARIABLE GRID LEAKS..... .75
- PANELS, ANY SIZE, 1/8" STOCK, per square inch..... .01 1/2
- TAIT DIALS (The dial without a set screw), 4" \$1.25; 3" ..... .75
- Silk wire wound VARICO COUPLERS, \$4.50 value, 180 degree..... 2.90
- THORDARSON TRANSFORMERS, \$4.50 value; our price..... 2.90
- HONEYCOMB COILS at our prices mean a saving to you. Order now.

All orders filled promptly. We are swamped with orders as usual. Order now and insure immediate delivery. Now in our new quarters.  
*The House of Service and Quality*  
Dealers and Representatives Write for Special Prices

Manufacturers' Outlet Company

Moco Products      28 South Wells St., Chicago, Ill.

## How to Make a Flewelling Receiver



**COMPLETE Blue Prints**

for the construction of a Flewelling Receiving Unit and two step amplifier.

**Instructions for Assembly**

Description of apparatus and accessories and details of tuning.

**CABINET DIMENSIONS**

**PANEL LAYOUTS**

**LIST OF PARTS**

Send only money orders—no checks or stamps. Coins at your own risk.

Book Department

**Radio Digest**

123 W. Madison Street, Chicago, Ill.

Only 50¢

Radiophone Broadcasting Stations

Corrected Every Week—Part II

(NOTE.—The second part of the schedule list appears below. The first appeared last week and the last part, together with the city-station index will appear next week.)
WAH, Eldorado, Kans. 485 only. The Midland Refining Co. Daily ex Sat. 10:30 am, 1:30 pm, markets, weather. Sat. 1 pm, same. Central.
WAIT, Marshall, Mo. Kelly-Vawter Jewelry Co.
WAJU, Yankton, S. D. Yankton College.
WBAU, Lafayette, Ind. 50 ml. Purdue University. Mon. Fri. 7:15-7:30 pm, educational lecture. Central.
WBAF, Minneapolis, Minn. Sterling Elec. Co.
WBAF, Moorhead, N. J. Fred M. Middleton.
WBAH, Minneapolis, Minn. 200 ml. The Dayton Co. Daily ex Sat. 11:30 am, 3:30-5:30, 9:30-10:30 am, Wed. 8-10 pm. Central.
WBAN, Paterson, N. J. 200 ml. Wireless Phone Corporation. Daily ex Sun, 9:15-9:45 am, 10:30-11:15 pm, 2:15-2:30, 4:30-5:30, music. Sat. mon. only. Eastern.
WBAP, Decatur, Ill. 100 ml. James Millikin Univ. University activities. No definite schedule. Central.
WBAP, Fort Worth, Texas. 400 and 485 only. 1,500 ml. Fort Worth Star Telegram. Daily ex Sun, 9:45-10 am, 11:30 am, 3:30-3:45, 4:30-4:45 pm. Daily ex Sun, 9:45-10 am, 11:30 am, 3:30-3:45, 4:30-4:45 pm, news, reports, concert. Central.
WBAQ, Mishawaka, Ind. Lyradion Mfg. Co.
WBAU, Hamilton, O. Republican Pub. Co.
WBAV, Columbus, O. 500 ml. The Enor Hopkins Co. Daily ex Sun, 12:30-1 pm. Mon, 7-9 pm. Central.
WBAA, Marietta, O. Marietta College.
WBAX, Wilkes-Barre, Pa. 200 ml. John H. Stenger, Jr. Three nights of week, not regular.
WBAY, New York, N. Y. 500 ml. A. T. & C. Educational purposes only.
WBL, Anthony, Kans. 200 ml. T. & H. Radio Co. Wed, Fri. 10-11 pm, concert, lecture. Sun, 10 am, church service. Central.
WBS, Newark, N. J. 200 ml. D. W. May, Inc. Daily ex Sun, 9:30-11 am, music; 1-1:15 pm, reports; 2:15-2:30 pm, music, reports. Mon, Thurs, Sat, 7:30-8:30 pm, program. Sun, 9-10:30 am, sacred music; 1-3 pm, program. Eastern.
WBT, Charlotte, N. C. 485 also. 1200 ml. Southern Radio Corp. Daily ex Sun, 11 am, 8 pm, weather, markets. Tues, Fri, 8:30 pm, music. Sun, 7:30 pm, church services. Eastern.
WBU, Chicago, Ill. 100 ml. City of Chicago. Daily ex Sun, 10-11:30 am, 11:42 am, 4:13-4:30 pm, music, reports. Mon, Wed, Fri, 3:30 pm, 7:30, speeches. Central.
WBZ, Springfield, Mass. 422 only. 1,000 ml. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7:30-8:30 am, 8:30-9:30 am, 1:30-2:30 pm, 3:30-4:30 pm, 7:30-8:30 pm, church service. Eastern.
WCB, Newburgh, N. Y. 150 ml. Newburgh Daily News. Daily ex Sun, 1 pm, 2, 3, 7 Mon, Fri, 10:30 pm. Eastern.
WCG, Fort Smith, Ark. John Fink Jewelry Co. Tests only.
WCD, Canton, N. Y. 200, 480 also. 300 ml. St. Lawrence Univ. No regular schedule. Eastern.
WCAE, Pittsburgh, Pa. 400 only. Kaufman & Baer Co.
WCAF, Rodgers, Mich. Michigan Limestone & Chem. Co.
WCAJ, New Orleans, La. 200 ml. Clyde R. Randall. Daily ex Sun, 6:45-7 pm, news, time. Thurs, 8:30-10 pm, concert. Sun, 2-4 pm, music. Central.
WCAK, Columbus, O. 300 ml. Entelkine Elec. Co. Daily ex Sun, 11:30-12:30 am, music, news. Tues, 7-9 pm, concert. Sun, 10-12:30, church service. Central.
WCAI, San Antonio, Tex. Southern Equipment Co. Daily ex Sun, 11:30 am, 1 pm, bedtime stories. Thurs, 9 pm, music, lecture. Central.
WCAK, Houston, Tex. 100 ml. Alfred P. Daniel. Daily ex Sun, 7-7:15 pm, music. Wed, 8-9:15, concert. Sun, 9-10:30 pm, music. Central.
WCAK, Northfield, Minn. 500 ml. St. Olaf College. Thurs, 11 pm, music. Sun, 8:30 pm, music, concert, lecture. Central.
WCAK, Villanova, Pa. Villanova College.
WCAO, Baltimore, Md. 100 ml. Sanders & Stayman. Daily ex Sun, 12-12:20 pm, 5-5:20. Mon, Wed, 8-9 pm. Eastern.
WCAP, Decatur, Ill. Central Radio Service.
WCAE, San Antonio, Tex. 1,000 ml. Alamo Radio Elec. Co. Mon, Thurs, Sat, 8:30-9:30 pm, concert. Central.
WCAE, Minneapolis, Minn. 500 ml. Wm. H. Dunwoody Industrial Inst. Mon, 8:30-10 pm, music, lecture. Mon, Tues, Wed, Thurs, Fri, 5:30-6 pm, code instruction. Central.
WCAE, Rapid City, S. D. 485 only. 300 ml. S. D. State School of Music. Daily ex Sun, 9:30 am, 12:30 pm, 3 pm, weather, reports. Wed, 7:15 pm, concert. Mountain.
WCAU, Philadelphia, Pa. 485 also. 500 ml. Durham & Company, Inc. Daily ex Sun, 11:30 am, 2:30-3:30, reports, music. Tues, Fri, 10-12 pm, concert. Sun, 2-4 pm, music. Eastern.
WCAV, Little Rock, Ark. J. C. Dice Elec. Co.
WCAW, Quincy, Ill. 485 also. 300 ml. Quincy Elec. Supply Co. (Quincy Herald). Daily ex Sun, 5 pm, church services. 2:45 pm, special programs. Central.
WCAZ, Burlington, Vt. Univ. of Vt.
WCAZ, Milwaukee, Wis. 485 also. 500 ml. Kesselman-O'Driscoll Music House. Daily ex Sun, 11 am, reports, music. Tues, Thurs, Fri, 8:30-9:30 pm, music. Sun, 7:30-8:30 pm, church services. Central.
WCAZ, Carthage, Ill. Carthage College.
WCE, Minneapolis, Minn. Findley Elec. Co.
WCK, St. Louis, Mo. 50 ml. Stix & Fuller. Daily, 12-12:30 pm. Daily ex Sun, 3:30-3:45 pm, music. Mon, Wed, Fri, 6:45-8 pm, concert, lecture. Central.
WCM, Austin, Tex. Univ. of Tex.
WCN, Worcester, Mass. 485 also. 100 ml. Clark Univ. Daily, 11:15 am, 8:15 pm, weather. Evening program irregular. Eastern.
WCO, Detroit, Mich. 400 and 485 only. 1,000 ml. The Detroit Free Press. Daily ex Sun, 10:35 am, WCX Woman's Club; 2 pm, news; 2:15, stock reports; 2:50, weather markets; 4:15 markets, music. Daily ex Sun, 10 pm, week starting Dec. 11 and alternate weeks thereafter, concert; 7-8:30 pm, week starting Dec. 18 and alternate weeks thereafter, concert. Sun, 2:30 pm, 4 pm, church services. Central.
WDC, Springfield, Ill. Illinois Watch Co. Time and weather. Eastern.
WDAE, Tampa, Fla. 485 also. 500 ml. Tampa Daily Times. Wed, Fri, 8-10 pm, music, lecture. Eastern.
WDAF, Kansas City, Mo. 400 and 485 only. 2,000 ml. Kansas City Star. Daily ex Sun, 3:30-4:30 pm, reports, music; 6-7, educational, bedtime story, etc.; 11:45 pm-1 am, Nighthawk Frolic. Mon, Wed, Fri, 8-10 pm, concert. Sun, 4-5 pm, music. Central.
WDAG, Amarillo, Tex. J. Laurance Martin.
WDAH, El Paso, Texas. 485 also. 300 ml. Mine & Smelter Supply Co. Daily ex Sun, 1 am, news, reports. Tues, Thurs, Sat, 7:30-8:30 pm, music. Mountain.
WDAI, Syracuse, N. Y. 485 also. 200 ml. Hughes Radio Corp. Daily ex Sun, 12 m, reports. Wed, Sat, evening concert.
WDAJ, Newark, Ark. G. 485 also. 2,000 ml. A. & W. P. R. Co. Daily, 7:30-8:30 pm, 10:30-11:30 pm, concert. Central.
WDKA, Hartford, Conn. 150 ml. Hartford Courant. Daily ex Sun, 2:30 pm, 3:30, 4:30, 5:30, music; 7:40, bedtime story; 8:15, concert. Eastern.
WDAK, Jacksonville, Fla. 485 also. 250 ml. Florida Times Union. Daily, 11 am, time, weather; 4-4:30 pm, 8-9, music; 10:05, reports. Eastern.
WDAO, Dallas, Tex. Automotive Elec. Co.
WDBP, Chicago, Ill. 2,000 ml. Drake Hotel. Daily ex Sun, 12:30 pm, from 9:30 am to 1:30 pm, quotations, reports; 6 pm, news. Tues, Thurs, Sat, 10 pm, concert. Sun, 9 pm, 10, concert. Central.
WDBA, Philadelphia, Pa. Lit Bros.
WDBS, Worcester, Mass. Samuel A. Waite.
WDBY, New Bedford, Mass. 500 ml. H. Smith. Mon, Wed, Fri, 12:15-1:50 pm, industrial reports; 7:45-10 pm, music. Sun, 10:30 am-12, 5-6 pm, church services. Eastern.
WDCX, Centerville, Iowa. 500 ml. First Nat'l Bank. Daily ex Sun, 11:30 am, reports, news. Mon, Thurs, 7:30-9 pm, concert.

WDAY, Fargo, N. D. 485 also. 300 ml. Kenneth M. Hance. Daily ex Sun, 12:15-12:30 pm. Tues, Thurs, Sat, 7:30-8:15, reports, news, music. Central.
WDM, Washington, D. C. 50 ml. Church of the Covenant. Sun, 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.
WDT, New York, N. Y. Ship Owners Radio Service.
WDV, Omaha, Neb. 100 ml. John O. Yeiser, Jr. Daily, 7-8 pm. Tues, Sat, 12-1 am. Fri, 10-10:45 pm. Sun, 2-4 pm. Music. Central.
WDY, Roselle Park, N. J. Radio Corp. of America.
WDZ, Tuscola, Ill. 100 ml. James L. Bush. Daily ex Sun, every half hour, 9:30 am-1:15 pm, Chicago Board of Trade quotations. Central.
WEA, Flint, Mich. Fallain & Lathrop.
WEAB, Fort Dodge, Ia. 485 also. 600 ml. Standard Radio Equip. Co. Daily ex Sun, markets every 30 min. from 9:40 am-1:20 pm; 5:15 pm, 7-8, music; 8:15, bedtime story; 9:45, weather. Wed, Sat, 10-11:15 pm, dance music. Sun, 10:30 am, 4:30 pm, 7:30, church services. Central.
WEAC, Terre Haute, Ind. 485 also. 75 ml. Baines Electric Service Co. Daily ex Sun, 10:15 am, weather; 12-1 pm, 5-6, music. Central.
WEAD, Atwood, Kan. 485 also. 150 ml. N. W. Kansas Radio Supply Co. Daily ex Sun, 11-11:30 am, markets, music; 12, markets; 1:45 pm, markets; on half hour 3:15 to 5:45, news sports, Tues, Wed, Thurs, Sat, 7:30-9, concert. Sun, 11 am, church service; 3 pm, sacred music; 7:30, church service. Central.
WEAE, Blacksburg, Va. Polytechnic Inst.
WEAF, New York City, N. Y. 400 only. 1,500 ml. Western Elec. Co. Daily ex Sun, 4:30-5:30 pm. Mon, Wed, Thurs, Sat, 7:30-10 pm, Tues, Fri, 7:30-8 pm. Eastern.
WEAG, Edgewood, R. I. Nichols-Hineline-Bassett Lab.
WEAH, Wichita, Kan. 485 also 500 ml. Lander Radio Co. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:30 pm, 1:30, 3:15, reports. Wed, Sat, 8 pm, concert. Every third Sun, 8 pm, concert. Central.
WEAI, Ithaca, N. Y. Cornell Univ.
WEAJ, Merrillville, Ind. 300 ml. Univ. of S. D. Mon, Wed, Fri, Sat, 7:30 pm, music, lectures. Central.
WEAK, St. Joseph, Mo. 100 ml. Julius B. Abercrombie. Thurs, 8-9:45 pm, concert. Central.
WEAM, North Platte, Neb. J. F. Burroughs of N. Plattefield. Daily, 7:30-8 pm, music, police news, etc. Eastern.
WEAN, Providence, R. I. 485 also. 50 ml. The Sheperd Co. Daily ex Sun, 12-1 pm, 4-5, 6-7, music, weather, concert. Tues, Thurs, 8:15-10, concert. Wed, Sat, 7-8 pm, concert. Sun, 10:45-11:30 am, 7:30-8:45 pm, church service. Eastern.
WEAO, Columbus, Ohio. Ohio State Univ.
WEAP, Mobile, Ala. 485 also. 50 ml. Mobile Radio Co. Daily ex Sun, Mon, 7:45-8:45 pm, music, 3-3:30 pm, church service. Central.
WEAR, Baltimore, Md. 485 also. 200 ml. News & American Pub. Co. Daily ex Sun, 2-2:30 pm, 6:30-7, weather, music, news. Tues, Thurs, 7:30-9:30 pm. Eastern.
WEAS, Washington, D. C. 200 ml. The Hecht Co. Daily ex Sun, 3-4 pm. Wed, Fri, 7-8 pm. Eastern.
WEAT, Tampa, Fla. John J. Fogarty.
WEAU, Sioux City, Ia. 200 ml. Davidson Bros. Co. Daily ex Sun, Mon, 11:2 pm, reports, markets, news. Mon, Wed, Fri, 8:30 pm, concert. Sun eve, church service. Central.
WEAV, Rushville, Neb. 200 ml. Sheridan Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.
WEAW, Anderson, Ind. 25 ml. Arrow Radio Lab. Mon, Wed, Fri, 7:30-8:30 pm, concert, news, etc. Central.
WEAX, Little Rock, Ark. T. J. M. Daly.
WEAY, Houston, Tex. 1,500 ml. Will Horwitz (Iris Theater). Daily ex Sun, 11 am, dinner hints, news; 12 m, music; 12:57-1 pm, time; 2:30 pm, music; 6 pm, news. Wed, Fri, 8-10 pm, concert. Sun, 11 pm, 8 pm, church services; 9 pm, concert. Central.
WEB, St. Louis, Mo. 200 ml. The Greenwood Co., Inc. Daily ex Sun, 9-9:40 am, 12-12:45 pm, 3-4. Wed, 7-9 pm. Central.
WEH, Tulsa, Okla. (300 S. Main St., Eldorado, Kans.) Midland Refining Co.
WEI, Houston, Tex. 485 also. 500 ml. Hurlburt-Still Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads. Tues, Thurs, 8 pm, concert. Central.
WEW, St. Louis, Mo. 485 also. 100 ml. St. Louis Univ. Daily ex Sun, 9 am, 10, 2 pm, reports. Central.
WEY, Wichita, Kan. 485 also. 500 ml. Cosradio Co. (Wichita Beacon). Daily ex Sun, hourly, 8:40 am, 12:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 8-10 pm, sports, concert, lecture; 10:45 weather. Sun, 8:10 pm, church service, concert. Central.
WFAA, Dallas, Tex. 400 and 485 only. 1,500 ml. Dallas News and Dallas Journal. Daily, 10 am, reports; 12:30-1 pm, address; 6:30-7, bedtime story; 8:30-9:30, music. Tues, Thurs, Sat, 11-12 pm, music. Sun, 10-10:30 pm, bible class; 10:30-10:30 pm, music. Central.
WFAE, Syracuse, N. Y. 100 ml. C. F. Woese. No definite schedule.
WFAF, Superior, Wis. 400 ml. Superior Radio Co. Daily ex Sun, 11 pm, news. Central.
WFAJ, Salina, Kan. 250 ml. Watson Weldon Motor Supply Co. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 1:30 pm, reports. Tues, Thurs, Fri, 8 pm, concert. Sun, 11 am, church service; 3 pm, concert. Central.
WFAK, Canton, Mo. Cameron Radio Co. and Mo. Wesleyan College.
WFAE, Fort Wayne, Ind. United Radio Corp.
WFAF, Sioux Falls, S. D. 485 also. 400 ml. Argus Leader. Daily ex Sun, 10:15 am, 1:15 pm, 3:15, 7:30, reports, music. Tues, Thurs, Sat, 8-9 pm, concert. Central.
WFAU, Boston, Mass. Edwin C. Lewis.
WFAV, Lincoln, Neb. 485 also. 300 ml. Univ. of Neb. Daily ex Sun, 12:40 pm, markets. Wed, 8:30 pm, concert. Sun, 11 pm, concert. Central.
WFAW, Independence, Kan. 500 ml. Daniels Radio Supply Co. Daily ex Sun, 12 m, 4 pm, news. Mon, Tues, Wed, 7:30-8 pm, entertainment. Thurs, Fri, 7-8:30 pm, Sat, 7-9 pm, music. Sun, 11 am, church services. Central.
WFAZ, Charleston, S. C. 485 also. 400 ml. S. C. Radio Shop. Daily ex Sun, 12 m, reports, news, music. Tues, Thurs, 8-10 pm. Eastern.
WFI, Philadelphia, Pa. 400 and 485 only. 1,000 ml. Daily ex Sun, 10 am, reports; 1:15 pm, news; 2, reports; 3:30-4:30, concert; 6:30-7, children's hour. Wed, Sat, evenings, concert. Wed, Fri, 10-10 pm, Sun, 3:30 pm, organ recital. Sun, 4 pm, chapel. Eastern.
WGB, Houston, Tex. 250 ml. QRV Radio Elec. Co. Daily ex Sun, 8:45-9:15 am, news. Sat, 7 pm, news; 8-9:15 pm, concert. Central.
WGAD, Ensenaada, Porto Rico. 250 ml. Escuela Hispano Americana de Radio Telegrafos, Inc. Sat and Sun.
WGAH, New Haven, Conn. New Haven Elec. Co.
WGAJ, Shenandoah, Ia. 100 ml. W. H. Cass. Mon, Thurs, 7:30-8 pm. Central.
WGAK, Macon, Ga. Macon Elec. Co.
WGL, Lancaster, Pa. 35 ml. Lancaster Elec. Supp. & Construction Co. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.
WGM, Orangeburg, S. C. 150 ml. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:55, time; 4 pm, Radio talk, markets, sports; 6, music, lecture; 10, time, weather, entertainment. Sun, 11 am, church service; 11:55, time; 10 pm, time, weather, music. Eastern.
WGAN, Pensacola, Fla. Cecil E. Lloyd.
WGAQ, Shreveport, La. 500 ml. Glenwood Radio Corp. Daily ex Sun, 5:30-6 pm, 8, music. Sun, 11 am, 7:30 pm, church service. Central.
WGAR, Fort Smith, Ark. Southwest American.
WGAT, Lincoln, Neb. 100 ml. Am. Legion, Dept. of Nebr. Mon, Wed, 9 pm, announcements. Fri, 9-10 pm, patriotic program, concert. Sun, 3-5 pm, sermon. Central.
WGAU, Wooster, O. Marcus G. Limb.
WGAW, Altoona, Pa. Ernest C. Albright.
WGAZ, Washington, C. H. O. 75 ml. Radio Elec. Co. Daily ex Sun, 12 m, music, news; 9:30 pm, concert. News, Sun, 10:30 pm, sermon. Central.
WGBY, Madison, Wis. 100 ml. North Western Radio Co. Daily ex Sun, 9-10 am, financial news; 11:30, news, opening markets; 4 pm, news, closing markets. Mon, Wed, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 10-10:12 am, sermon. Central.
WGAZ, South Bend, Ind. 200 ml. South Bend Tribune. Daily ex Sun, 9-9:30 am, household hints, news; 5-5:30 pm, music. Tues, Thurs, Sat, 7-8 pm, music. Central.
WGF, Des Moines, Iowa. 485 also. 300 ml. Register and Tribune. Tues, Fri, 7:30 pm, entertainment. Sun, 5 pm, church service. Central.
WGI, Medford Hillside, Mass. 485 also. 500 ml. Am. Radio & Research Corp. Daily ex Sun, 9:30 am, 11:30, 3:25 pm, music; 10:30 am, 1:30 pm, 3, 6, 9, 10, reports, news; 11 pm, ex Sat, children's hour. Mon, Wed, Fri, 6:15 pm, code practice. Tues, Thurs, Sat, 6:45 pm, code practice. Tues, Fri, 2 pm, Amrad Women's Club. Tues, Sun, 8:30 pm, concert. Sun, 9:30 pm, concert. Sat, 8 pm, weather; 9:30 pm, Thurs, Thurs, 6:30, reports. Eastern.
WGL, Philadelphia, Pa. 2,000 ml. Thos. F. J. Howell. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.
WGM, Atlanta, Ga. 400 only. 1,500 ml. The Atlanta Constitution. Daily ex Sun, 6-7 pm, orchestra concert; 9:30-10:30 pm, music. Sun, 3:30-4:30 pm, organ recital; 9:30-10:30 pm, music. Central.
WGR, Buffalo, N. Y. 485 also. 1,000 ml. Federal Tel. & Tel. Co. Daily ex Sat, 12:15 pm, weather; 3:30 pm, Thurs, Thurs, 6:30, reports. Eastern.
WGS, New Orleans, La. 300 ml. Interstate Elec. Co. Mon, Tues, Wed, Sat, 8-9 pm, music talks. Central.
WGT, St. Louis, Mo. 485 also. 1,000 ml. General Elec. Co. Daily ex Sun, 11:55 am, 12:30 pm, 6, 10, reports, time, sports. Mon, Tues, Thurs, Fri, 2-2:30 pm, 7:45, concert. Fri, 10:30 pm, special. Sun, 10:30 am, 4:30 pm, church service. Eastern.
WHA, El Paso, Texas. 485 also. 600 ml. Univ. of Wis. Daily ex Sun, 11:58-12 m, time signals; 12 m, weather; 12:07 pm, agricultural bulletin; 12:20 pm, educational lecture. Tues, Fri, 8-9 pm, news, lectures, music. Central.
WHA, Iowa City, Ia. 200 ml. Univ. of Iowa. Mon, Tues, Wed, Fri, 8:30 pm, lecture, concert, news. Sat, 9 pm, sports. Central.
WHAB, Galveston, Tex. 300, 485, 600 also. 500 ml. Clark W. Thompson Co. Daily ex Sun, 9:45 am, 3:30 reports, 8, reports, music, news. Tues, Thurs, Sat, 8 pm, entertainment. Sun, 10 am, church service. Central.
WHAC, Waterloo, Ia. 150 ml. Cole Bros. Elec. Co. Daily ex Sun, 6 pm, news, sports. Mon, Wed, Fri, 9:30 pm, concert. Central.
WHAD, Milwaukee, Wis. 100 ml. Marquette Univ. Wed, 7:30-8:30 pm, music, entertainment. Central.
WHAJ, Sioux City, Ia. 200 ml. Automotive Elec. Service Co. Daily ex Sun, 12:30-5:30 pm, music, reports. Thurs, Fri, 8 pm, music. Central.
WHAF, Pittsburgh, Pa. 200 ml. Radio Elec. Co. Daily ex Sun, 11:30-12 m, 3-3:30 pm, music, news. Sun, 9-10, music. Eastern.
WHAG, Cincinnati, O. 100 ml. Univ. of Cincinnati. No definite schedule.
WHAH, Joplin, Mo. Hafer Supply Co.
WHAJ, Davenport, Ia. 30 ml. Radio Equip. & Mfg. Co. Daily ex Sat and Sun, 2-2:30 pm, 4:30-5:30, 10-11, Sat, 10-11 am, 2-2:30 pm, 5-5:30, 11-11:30. Central.
WHAJ, Clarisburg, Va. Roberts Hdve. Co. 50 ml. No definite schedule.
WHAJ, Lansing, Mich. 200 ml. The Capital News. Daily ex Sun, 9:15-9:45 am, 12:30-1 pm, 3:45-4:15, 7:30-8:30, Sun, 2:30 pm. Central.
WHAM, Rochester, N. Y. Univ. of Rochester.
WHAO, Savannah, Ga. 100 ml. Frederick A. Hill. Daily, 8:30-10 pm. Eastern.
WHAP, Decatur, Ill. 100 ml. Otto & Kuhns. No definite schedule.
WHAQ, Washington, D. C. 75 ml. Semmes Motor Co. Mon, 7-8 pm, lecture on automobile upkeep, music. Eastern.
WHAZ, Atlantic City, N. J. Paramount Radio & Elec. Co.
WHAS, Louisville, Ky. 485 also. 1,500 ml. Courier Journal and Louisville Times Co. Daily ex Sun, 4-5 pm, 7:30-8:30, Sun, 9:57-10:45 am, 4-5 pm, church service. Central.
WHAV, Wilmington, Del. 200 ml. Wilmington Elec. Spec. Co. Daily ex Sun, 12-1 pm, music. Mon, Wed, Fri, 6-8 pm, concert. Tues, Thurs, 6-7 pm, Wed, 8-9 pm. Eastern.
WHAZ, Tampa, Fla. 200 ml. Pierce Elec. Co. Daily ex Sun, 12-1 pm, 4-5, music, ariograms. Sat, 12-1 pm, music, entertainment. Eastern.
WHAY, Huntington, Ind. 75 ml. Huntington Pub. Co. Daily ex Sun, 12 m, music; 1:30 pm, 6, reports, sports. Mon, Wed, Sat, 3 pm, concert. Central.
WHD, Morgantown, W. Va. 100 ml. W. Va. University. Daily, 4-6, 7-7:30, news etc. Eastern.
WHK, Cleveland, O. 300 ml. Warren R. Cox. Daily ex Sun, 8:30-9 am, test; 1:30-2 pm, 4-4:30, music; 6-6:30, news, music. Wed, Sun, 8-9:45 pm, sermon, concert. Eastern.
WHN, Brooklyn, N. Y. 200 ml. Associated Broadcasters, Inc. Daily ex Sun, 7-8 am, 9:15-10:55, 12:55-1:15 pm, 2:15-2:30, 4:15-5:30, 6:15-7, 7:30-8:30, 10:30-12 m, 12:30-12:45 pm, Eastern.
WHX, Des Moines, Ia. 50 ml. Iowa Radio Corp. Daily, 5:30-6:15 pm. Wed, 8-9:30 pm. Central.
WIAE, Rockford, Ill. 50 ml. Jostyn Automobile Co. Tues, Fri, 7:30-8:30 pm, music. Central.
WIAF, Galveston, Tex. 485 also. 200 ml. Galveston Tribune. Daily ex Sun, 12:35 pm, reports. Tues, Sat, evening concert. Central.
WIAD, Ocean City, N. J. 200 ml. Ocean City Yacht Club. Fri, Sat, Sun, 8-12 pm. Eastern.
WIAE, Vinton, Ia. 75 ml. Zimmerman Radio Co. Tues, Thurs, Sat, 9 pm, music, news. Wed, 8 pm, band concert. Sun, 2:30 pm, music. Central.
WIAE, New Orleans, La. 300 ml. G. A. Delortin. Tues, 9-10:30 pm, Thurs, 12-1 am, music. Sun, 10-10:30 pm, music. Central.
WIAH, Newton, Ia. 200 ml. Continental Radio & Mfg. Co. Daily 12:30-1 pm, music, news. Mon, 7:30-8 pm. Central.
WIAI, Springfield, Mo. 100 ml. Heer Stores Co. Daily ex Sun, 10:30-11 reports, news. Tues, Thurs, Sat, 7:30-8:30 pm, music. Central.
WIAJ, Neenah, Wisc. Fox River Valley Radio Supply Co.
WIAK, Omaha, Neb. 485 also. 300 ml. Daily Journal-Sentinel. Daily ex Sun, 7:45 am, 9:10, 10:15, 12 m, 1:50 pm, 3:50, markets, weather. Central.
WIAO, Milwaukee, Wis. 200 also. 100 ml. School of Engineering. Mon, Tues, Thurs, Fri, 10:15-10:30 am; 11:30-11:45, news; 11:45-12:10 pm, lecture; 5-6 pm, news; 7-7:15, music; 7:15-7:30, lecture. Central.
WIAQ, Marion, Ind. Chronicle Pub. Co.
WIAR, Paducah, Ky. 150 ml. Paducah Evening Sun. Daily ex Sun, 3:30-4 pm, reports, news, music; 8 pm, concert, lecture, etc. Eastern.
WIB, Burlington, Ia. 400 ml. Hawk-Eye Home Elec. Co. Tues, Thurs, 8-9 pm, concert. Central.

WIAT, Tarkio, Mo. Leon T. Noel.
WIAU, Le Mars, Ia. Am. Trust & Savings Bank.
WIAV, Birmingham, N. Y. N. Y. Radio Lab.
WIAW, Saginaw, Mich. Saginaw Radio & Elec. Co.
WIAZ, Washington, D. C. 200 ml. Woodward & Lothrop. Daily ex Sun, 10:30-11:30 am, 2-3 pm, music. Sat, 8-10 pm, concert. Eastern.
WIB, Miami, Fla. Flagler St. Elec. Supply Sales Co.
WIB, Mekeessport, Pa. 500 ml. K. & L. Elec. Co. Daily ex Sun, 6:30-7 pm, 7:30-8 pm, 9:30-10:30 pm, Sun, 1:30-2:30 pm and 6:30-7 pm. Eastern.
WIL, Washington, D. C. 100 ml. Continental Elec. Supply Co. Daily 5:30-7 pm., music, entertainment. Eastern.
WIP, Philadelphia, Pa. 400 only. 2,000 ml. Gimbel Bros. and Public Ledger. Daily ex Sun, 2:30-3:30 pm. Daily, 1:30-2 pm, 7-7:30 pm. Tues, 7-12 pm. Fri, 7-9:55 pm. Sat, 10-10-12 m. Sun, am, pm, church service. Eastern.
WIZ, Cincinnati, O. 485 also. 200 ml. Cino Radio Mfg. Co. Daily ex Sun, 12 m, 3:30 pm, 7-8, reports, entertainment. Central.
WIAB, Lincoln, Neb. 200 ml. American Radio Co. Mon, Wed, 8:30-9 pm. Central.
WIAD, Waco, Tex. 485 also. 500 ml. Jackson's Radio Engrng. Lab. Daily ex Sun, 12:30-1 pm, markets, news, music; 3:30-4, news, music; 6-6:15, sports; 8:45-9:45, concert, news. Sun, 11-12 am, church service; 3:30-4 pm, music; 6-6:15, sports; 8:45-9:45, music. Central.
WIAP, Muncie, Ind. 1,200 ml. Muncie Press and Smith Elec. Co. Daily ex Sun, 3:30-4 pm, news, music. Mon, Wed, Fri, 7-8 pm; Sat, 6-7 pm, music. Sun, 10-12 am, church services. Central.
WIAG, Norfolk, Neb. 485 also. 150 ml. Norfolk Daily News. Daily ex Sun, 12:15 pm, 3:30, 5, 5:30, reports, code school. Central.
WIAT, Dayton, O. Y. M. C. A.
WIAK, Stockdale, O. 485 also. 250 ml. White Radio Lab. Daily ex Sun, 10:30-10:50 am, music; 11:05-11:20, reports, news; 6-6:30, music, news. Wed, 8-9 pm, concert. Sun, 2-2:45 pm, church service. Central.
WIAM, Cedar Rapids, Ia. 50 ml. D. M. Perham. Mon, Wed, Fri, 7-8 pm, music. Central.
WIAN, Peoria, Ill. 300 ml. Peoria Star. Daily ex Sun, 9:15-11:30 am, markets, weather; 1:30 pm, closing markets, ariograms. Tues, Thurs, Sat, 9:15-9:45 pm, music. Central.
WIAP, Duluth, Minn. 200 ml. Kelley Duluth Co. Mon, Thurs, 8-9:30 pm, music. Mon, Thurs, Sat, 10:30-12 midnight. Sun, 11-12 m, pipe organ, 12-1 pm, church service. Central.
WIAQ, Topeka, Kans. Capper Publications.
WIAR, Providence, R. I. 485 also. 600 ml. The Outlet Co. Daily ex Sun, 10:11 am, 2-3 pm, 5-6, Fri, 8-10 pm, concert. Eastern.
WIAS, Pittsburgh, Pa. 150 ml. Pittsburgh Radio Supply House (Pittsburgh Leader). Daily ex Sun, 11:30-12 m, 2:30-3 pm. Mon, Tues, Fri, 7-8 pm. Eastern.
WIAT, Marshall, Mo. 100 ml. Kelley-Vawter Jewelry Co. Daily ex Sun, 5:30-6 pm, concert. Central.
WIAK, Cleveland, O. 485 also. 1,000 ml. Union Trust Co. Daily ex Sat pm, Sun, 9-9:45 am, 10-10:45, 2-2:45 pm, 3-3:45, music, financial reports, news. Tues, 7:30-8 pm; Thurs, 8:15-10:30 pm, entertainment. Eastern.
WIC, Chicago, Ill. Chicago Radio Lab.
WID, Granville, O. 25 ml. Denison Univ. Tues, Thurs, 5-6 pm, educational lectures. Sun, 5-6 pm, religious stories. Central.
WIH, Washington, D. C. 100 ml. White & Boyer Co. Daily ex Sun, 1-2 pm, music. Tues, 7:45-10 pm, music. Eastern.
WIK, Toledo, O. 300 ml. Service Radio Equipment Co. Daily ex Sun, 2-3 pm, reports. Mon, Wed, Fri, 11-12:30 pm, concert. Sat, 2-5 pm, sports, news. Sun 11-12:30 pm, 7:30-8:30, church services. Eastern.
WIA, New York, N. Y. De Forest Radio Telephone & Telegraph Co.
WIJ, Newark, N. J. 1,500 ml. Radio Corp. and Westinghouse Elec. Co. Daily ex Sun, 9-9:15 am; 12-1:15 pm, 4-4:15, 7-7:30, 8-10:30. Sun, 10:30 am, church services; 3-4:30, music. Eastern.
WKA, Cedar Rapids, Ia. 200, 485 also. 200 ml. H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, ariograms; 6-7, music. Thurs, 11-12 pm, music. Sun, 4-5 pm, church service. Central.
WKA, Lincoln, Neb. 400 ml. The Lincoln Star. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.
WKAD, East Providence, R. I. Charles Looff.
WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
WKAG, Louisville, Ky. Edwin T. Bruce.
WKAB, West Palm Beach, Fla. Planet Radio Co.
WKAC, Okemah, Okla. Okfuskee County News.
WKAL, Orange, Tex. Gray Gray.
WKAN, Montgomery, Ala. 200 ml. Alabama Radio Mfg. Co. Mon, Wed, Fri, 6:30-7 pm, music, news. Central.
WKA, Cranston, R. I. Wilcox Flint.
WKAO, San Juan, Porto Rico. Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich. Mich. Agril. College.
WKAS, Springfield, Mo. 100 ml. L. E. Lines Music Sat, 8-9:15 pm, concert. Sun, 10:30-11:30 am, 10-10:45, 2-2:45 pm, H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, ariograms; 6-7, music. Thurs, 11-12 pm, music. Sun, 4-5 pm, church service. Central.
WKA, Lincoln, Neb. 400 ml. The Lincoln Star. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.
WKAD, East Providence, R. I. Charles Looff.
WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
WKAG, Louisville, Ky. Edwin T. Bruce.
WKAB, West Palm Beach, Fla. Planet Radio Co.
WKAC, Okemah, Okla. Okfuskee County News.
WKAL, Orange, Tex. Gray Gray.
WKAN, Montgomery, Ala. 200 ml. Alabama Radio Mfg. Co. Mon, Wed, Fri, 6:30-7 pm, music, news. Central.
WKA, Cranston, R. I. Wilcox Flint.
WKAO, San Juan, Porto Rico. Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich. Mich. Agril. College.
WKAS, Springfield, Mo. 100 ml. L. E. Lines Music Sat, 8-9:15 pm, concert. Sun, 10:30-11:30 am, 10-10:45, 2-2:45 pm, H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, ariograms; 6-7, music. Thurs, 11-12 pm, music. Sun, 4-5 pm, church service. Central.
WKA, Lincoln, Neb. 400 ml. The Lincoln Star. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.
WKAD, East Providence, R. I. Charles Looff.
WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
WKAG, Louisville, Ky. Edwin T. Bruce.
WKAB, West Palm Beach, Fla. Planet Radio Co.
WKAC, Okemah, Okla. Okfuskee County News.
WKAL, Orange, Tex. Gray Gray.
WKAN, Montgomery, Ala. 200 ml. Alabama Radio Mfg. Co. Mon, Wed, Fri, 6:30-7 pm, music, news. Central.
WKA, Cranston, R. I. Wilcox Flint.
WKAO, San Juan, Porto Rico. Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich. Mich. Agril. College.
WKAS, Springfield, Mo. 100 ml. L. E. Lines Music Sat, 8-9:15 pm, concert. Sun, 10:30-11:30 am, 10-10:45, 2-2:45 pm, H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, ariograms; 6-7, music. Thurs, 11-12 pm, music. Sun, 4-5 pm, church service. Central.
WKA, Lincoln, Neb. 400 ml. The Lincoln Star. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.
WKAD, East Providence, R. I. Charles Looff.
WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
WKAG, Louisville, Ky. Edwin T. Bruce.
WKAB, West Palm Beach, Fla. Planet Radio Co.
WKAC, Okemah, Okla. Okfuskee County News.
WKAL, Orange, Tex. Gray Gray.
WKAN, Montgomery, Ala. 200 ml. Alabama Radio Mfg. Co. Mon, Wed, Fri, 6:30-7 pm, music, news. Central.
WKA, Cranston, R. I. Wilcox Flint.
WKAO, San Juan, Porto Rico. Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich. Mich. Agril. College.
WKAS, Springfield, Mo. 100 ml. L. E. Lines Music Sat, 8-9:15 pm, concert. Sun, 10:30-11:30 am, 10-10:45, 2-2:45 pm, H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, ariograms; 6-

**FLEWELLING THEORY**

(Continued from page 7)

becomes free, and the action renews itself. By using the exact value for the grid leak resistance, we can time this action to meet our needs. Incidentally this is what is done in the Flewelling Super and results in a time element entering into our calculations. By changing the time of this action (which is very audible in the phones when slow enough), we can start and stop at any frequency all action in the circuit.

It is this stopping and starting action that gives the Flewelling super its characteristic sound. It will therefore be seen that the whistle is not caused by the familiar "low frequency oscillation of 10,000 to 15,000 cycles per second", but by this starting and stopping action.

**How Condensers Effect Action**

It is well known that if a condenser is placed in a suitable circuit and alternately charged and discharged there will be set up in the circuit a surging action that is caused by the endeavor on the part of the circuit to find a position of equilibrium. The magnitude of action depends of course, upon the constants of the circuit.

Now if the frequency of the surges of the condensers is properly timed, and it can be by proper timing of the tube function, we will be enabled to let our circuit "run away" to a point of maximum amplification, and then to stop it from entering into the condition of free oscillation by the application at the proper moment of positive resistance in the form of a surge from the condensers. This cycle of events must occur at a such a rate of speed that it will, if audible at all, not be so slow as to result in distortion and it is therefore necessary to so adjust our leaks that maximum amplification will be obtained and yet block out any distortion.

It will be found that the action's speed will be dependent not upon the leak value alone, but that this value must be changed as other constants in the circuit are changed. For example, in tuning, if the tuning condenser and the coupling of the coils are changed, the leak values should be changed to correspond, and thus keep the time element at the right point.

**Flewelling Flivver Differs from Super**

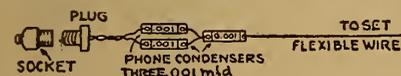
The above outline of action is but roughly drawn. It is given to show that there is a different action occurring in the Flewelling Flivver than in the usual Super, because so many folks have thought that there was no difference in the two except that the large inductances in the latter were replaced by condensers.

Like all questions however, this one has two sides to it.

Consider for a moment a Flivver circuit modified so that it would have no plate coil, and no ground or aerial, a circuit that has no more opportunity for regeneration than that possible by way of the coupling of the grid and plate circuits through the tube elements themselves. If you saw such a circuit bring in a station ten miles away would you blame the writer if he asked the question, "Is this circuit dependent upon regeneration for its action?" Unfortunately such reception is not yet at all reliable. It has been accomplished only in rare cases but the accomplishment brings such an element of uncertainty into our proposition that it seems worth while still to entertain the doubt.

**Light Socket Aerial**

Phone condensers will make a socket aerial. Procure three .001 mfd. phone condensers and connect them as shown



in the illustration, using a hard rubber base, wood or bakelite.—Arthur H. Phillips, Winnipeg, Canada.

Radio insurance is now being offered covering fire, lightning, breakage and theft.



Because of the astonishing number of requests for Chi-Rad's latest Handbook-Catalog, we are forced from this date on to make this small wrapping and mailing charge.

In this Chi-Rad Handbook are 48 pages of valuable information for every radio fan. It includes the following:

1. Technical discussions of standard radio apparatus and equipment.
2. Complete instructions, including diagrams, circuits, and illustrations on "How to Build a Reinartz Receiver."
3. Radio definitions, codes, wire tables, etc.

Just wrap a dime up in this ad and mail it to us today. Requests for books will be filled in the order in which we receive them.

Chicago Radio Apparatus Co.  
415 S. Dearborn Street  
Chicago

Largest  
Radio  
Store  
in  
America

RADIO

Largest  
Radio  
Store  
in  
America

BUY HERE FOR LESS

Radio Supplies purchased here are sold under a positive guarantee of satisfaction. We carry the largest new stock of first quality merchandise.

**Complete Parts for 2 Step Amplifier**

Can be used to amplify Reinartz, Flewelling, Crystal or any receiving set so that loudspeaker or phonograph can be used in place of headset. These parts consist of 1 Formica Panel 7x10 (or other suitable size), 1 High Ratio Thordarson Transformer, 1 Low Ratio Thordarson Transformer, 2 Howard Rheostats, 2 Bakelite Sockets, 3 Jacks, 13 Binding Posts, 1 Baseboard for mounting, and 1 Wiring Diagram with complete instructions for assembling, with template for drilling panel. Complete..... **\$12.45**

**Complete Parts for Reinartz Circuit**

Includes 1 7x18 Formica Panel, 1 Bakelite Socket, 1 Howard Vernier Rheostat, 23 Plate Condenser, 11 Plate Condenser, 3 Switch Levers, 2 Dozen Switch Points, 1 Reinartz Wound Coil, 1 Variable Grid Leak, 8 Binding Posts, 25 Feet Tinned Wire, 1 Base for Coil, 1 Mounting Base Board, and 1 Diagram to Construct this Set. Complete..... **\$11.45**

**COMPLETE KNOCKDOWN RECEIVING SET**

This includes 2 Variometers, 1 Coupler, 3 Dials, 1 Rheostat, 1 Cunningham Detector Tube, 1 Bakelite Socket, 1 Mahogany Cabinet, 7x18 Formica Panel, 6 Binding Posts, 1 Switch Lever, 12 Switch Points, 2 Stops and 1 Diagram to construct this set. Set is capable of receiving 1,000 miles if installed with outdoor aerial.... **\$17.95**

**VARIABLE CONDENSERS**

\$4.30 Value, 43 PLATE, now.....\$1.75      \$3.10 Value, 5 PLATE, now.....\$1.25  
\$3.70 Value, 23 PLATE, now.....\$1.45      \$2.70 Value, 3 PLATE, now.....\$1.15  
\$3.30 Value, 11 PLATE, now.....\$1.35

**U.S.A. SIGNAL CORPS Aviation Type 194-W WESTERN ELECTRIC PHONES, \$7.95**

Each Phone Cap is covered with large soft rubber ear cushions, and an aviation leather helmet goes with each set! These are the only phones to pass the Government specifications for sensitiveness and loudness, the requirements called for in aircraft reception.

**ORIGINAL BALDWIN PHONES**

These are the Genuine Nathaniel Baldwin "Mica Diaphragm" **\$9.95**      Genuine Baldwin "Mica Diaphragm" Type "C" Loud Speaking Units. Special..... **\$4.65**

**COMPLETE PARTS FOR FLEWELLING CIRCUIT**

Includes 6x14 Formica Panel, 23 Plate Condenser, 3 Micon .006 Condensers, 1 Freshman Variable Grid Leak, 1 Remler Leak, 2 Coil Mount, 2 Honeycomb Coils, 2 Coil Plugs, 1 Socket, 1 Howard Vernier Rheostat, 8 Binding Posts and 1 Diagram to Wire and Construct This Set. Complete..... **\$12.45**

**FEDERAL JACKS** FILAMENT CONTROL SINGLE CIRCUIT.....35c  
FILAMENT CONTROL DOUBLE CIRCUIT.....50c

**MAGNAVOX, LOUD SPEAKER, Type R3** ..... **\$34.95**

**VARIOMETERS, Genuine Mahogany, \$5 Value, Now**..... **\$1.95**

**VARIOCOUPERS, \$4.50 Value, Now** ..... **\$1.75**

**HONEYCOMB COILS**

1,500 Turns.....\$1.50	750 Turns.....\$1.00	75 Turns.....40c
1,250 Turns.....1.50	250 Turns......75c	50 Turns.....40c
1,000 Turns.....1.25	150 Turns......60c	35 and 25 Turns.....40c
100 Turns......50c		

\$8.50 Guaranteed 3,000 Ohm Head Phones... <b>\$3.65</b>	Grewol Detectors ..... <b>\$1.65</b>	Lightning Arresters ..... <b>95c</b>	Anti-Capacity Switches ..... <b>\$1.50</b>
Rheostats ..... <b>45c</b>	Signal Corps Super Sensitive Microphone ..... <b>\$2.45</b>	2-Slide Tuning Coils, at..... <b>\$1.95</b>	Lightning Switches ..... <b>\$2.65</b>
Sponge Rubber Ear Caps, Pair..... <b>50c</b>	Transmitters ..... <b>\$2.45</b>	3-Coil Honeycomb Mntgs., with Knobs ..... <b>\$4.20</b>	Hydrometers, now at..... <b>45c</b>
Dials, 2, 3 and 3½ inch ..... <b>25c</b>	Solid Copper Aerial Wire, 100 ft..... <b>35c</b>	Phone Caps, for mostly all phones..... <b>25c</b>	Freshman Variable Grid Leaks..... <b>95c</b>
Thordarson Amplifying Transformers, \$4.50 Value, Now ..... <b>\$2.95</b>	Spaghetti Tubing, yard ..... <b>10c</b>	Signal Cps. Hot Wire Ammeters, at..... <b>\$5.45</b>	
	Cord Tip ..... <b>60c</b>		
	Plugs ..... <b>60c</b>		

**FORMICA PANEL, 1/8" thick, Black or Brown, Square Inch**..... **1½c**

**We guarantee all merchandise purchased of us. Mail orders receive immediate attention**

Letters of comment on the merit of the merchandise sold and the service rendered through our mail order department have brought duplicate orders which have put us in a swamped condition. We ask to bear consideration, if your order is a day or two behind in delivery.

BUY HERE FOR LESS

**CHICAGO SALVAGE STOCK STORE**

509 South State Street      CHICAGO, ILLINOIS

# Radio Digest Illustrated

REG. U. S. PAT. OFF.

Published by the Radio Digest Publishing Company, Inc.  
123 West Madison Street  
Telephone State 4844-4845  
Chicago, Illinois

E. C. RAYNER, Publisher  
Chas. F. Smlsor, Editor Evans E. Plummer, Managing Editor  
Harry J. Marx, Technical Editor

Eastern Representative, Jacob Miller, 2126 Broadway, New York  
Telephone Columbus 2390

Pacific Coast Representatives  
E. J. Wood, 251 Kearny St., San Francisco  
Telephone Kearny 1472  
H. M. Morris, 417 Western Mutual Life Building, Los Angeles  
Telephone 12011

58  
PUBLISHED WEEKLY

SUBSCRIPTION RATES  
Yearly ..... \$5.00 | Foreign ..... \$6.00  
Single Copies, 10 Cents

Vol. IV Chicago, Saturday, February 24, 1923 No. 7

## Pay System in England

### Owners of Sets Pay a Yearly License

OWNERS of stations in England are trying to put broadcasting on a paying basis. Artists will be paid for their performances before the microphone and programs will be kept on a very high standard. This is made possible by the British government regulations.

To own a receiving set in England one must have a government license costing about \$2.20 a year. The government has agreed to pay one-half of the funds thus received to the broadcasting stations for program costs. The other revenue necessary for the operation of the stations will come from the sale of receiving sets by the broadcasting companies.

## A Great Silent Audience

To the Speaker the Microphone is the Only Audience  
THE Radio broadcaster who has had previous platform experience must change his whole mental outlook. He has been accustomed to "feel out" his audience. It may be cold, he must arouse it; it may be critical, he must ingratiate himself; it may be turbulent, he must calm it; it may be sympathetic and "go along" with him from the start.

Talking into a microphone is a good deal like making an impassioned appeal to a wooden Indian—the expended energy is all on one side. The broadcaster must build up a new technic, and draw powerfully on his imagination—and his success will be in proportion to his power to visualize, just as the success of the speaker today lies largely in the ability to "sense" his audience.

He will stand in front of that steel transmitter in the solitude and tense silence of the studio and a greater audience than ever gathered in the Athenian theater of Dionysius, in the Roman Colosseum, or on the hill of Tara will form in the prospect of his mind's eye. He will visualize the dwellers in the city apartment, in the street crowd that has drifted into the retailer's shop, the farmer and his family gathered around the fireside, the lonely rancher on the western plain, the camping party. Did ever the human voice since man communicated his ideas to man have such an audience as this?

## Co-operation Aided by Radio

### Country Schools and Farm Bureaus Are Benefitted

NOTHING in the farm field is more impressive to an outsider than the extension of co-operative action in recent years. Just as common interest is a powerful motive in co-operation, so the dissemination of common intelligence and the maintenance of contact are conditions which make the promotion of common interest possible. Some of our states have farm bureaus in every county. Information sent out by Radio under their auspices would further the purpose of such bureaus and get their information and their policies to the individual members with the speed of light.

Perhaps the greatest general utility of Radio to the farmer is in tying up with the extension work of the agricultural colleges and schools and the various state organizations devoted to improvement of farm methods. Today a relatively small number of farmers, workers or owners, benefit from such instruction. The exigencies of farm work do not often permit enrollment for full terms.

Radio would open the door of the agricultural school to tens of thousands who would never otherwise receive such institutional instruction, and it would enable the student who has been obliged to terminate a short course to continue his studies in many cases under the same faculty. With practical men in charge of such instruction the possibilities of Radio in this direction are limitless.

Every high school and even the country schools in remote districts should have the benefits of Radio. It brings them within reach of the lectures, music, and education methods of the metropolis. It means an educational contribution of highest excellence to every rural school. It includes not only direct and interesting instruction to the pupils, but stimulation of the interest of teachers and the increase of their efficiency.

## Condensed

By DIELECTRIC

Major Armstrong is quoted as having said that concerts would be broadcast all over the world "in an amazingly short time," and that a central receiving station on each continent would receive the program and relay it. With the exception of jazz I don't know of any distinctly American "accent" in music that could disturb the sensibilities of foreigners and even that is known to a large part of the civilized world. What appeals to me strongly is the possibility of hearing singers and orchestras, which, for one reason or another, do not take kindly to the idea of crossing the seas to this country. Also, be it said, there are American artists to whom Europeans could listen with pleasure and profit. Beyond the mere entertaining of the world's listeners in is the decidedly important feature of broadcasting such information regarding any nation, as would dispel the provincialism so rampant in some quarters.

Now that it is possible to talk through thick walls of steel and concrete, even without the use of aerials or ground connections, the recording of bank officials being locked into vaults from which they cannot communicate with those on the outside will be a thing of the past. It might have its disadvantages as well in certain cases. A meeting of I. W. W. nonconformists might have its proceedings spread abroad if a transmitter were secretly installed in the room where these long-haired gentry were conniving. But we must not let such thoughts deter us from encouraging the development of so useful a device. Let the spirits speak from the dark recesses of a Congressman's cellar!

In calling attention to the astounding increase in the number of receiving sets in use in this country, let me cite an interesting instance where Radio has swept through a commercial village which had been without other sources of entertainment. This colony houses the employees of a large manufacturing establishment. They had no movie houses or other source of providing amusement so they turned to Radio. It is natural that many of them would have done so, even had theaters abounded, but to find one hundred and forty-two sets where there are only two hundred homes is a pretty good average.

Much food for thought is to be found in the announcement by Dr. Hull, of the General Electric Company, of his uni-potential cathode vacuum tube. Consider that the power for plate and filament with these tubes may be supplied from the house wiring, and that a receiver, amplifier and loud speaker may be operated from plugging in to a lamp socket, then you see where such speculation leads. With the advent of the "pickle" tube and others in process of development we shall soon realize a vast improvement over what we have been content to use up to the present. The cost of these tubes should be materially reduced and I doubt very much the theory that such reduction would cripple the manufacturer—very much. Does the set at eighty dollars, or the set at three hundred dollars sell the more quickly? Would not a popular price mean greater sales? Perhaps I have too little "capacity" to hold the facts in mind, though I shall be glad to furnish my hook-up on demand.

Edward J. Nally must have stirred the French Radiophans with visions of the future and caused them to speed up local movements toward progress in this fascinating science. He may well be within the scope of possibilities in predicting before a gathering in Paris the transmission of an entire page of a newspaper with one touch of a telegraph key. Then again, he foretold the relaying of Radio concerts from a central point by telephone to various broadcasting stations. When that is done ('twere well, 'twere done quickly) every owner of a receiving set in every state in the Union may listen in to the Chicago Opera! A slight urge from you fans might hasten that glad day.

I have implicit faith in the pallophotophone as an instrument to be widely used not alone for the transmission of speeches by those who could not easily spare the time to visit a broadcasting station, but as the means of permanently recording a voice, an instrument or the expression of an idea which may fittingly typify the present age and be preserved for future generations. If the material at hand for recording such things is of a destructive nature, then someone should experiment until an imperishable substance be found. With the mental picture so readily formed from the address of Dr. William Gates, which preceded the broadcasting of the Quiche language by a native Guatemalan, it was not difficult to reach some notion of the mode of life in that country and, to a linguist, appreciate the significance of this Indian tongue in its relation to other known languages. It is just such broadcasting that shakes us loose from our local moorings and sets us to realizing how little we know of the rest of the world. Radio is the most cosmopolitan educational medium in existence today.

Atlantic City, N. J., the famous bathing resort, is looking forward to the time when it will enable bathers to enjoy music as received by a central station and distributed through amplifiers along the boardwalk. There is every reason to suppose that some day every summer resort of prominence will have its public receiving set with amplifying devices for the pleasure of all visitors, and even the effort of tuning in will be left to the "town tuner." I am wondering if they will broadcast "No. 2 yellow corn" while stock brokers are seeking recreation on the beach.

## RADIO INDI-GEST

(This column is open to all aspiring Radioknuts who tender suitable contributions. Try to "make" the column if you can. All unsuitable manuscripts are turned over to the Office Squirrel who does not guarantee their return or anything else for that matter.—Indi.)

### Oh Shame! You've Been Broad-Casting

Dear Indi—  
I'm very much interested in the latest feminine footwear, especially the Radio Boots! I passed one of these 185-pound dames on the street the other afternoon, wearing a pair of No. 12 Radio Boots. Believe me, boys, she had some wave length!  
I didn't even bother to meter! "Watts the use?" I said, "She's on her way ohm!"  
So I let Uncle go over after Ant-enna, and he didn't find her, ether!  
—HARRY C. WOODS.

### To Be Seen But Not Heard



"How do you like your new Radio receiving set?"  
"Fine! I've picked up broadcasting of every form of entertainment except oriental dancers."—LONDON TIT-BITS.

"It's the Bunk," Says Gamaliel  
VIA RADIO TO  
INDI-GEST, CHICAGO.  
SEE YOUR OFFICE SQUIRREL CLAIMS I HAVE OTHER THINGS IN MY CELLAR BESIDES THE SO-CALLED SECRET TRANSMITTING SET STOP IT'S A BASE LIE STOP OWING TO MY ADMINISTRATION I DON'T EVEN HAVE COAL STOP I DO HAVE PRIDE IN MY ADMINISTRATION BUT WHO IN H—L CAN BURN PRIDE THIS SIDE OF STYX QUESTION  
—GAMALIEL.

### A Wag, a Moan and a Blank Despair

(With Apologies to Rudyard Kipling)  
A fool there was and he got the desire,  
Even as you and I.  
He bought some tubing and lots of wire,  
Even as you and I.  
He wrapped it round and took off taps,  
And said the thing may work, perhaps?  
Even as you and I.



A panel he got and then switch points,  
Even as you and I.  
A condenser next and wire for the joints,  
Even as you and I.  
He listened for days and nary a sound,  
Till some poor fish told him he needed a ground!  
Even as you and I.

### Where Paying Was Believing

The mayor of a prosperous California city recently broadcast an address to the invisible audience by means of one of the new 500-watt transmitters now becoming popular on the Pacific Coast. Being skeptical,



he asked all out-of-town listeners in to wire him collect. They did. However, the mayor requested the Radiophans to cease firing just as his telegraph bill reached \$3,000. Said mayor is now a hard shelled Radioknut, almost ripe enough to pick, adds the Office Squirrel.

# A. B. C. Lessons for Radio Beginners

## Chapter VIII—A Crystal Detector Receiver

By Arthur G. Mohaupt

**A** CRYSTAL detector if properly constructed and used in connection with well-designed antenna will give very satisfactory results for receiving music and other forms of entertainment broadcast from the various broadcasting stations throughout the country.

A crystal detector is inexpensive in first cost, requires very little upkeep and maintenance, and is excellent for becoming acquainted with the general operation of a Radio receiving set. The ability to "tune in" a certain station and to "tune out" other undesired stations can be acquired only through practice and experience, and by beginning with the simplest and grad-

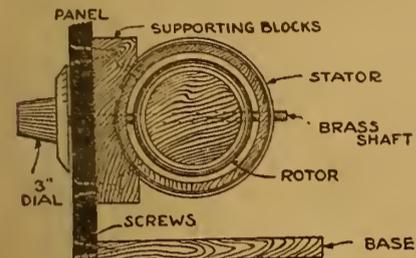


Figure 32

ually working up to the more complex tube sets, the numerous little tricks and stunts can be learned readily.

### Suitable for Short Range

Although it is generally said that a crystal detector is suitable only for short range reception (twenty to thirty miles), instances are numerous where stations located at distances of 500 to 1,000 miles away have been received, using only a crystal. Of course, the long distance results were obtained with the use of an excellent antenna and under ideal conditions. But there is absolutely no reason why, if some operators can secure such results, others cannot do likewise. Under average conditions, however, a crystal will surely be able to receive and detect signals within a range of about twenty-five miles from the local broadcasting stations.

A crystal detector will not work satisfactory with a loop or other form of indoor antenna, for it is not sufficiently sensitive to catch the weak signals currents generally received with such forms of antennae. However, with a good outdoor aerial it is capable of supplying many an evening's pleasure and pastime.

### First to Consider

The antenna is the first part to consider in the construction and installation of a Radio receiving station. As was stated in the previous paragraph, the outdoor antenna produces best results, although an aerial stretched in an open attic of a home will give nearly the same results.

For a receiving station, the single-wire inverted L-type antenna will be found very satisfactory. It is not so subject to interference from other stations operating at the same time, and does not cause as much trouble due to the accumulation of static as do two and four-wire antennae.

### Length of Single-Wire Antenna

The single-wire antenna should be about 60 feet in length and mounted at an elevation of about 40 feet. It should be properly insulated and securely mounted, so that in case of failure or swaying in the wind it will not come in contact with electric power telephone wires. Copper or phosphor bronze wire, either solid or stranded, about No. 14 in size, is best suited. Iron wire should not be used on account of its high resistance.

The antenna is connected to the receiving



Figure 33

set indoors by means of a No. 14 copper lead-in wire. At the point where the lead-in wire enters the building, an approved form of lightning arrester should be employed. This arrester is grounded to a nearby water pipe or other suitable ground connection. (The complete details of the antenna system were fully explained in the two preceding chapters, both of which will prove very valuable to those who wish to install a receiving set.)

### Constructing the Receiving Set

The receiving set itself, we will remember, performs the two important functions: tuning the station to the wave length of the desired signals and then rectifying

the incoming electrical oscillations so that when they are passed through the telephone receivers they are capable of producing audible sounds. We will first consider the construction of the tuning unit.

The tuning device to be constructed will be of the variocoupler type, consisting of a primary and a secondary, the primary having a number of taps brought out and the secondary capable of rotating within the primary.

### Primary Winding

For the primary of the variocoupler a fiber or bakelite tube is used, 3/32 of an inch thick, 3 inches in diameter and about 4 inches long. On this tube are wound about 60 turns of No. 24 cotton covered copper wire. The winding is begun about 3/8 inch from one end of the tube, and thirty turns are wound. Then a free space of 1/2 inch is left and the remaining thirty turns are applied.

At each tenth turn of the winding, however, a 1-inch loop is made. Counting the beginning and ending of the coil, there will be seven taps for altering the number of effective turns in the winding. These taps, as will be explained later, are connected to a series of switch points on the panel.

### Secondary Winding

The secondary or rotor of the coupler is also wound on a fiber or bakelite tube, slightly smaller and shorter, however, than the primary. The secondary is securely fastened to a 1/4-inch brass rod which passes through the center of the tube at right angles to the axis. This rotor is then placed in the center of the primary and the brass rod inserted in the space left vacant by the winding.

The secondary can then be rotated within the primary, and the brass rod acts as the shaft. The secondary is also wound with 60 turns of cotton covered copper wire, about No. 26 in size. About 1/2-inch space is left vacant in the center to allow room for the brass shaft to pass through.

The coil is then securely tacked to two wooden blocks 1/4-inch thick, 1-inch wide, and 4 inches long, and rounded out so as to properly fit the coil. These wooden blocks are then supported against the rear side of the panel and held fast by means of four flathead brass screws entering from the front of the panel. The general appearance of the mounted coil as viewed from the end is illustrated in Figure 33.

### The Panel

The panel forms the vertical support on which the various apparatus is mounted. A convenient size to use is 6 inches high by 9 inches long and 1/2-inch thick. Although smooth surfaced wood stained black will serve very well, hard rubber or bakelite will be somewhat better. The panel is mounted by means of three flathead brass screws to a wooden base 9 inches long, 4 inches wide, and 1/2-inch thick. The base can be given one or two coats of shellac to preserve its appearance and to make it moisture proof. The general appearance of the panel with the mounted apparatus is illustrated in Figure 33.

At a distance of 1 inch from the left edge and 2 inches from the top and bottom respectively, 3/8-inch holes are drilled and two binding posts inserted. The upper one is marked A, as the aerial lead-in wire is connected here. The lower one is marked G, as the ground wire of the set is connected to this terminal.

At a distance of 4 inches from the left edge and 3 inches from the top, a 9/32-inch hole is drilled through which the brass shaft of the variocoupler projects for about an inch. On this shaft a 3-inch dial is then fastened. By rotating the dial the rotor of the coupler can be set to any desired position. By means of the graduations on the dial the position of the rotor can be noted, so that it can readily be reset to this position in case a particular station is desired.

Two inches from the right edge and 2 inches from the top and bottom respectively, 1/8-inch holes are drilled and two more binding posts inserted. These terminals are marked PH, for it is here that the telephone receivers are connected.

### Mounting the Switch Points

The next step is to mount the switch points and switch lever. For the shaft of the switch lever a 5/16-inch hole is drilled 1 1/2 inches from the bottom and 2 1/2 inches from the right edge. At a radius depending upon the length of the switch lever nine holes are drilled with a No. 18 drill. Through the two end holes switch stops are inserted while in the other seven holes the switch contact points are inserted. The holes for these contact points are drilled 3/4 inch from center to center.

The last thing to mount on the panel is the crystal detector. The holes to be drilled for this detector depend upon the type and design of detector used. It is recommended, however, that a glass covered detector with fixed contact point be

used, for these give excellent service and require little attention. If an exposed crystal is used, it may have to be cleaned with a little benzine or alcohol occasionally to remove the dust and dirt that may have accumulated on it. The detector is mounted directly over the center of the switch lever as illustrated in Figure 33. Everything is now ready to be wired.

### The Wiring Process

After everything has been securely mounted and fastened according to the above directions, the apparatus is ready to be wired. The wiring should be done with No. 14 or 16 copper wire, preferably tinned. To prevent any possibility of a ground or

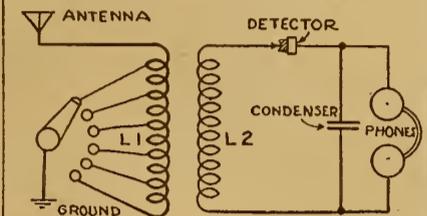


Figure 34

short circuit in the system occurring it is good policy to cover the wire with rubber or spaggetti tubing.

All wires should be run in perfectly straight lines, and should cross each other at right angles. This not only adds to the neatness of the outfit, but avoids to some extent the inductive interference of one circuit upon another. All connections and contacts should be soldered, for unsoldered connections are likely to become dirty and have their contact resistance increased to such an extent that the apparatus will not function properly.

An efficient hook-up to use for connecting the various pieces of apparatus is given in Figure 34. As shown, the terminal or binding post to which the aerial lead-in wire is brought is connected directly to one end of the primary (L-1) of the variocoupler. The shaft of the rotating switch lever (S) is then connected to the ground terminal or binding post. Thus by adjusting the lever (S) any number of turns of the primary can be "cut" into use so as to

tune the receiving set to the wave length of the incoming signals.

One terminal of the rotor (L-2) of the variocoupler is connected to the detector, while the other side of the detector is connected to one of the telephone binding posts. The other telephone terminal is connected to the free end of the coupler secondary. Across the condenser terminals is also connected a .00025 mfd. telephone or bypass condenser. If all the work is carefully and neatly done according to directions, good results can be expected.

### The Cabinet

The cabinet for housing the apparatus can be built of good quality soft wood and stained any desired color, although a mahogany stain produces the most desirable finish. If a more elaborate cabinet is desired, quarter-sawed oak can be used.

Three-eighths-inch stock is very suitable, in that it is sufficiently strong and at the same time, easily worked. The two end pieces must be 6 inches long and 4 inches wide, while the top piece must be 9 3/4 inches long and 4 inches wide. The rear wall is 6 inches wide and 9 3/4 inches long. The entire cabinet is mounted on a base board 10 1/4 inches long, 4 1/4 inches wide, and 1/2 inch thick. The front is arranged so that the panel and the base on which it is mounted will easily slide in and out.

(Continued on page 12)

**RUSONITE**  
CRYSTAL RECTIFIER  
MULTIPOINT (Patent Pending)  
A Synthetic CRYSTAL DETECTOR sensitive over its entire surface  
Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by Radio experts and press. Sold in Sealed Packages only. Join the ever increasing RUSONITE fans.  
Price, Postpaid, mounted 50c  
Sensitivity guaranteed 50c  
**RUSONITE CATWHISKER**  
14 Karat Gold Multiple Contact Super Sensitive..... 25c  
Order from your dealer or direct from us.  
**RUSONITE PRODUCTS CORP.**  
19 Park Row, N. Y.

## WILLARD

WILLARD RADIO CORPORATION  
DEPT. R. D., 291 BROADWAY, NEW YORK

<p style="text-align: center;"><b>REINARTZ CIRCUIT</b> EVERY PART COMPLETE</p> <p style="font-size: small;">1 Reinartz wound coil, 1 coil base, 1 tube socket, 1 Vernier rheostat, 1 23-plate .0025 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 25 switch points and nuts, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, 25 feet bus bar wire, 1 high-grade Radion panel and diagram <b>\$10.00</b></p>	<p style="text-align: center;"><b>FLEWELLING Circuit</b> EVERY PART COMPLETE</p> <p style="font-size: small;">2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction <b>\$11.00</b></p>
<p style="text-align: center;"><b>CONDENSERS</b></p> <p style="font-size: small;">3 Plate Variable; value, \$1.75... \$1.05 13 Plate Variable; value, \$2.50... 1.20 23 Plate Variable; value, \$3.50... 1.35 43 Plate Variable; value, \$4.50... 1.65 13 Plate VERNIER; value, \$5.50... 3.75 23 Plate VERNIER; value, \$6.00... 4.00 43 Plate VERNIER; value, \$6.50... 4.25</p>	<p style="text-align: center;"><b>AUDIO FREQUENCY TRANSFORMER</b></p> <p style="font-size: small;">VALUE, \$4.50 PRICE, \$2.75</p>
<p style="font-size: small;">FILAMENT RHEOSTAT—Condensite base; value, \$1.10; special at ..... \$0.70 FILAMENT RHEOSTAT with 2 1/2" dial; value, \$1.50; special at ..... .85 Potentiometer with knob; value, \$1.75; special at ..... 1.00 Potentiometer with 2 1/2" dial; value, \$2.15; special at ..... 1.15</p>	
<p style="text-align: center;"><b>ALUMINUM LOUD SPEAKING HORN—Nickel plated—highly polished; \$8.00 list. \$3.75</b></p>	
<p style="font-size: small;">V. T. SOCKETS—Nickel brass sleeve, composition base; value, \$1.00; special at ..... \$0.50 Ball Bearing Inductance switch; value, 75c; special at ..... .30 BEST QUALITY JACKS, Single circuit; value, 65c; special at ..... .30 Double circuit; value, 90c; special at ..... .45 VARIOCOUPLER—Celoron condensite and Litz Wire wound secondary; value, \$4.50; special ..... 3.25 THREE-INCH DIALS—Unbreakable—heat resisting composition—high finish; special. \$0.30 TWO-INCH DIALS—Same design—for rheostats and potentiometer; special..... .25 EXTRA SPECIAL—Telephone Headsets; \$8.00 list; reduced to ..... 3.50 RAYMOND VERNIER RHEOSTATS—Value, \$1.50; special ..... .95</p>	
<p style="text-align: center;"><b>REINARTZ COILS</b> Value \$2.50 ..... \$1.75</p>	

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on Receipt of Purchase Price

# Honeycomb Mounting on Cabinet Top

## Logical Place on Set for Duolateral Coils

Regular mounting for honeycomb coils is not liked by every Radiophan. The front of the panel is not the logical place for them. A better way for mounting

### WORKSHOP KINKS? EARN A DOLLAR—

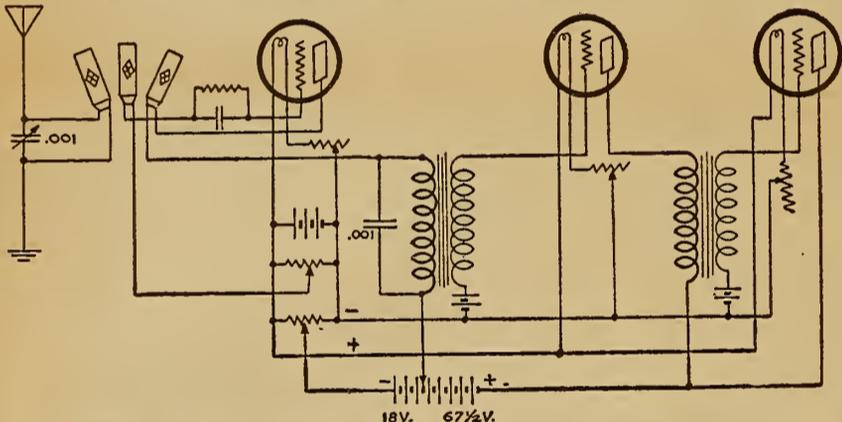
THERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in securing such material.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

RADIO KINKS DEPARTMENT,  
Radio Digest Illustrated,  
123 West Madison St., Chicago, Ill.

them is on top of the cabinet. In the illustration the mounting is shown of the regular type, but the unique part about this arrangement is that the coils are operated by regular dials or knobs. Cranks are attached to the dial shaft ends and pitmans act on the two outside coils for making the adjustments.—W. H. Zink, Baltimore, Md.

### Spider Web Coils in Set

The accompanying illustration shows a new hook-up which I developed recently, which is so far superior to anything that I have had before that I am going to pass it along for others to try. With this hook-up I get Chicago loud enough so that I can understand the announcements 30 feet

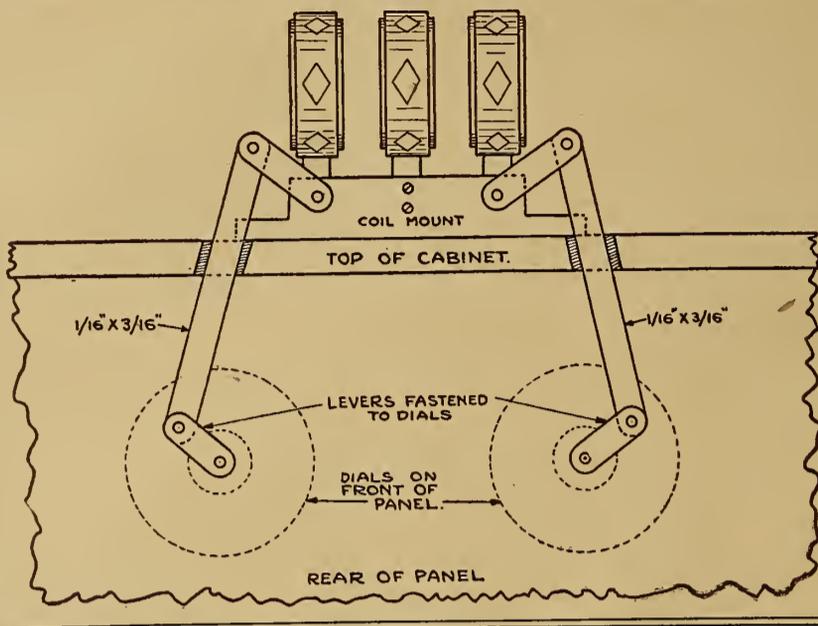


from the set through a loud speaker and using only the detector tube. With two steps of audio you can hardly stand the phones on the ears, and all the large stations in the country within 1000 miles range come in loud enough so as to be heard all over the room through the loud speaker. In fact I seem to get about all anybody is getting from Canada to Cuba and from New York and the Eastern states to Denver, Colo. Chicago will come in through the loud speaker using a loop aerial but not loud.

I am using spider web coils wound as described by me in the Radio Digest of September 2, using a 2-inch core and from 39 to 43 pegs, the more the better, and going in and out taking two pegs at a time. They are far superior to the regular honeycomb coils and by bringing down the taps to a number of small brass screws on the core and making a little switch lever out of thin brass, they can easily be tuned over quite a wide range. I use No. 22 D. C. C. wire on the primary, tapping at 14, 16, 18, 20, 25, 30, 35, 40, 50 and 60 feet. The turns are hard to keep track of and so in winding I measure off so many feet to the next tap.

The secondaries are wound with No. 28 D. C. C. wire. This size not only seems to work best but it enables one to put on more turns without the coil getting too bulky. It is tapped at 15, 30, 40, 50, 60, 70, 80, 90 and 100 feet. Ticker is same as a secondary. These coils will tune to 1000 meters or more. My aerial consists of two wires about 150 feet long and I am using for broadcasting reception 20 feet on the primary, 30 feet on the secondaries and 30 feet on the tickler. The wiring is the same as a regular hook-up and tuning the same as for the regular honeycomb set. I am using 67½ volts on the amplifying tubes and to get them to take this voltage it is necessary to add a small flash light cell or "C" battery in the grid circuit with the negative to the grid. The potentiometers are a help but not necessary. For broadcasting reception the coils do not have to be so large but the

## LEVERS OPERATE COIL ADJUSTMENT



primary, which is the largest, measures over 4½ inches.

Instead of jacks for connections I have five binding posts at the lower right hand corner of the cabinet. The first two are for the detector and the other three for the amplifiers. I have tried adding a step of Radio frequency but without success as the loss in regeneration is not compensated for by the Radio frequency and I get more out of using just the three tubes. This set is very selective, has a long range and is well worth the trouble of making the coils.—J. R. Wilkinson, Kankakee, Ill.

more sensitive and responsive the phones are, the clearer and stronger will be the sounds heard.

### Chapter Nine

In Chapter Nine we will begin our study of the principles of operation of the three-electrode vacuum tube as employed in all higher-priced receiving sets. We will first consider the tube as a detector and then as an amplifier. In doing so, of course, we will take up a discussion of all the important circuits used for vacuum tube receivers. Since the successful operation of vacuum tube circuits is dependent upon a thorough knowledge of the characteristics and behavior of vacuum tubes, it is very important that everyone interested in this fascinating and timely subject carefully read the article in next week's issue.

### Pins for Coil Winding

In winding a pair of honeycomb coils I had trouble in pushing the pins in the wooden form without bending. Something was needed that would not bend so I procured a box of used phonograph needles and used them instead. They were just the right length and they solved the difficulty. A coin such as penny or dime placed between the finger and the pin end forms an excellent shield when pushing them into the core.—Charles Spaulding, Erie, Pa.

Dry weather in Oregon is held responsible for the prevalence of static which has interfered with broadcasting.



Now design: heavy phosphor-bronze springs; no spacer washers required. Write for Bulletin on these Jacks, "TU-WAY" Plugs and other Carter products.  
CARTER RADIO CO., 209 S. State St., Chicago

### Loud Speaker Hint

If a loud speaker is placed on a soft rubber cushion about three-quarters of an inch thick the sound will be much clearer. The rubber must be of a certain density to prevent a lateral movement of the loud speaker.

### A. B. C. LESSONS

(Continued from page 11)  
Operating the Receiving Set

The outfit is now ready to be put into operation. One thing needed in learning to operate a Radio outfit is patience. If at first the apparatus does not work, do not immediately condemn it for there are plenty of other places where the trouble may lie. Examine the antenna and lead-in wire to make sure that all connections are electrically secure and that the antenna is well insulated etc.

After everything is in good condition, the lead-in wire is connected to the antenna terminal of the receiving set, and the ground terminal is connected to a water pipe or other suitable ground, adjust the inductance switch lever (S) until the signals can be heard in the phones. Adjusting the switch lever alters the number of turns of the primary in series with the antenna, and in this way the set is tuned to the wave length of the incoming signals. The final step in the tuning process is to adjust the position of the rotor by turning the dial until the signals can be heard loudest in the phones. Adjusting the rotor alters the degree of coupling and in this manner establishes a resonance condition. In case the signals do not come in as clear as they might, adjust the contact point on the crystal until a more sensitive spot is found.

### The Telephone Receivers

Successful and satisfactory receiving with a crystal set is dependent to a great extent upon the operation and sensitiveness of the phone receivers. To get best results, as good a quality of phones as the pocket-book will permit should be secured, for the

## Data on Construction of Fixed Condensers

Most amateurs who have been assembling the Flewelling circuit outfit have experienced difficulty in obtaining the .006 mfd. condensers, and many have built up these condensers from units of other standard capacities.

The construction of fixed condensers of any capacity is a simple matter for any amateur providing he knows the active area of dielectric required. The formula for finding this area is:

$$A = \frac{C \times T \times 10^{10}}{2248 \times K}$$

Where A is the area of active dielectric surface in square inches, C is the capacity in microfarads, T is the thickness of the dielectric in inches and K is the inductivity, which for various materials is as follows:

Air	1.000
Glass (Common)	3.013 and 3.258
Glass (Light Flint)	6.850 and 7.000
Glass (Very Light Flint)	6.570
Hard Rubber	2.050 and 3.150
Mica	6.000
Paper	1.500
Porcelain	4.380

For example, a condenser of .006 mfd. capacity using mica dielectric of .001 inch in thickness must have an active dielectric area of

$$A = \frac{.006 \times .001 \times 10^{10}}{2248 \times 6} = 4.448$$

There should therefore be used four pieces of mica one by two inches and five pieces of foil one by 1.48 inches. The foil so placed that it projects ¼ inch out from between the mica.

The overlapping foil areas will then be ¼ by 1.48 inches, or 1.112 square inches which with four dielectric sheets, gives the required 4.448 square inches.

Attention is called to the fact that the thickness of the foil does not have any bearing on the capacity of the condenser.—E. R. Willard, Berkeley, Calif.

### Cat-Whiskers

The cat-whisker of a crystal set should not be too long. Two inches of steel violin E string is about the proper length. The spring should rest very lightly on the crystal. If the spring is longer than two inches external vibration or jarring will cause the spring to change position and jump off the crystal.

### PHANTOM-CIRCUIT

Build Your Own. This marvel of mystery, using no loop, no aerial and no ground, brings in music instead of interference. We have heard stations 950 miles distant on one tube. By using WD-11 tube set can be entirely self contained. Very easy to build from our instructions, use your own spare parts, nothing complicated like radio frequency or super regenerative. Only one tuning control. Complete instructions, with hook-up and photo of circuit mailed to you for 60 cents. Stamps accepted.  
VESCO RADIO SHOP, Box D-704, Vacaville, Calif.



### SWELLS EVERY NOTE INTO FULL RICHNESS MAKES YOUR OUTFIT COMPLETE

WITH  
**BALDWIN PHONES**  
Type C Unit, \$11.00  
Type C Head Set, \$17.00  
AT ALL GOOD DEALERS

### SHIELTONE LOUD SPEAKER

STATES ELECTRIC COMPANY, Agents  
469 Broad St. Newark, N. J.

## C R L

### VAR. GRID LEAK

¼ to 10 megohms

### KLENTZ RADIO CO.

Exclusive Distributors  
508 South Dearborn St.  
Room 770 Wabash 1380  
Chicago

## Delicate Soldering

THE POST SOLDERING IRON  
Platinum Heating Unit—Interchangeable Tips—Universal Current  
Large & Small

ONE-HALF ACTUAL SIZE  
Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute  
From your Dealer, or write  
POST ELECTRIC COMPANY (Dept. 509), 30 E. 42nd St., New York

# Reinartz Panel Set Designed for Compactness

## Part III—Construction of Cabinet

By H. J. Marx

**T**HE best of amateurs will spend a lot of time and money in assembling an elaborate and efficient Radio receiving set and then usually put it in a box which is called, in name only, a cabinet. Some even omit that, leaving it open for the accumulation of dust and dirt, not only making it unsightly in appearance, but also destroying its efficiency of operation. An open set is always exposed to damage in handling. Wires are bent, connections are broken or become loose, sometimes parts or tools are dropped in between the apparatus, causing short circuits or otherwise damaging the set.

Any well made set deserves a neat, substantial cabinet that not only makes it dust and dirt proof but also enriches its appearance and adds to its attractiveness.

### Material Used

In building a cabinet naturally the first consideration is expense. If made at home, the labor is seldom an important item. The expense, then, is simply a question of the cost of materials.

Mahogany is often the first choice. However, not only is its cost high, but in addition the wood is rather difficult to work and also difficult to obtain in the sizes ordinarily required.

Pine is cheap and easily obtainable but is much too soft for cabinets. Light wood screws soon turn loose and the cabinet will then come apart.

Birch is very popular among the cabinet makers. Cedar or cigar box wood is also well adapted to cabinet work. In fact the amateur cannot do better than go to some box factory and get the materials all planned to the proper thickness. This work can be obtained at a nominal cost. Very often the manufacturers will be glad to make up a special order cabinet at a very slight expense.

### Size of Stock

The sides and top are made of 1/4-inch stock, 8 inches wide. The back is made of 3/8-inch stock, also using the 8-inch width. This width is sufficient to allow for cutting off the 3/8-inch square strip that is fastened to the top for the panel to set against. The baseboard to which the panel is fastened and also the base of the cabinet are both cut from 1/2-inch stock, 8 inches wide.

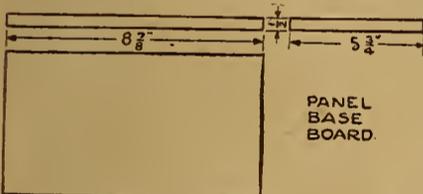
The total stock required for a cabinet is:

- 25 inches 1/4-inch stock 8 inches wide
- 10 inches 3/8-inch stock 8 inches wide
- 20 inches 1/2-inch stock 8 inches wide

Two small brass hinges in addition to the miscellaneous nails and screws are required. It is best to glue all joints for the best sort of a job.

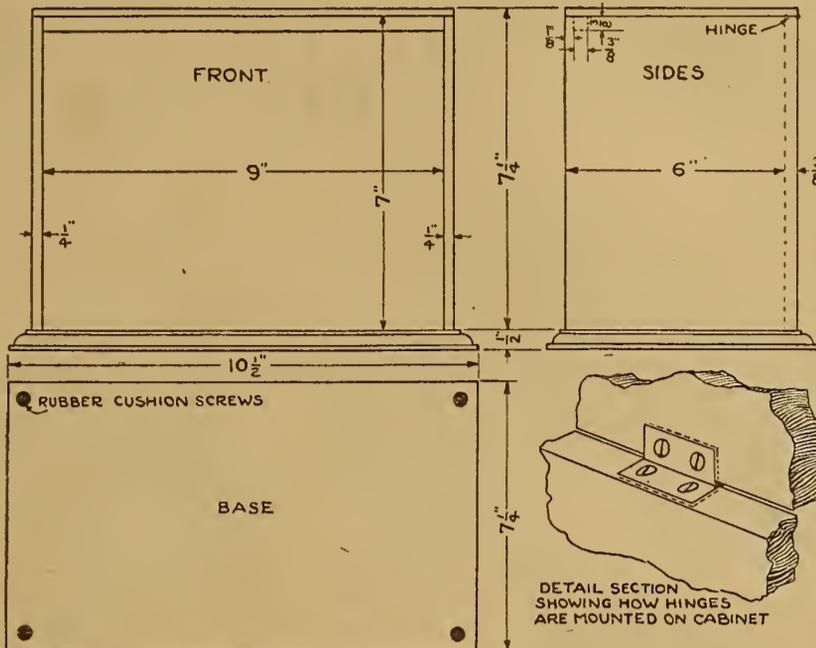
### Base of Cabinet

The base of the cabinet can be very simply constructed with a beveled edge.



in this way eliminating the moulding edge shown in the illustration. Naturally at any cabinet maker's, equipped with moulding machines a fancy edge of this kind presents no difficulties.

The sides and backboard can be fastened to the base by means of countersunk woodscrews driven up through the base. Clearance holes should be drilled and countersunk in the baseboard, and in addition, a smaller drill should first be run



into the sides and back so as to avoid splitting the wood when tightening the screws. After assembly the base can be covered on the bottom with a green felt to avoid scratching the surface of the table on which the cabinet stands.

### Hinged Top Used

The top is hinged to the backboard, and, if desired, a small hook can be fastened to the sides to hold the top down. In order to avoid accumulation of heat in the cabinet a hole can be drilled in the top and a panel bezel inserted.

The 3/8-inch strip is fastened on the underside of the top board 1/8 inch from the front and simply keeps the panel in position flush with the surface of the cabinet.

### Staining the Cabinet

Naturally the deciding element in the appearance of any cabinet is the finish. If the wood is well grained, a natural finish presents many advantages. If mahogany, birch or oak are used, these can be carefully sandpapered first using a rough grade and finishing up with an 0 or even 00 grade. The surface can then be oiled or given one very thin coat of a high grade spar varnish or shellac. This should be carefully applied in a fairly warm room, using a good camel's hair brush. Allow the cabinet to dry thoroughly, as handling it before the varnish has hardened will spoil the brilliant finish.

If the wood is stained, it can be given the coat of stain first and then varnished, or a good quality varnish stain can be used. About three coats are usually required, each of which should be given plenty of time to dry and harden. Each coat should be rubbed down with a very fine grade of sandpaper, followed by pumice stone if a piano finish is desired. Too much care cannot be taken in this part of the work. Don't try to rush the

job, and above all, don't use cheap stains, varnish or brushes!

### Batteries Required

For the Reinartz circuit anywhere from 22 1/2 to 45 volts have been used in the plate circuit, depending on the type of tube used. With the average tube, a six-volt storage battery is necessary. A peanut (WD-11) tube can be used with a dry cell in place of the storage battery. In the dry cell the carbon or center post is the positive terminal, while the zinc or rim post is negative. This tube does not require as much plate or B battery voltage, and most efficient results can be obtained by experimenting to find which voltage is best suited to the tube.

All tubes have a particular plate voltage at which they give the maximum results and clearest reception. This voltage, however, is best determined by experimentation.

### Tuning Aid

To neutralize the effect of "body capacity" in tuning in Radiophone signals, place a sheet of aluminum back of the variometer dials. The aluminum strip should be grounded. Care should be taken that it does not touch the frame of the variometer.

### Storage Battery Leads

Keep the leads from the storage battery to the filaments of the vacuum tubes as short as possible. There is a loss in voltage in any wire carrying a current. This can be reduced by increasing the size of wire or reducing its length.

**CONGRESS RADIO CO.**  
503 So. State Street  
CHICAGO - ILLINOIS  
Open Until 9 P.M. Every Night

Master Baldwin C Units with cords .....	\$4.65
Master Baldwin Type C Headsets .....	8.25
Victor \$5.00 Headset .....	3.45
Brandes Superior Headset \$8.00 list .....	5.95
CRL Adjustable Grid Leak with Condenser .....	1.50
CRL or Acorn Rheostats 75c value .....	.45
Glass Covered Detectors \$2.00 value .....	.95
Freshman Variable Grid Leak and Condenser .....	.90
Grebe Type Dials 2" and 3" .....	.25
Sicon Crystal Receiving Set, with Phone .....	4.50
3 Plate Variable Condenser .....	1.00
11 Plate Variable Condenser .....	1.25
23 Plate Variable Condenser .....	1.45

MAIL ORDERS RECEIVE IMMEDIATE ATTENTION

**FOR YOUR RADIO**

**World BATTERY**

Saves you 50% of the usual cost and you get an unconditional WRITTEN 2 YEAR GUARANTEE

Best battery buy on the market today. Thousands of satisfied users.

5-Volt 40 Amp	\$8.50	6 Volt 50 Amp	\$10.00
5 Volt 80 Amp	\$12.50	6-Volt 100 Amp	\$14.50

Ask about our rubber containers

**WORLD BATTERY CO.**  
60 E. Roosevelt Rd.—Dept. L.  
CHICAGO, ILLS.

LIST PRICE \$4.00

**REINARTZ COILS**

Complete with Mounting Bracket and Hook-Up

DEALERS: WRITE FOR DISCOUNTS

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

**ORIGINAL NATHANIEL BALDWIN TYPE C PHONES..... \$9.50**

**ATWATER-KENT PARTS**  
VARIOMETER, \$6.95 VARIOCOUPLER, \$6.95  
MOUNTED VARIOCOUPLER, \$11.25  
2 STAGE AMPLIFIER.....\$13.90

W.D. 11 ADAPTER.....\$0.90  
W.D. 11 SOCKET......75  
FRESHMAN GRID LEAK-COND. .80

Prices Quoted on Other Items  
Mail Money Order Only. Include Stamps for Postage.

**RADIO MAIL SERVICE** 146 Grace St. Jersey City, N. J.

**TWO SUPERSENSITIVE CIRCUITS**  
(Both Copyrighted)

My Highly Improved Reinartz brings in all important stations on both coasts and Mexican border, loud, clear and without distortion. We dance to music from Atlanta received on one loud Baldwin unit. Build one of these wonderful sets from my blueprints and specifications, price 50c, or with a perfect and complete double wound spiderweb coil, \$3.00 by mail. No other windings used. Photo of my set on a glass panel with every order.

My W. D. 11 Circuit is especially designed for use with the "Pickle" tube and brings out the full value of that little tube as no other circuit can. Stations 1000 miles away come in clearly on one tube. This set is small, complete, portable. For the man who wishes the highest efficiency this is the set to build. Price of blueprint and specifications \$1.00, or with complete and perfect windings \$5.00. Photo of set with every order.

Either set is cheap and easy to build, easy to operate. Everything clearly shown. Please don't send stamps.

S. A. Twitchell, 1925 Western Ave., Minneapolis, Minn.

**WD-11 OUTFIT (PEANUT TUBE)**

This wonderful dry battery outfit with a range of 600 miles comes to you ready to assemble, panel drilled and marked, mahogany finished box, condenser ready to screw in place. Variocoupler wound complete, rheostat, dials, binding posts, socket, wire screws and picture diagram for wiring, all at above price.

**\$13.85** Less Tube

WD-11 Tubes .....\$5.95  
Head Phones.....\$4.50 and up  
Two-stage Amplifier Box to match the above.....\$14.15

Postage extra on four pounds. No personal checks received. Let us quote on your wants.

**RADIO PARTS CO.**  
8 So. Austin Boulevard, CHICAGO, ILL.

**CROWN Coil Mountings**  
especially adapted for FLEWELLING CIRCUIT

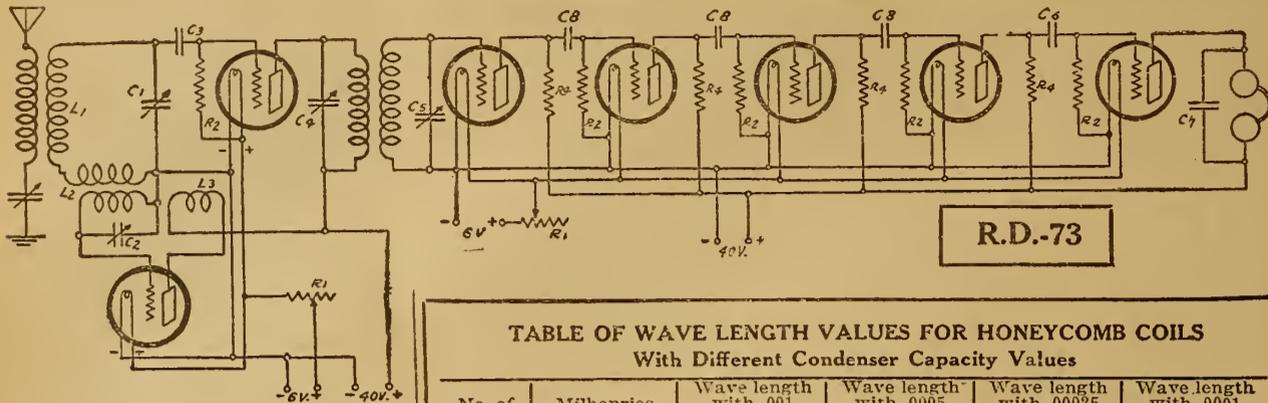
Used by many manufacturers as standard equipment on sets. For long and short wave reception. A few of its many special features:

1. Special Locking Device to keep the coil in place, thus preventing it from being thrown out of adjustment.
2. Special Adjustable Bearing feature.
3. Special constructed Calibrated Dial, showing the stations tuned.
4. Positive Connections on rear of blocks.
5. Complete with Flexible Leads.

At your dealers—otherwise send purchase price and you will be supplied postpaid.

**CROWN RADIO MANUFACTURING CORPORATION**  
78 FIFTH AVENUE  
NEW YORK CITY

# THE ROLLS-ROYCE OF RADIO RECEIVING SETS



NUMEROUS inquiries have been received for an authoritative long distance receiving set circuit. The Armstrong Super-Heterodyne Circuit comes nearest to filling the general requirements for a circuit of this sort. For this reason it is given as Hook-Up Diagram R.D.-73.

The tuning unit is best supplied in two honeycomb coils. Their values depend on the wave length range desired for reception. The table of wave length values for honeycomb coils will be found invaluable for determining the proper coil to use for L1. Naturally the inductance of the L2 coil in series in the secondary circuit must be taken in consideration. L2 can be made up of two sets of 18 turns of No. 30 double cotton covered wire wound on a tube 2 1/4 inches in diameter. L3 is also 18 turns of the same wire wound on the same tube close to L2, running in the same direction.

TABLE OF WAVE LENGTH VALUES FOR HONEYCOMB COILS With Different Condenser Capacity Values

No. of Turns	Milhenries Inductance	Wave length with .001 mfd. capacity	Wave length with .0005 mfd. capacity	Wave length with .00025 mfd. capacity	Wave length with .0001 mfd. capacity
25	.04	377	267	188	85
35	.075	513	365	258	163
50	.15	730	516	365	230
75	.3	1032	730	516	326
100	.6	1460	1032	730	462
150	1.3	2148	1632	1074	679
200	2.3	2854	2020	1426	901
250	4.5	3992	2822	1996	1263
300	6.5	4802	3445	2400	1517
400	11.0	6244	4415	3622	1790
500	20.0	8429	5960	4214	2658

C1 is a .0005 mfd. variable condenser for secondary tuning. This might well be of the vernier type. C2 should have a capacity of .001 mfd., preferably vernier. C3 should be fixed in value, .0001 mfd. C4 and C5 should both be variable, .0005 mfd. C6 has a fixed capacity of .0001 mfd., C7 of .001 mfd. C8 consists of three fixed condensers of .005 mfd. each. The resistances for coupling between

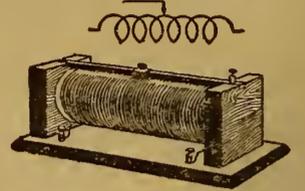
tubes have the following values: R4, 50,000 ohms; R2, 1 megohm. R1 represents a 6-ohm rheostat, two of which are used. Since each of these controls more than one tube their resistance wire should be able to carry at least 8 amperes.

Tuning will be found somewhat difficult until the operator is acquainted with the set. The circuit is not recommended for the beginner in the Radio field.

the receivers. The crystal is inside of the little cup and held in position by a small set screw. The cat whisker is the thin wire spirally wound and terminating in a projecting point, which rests lightly on the surface of the crystal. It is fastened to a universal mounting joint so that it can be moved over the entire visible surface of the crystal in order to find the sensitive spot.

### Single-Slide Tuning Coil

This is about the simplest and oldest form of tuning unit and is used for tuning the circuit to the proper wave length. In the same sense that any musical instrument string must be tuned to the proper tone, so any receiving set must



be tuned to the same wave length as the broadcasting station in order to receive their concert. Wave length does not mean the distance to the station, but rather refers to the period of vibration, similar to the musical tones of any stringed instrument. Only one slide is used for tuning.

Patents Procured and Trade-Marks Registered. Advice and terms upon request.

ROBB, ROBB & HILL, 1417 Hanna Bldg., Cleveland, O. 956 McLachlan Bldg., Washington, D. C.

## The Reader's Review

### Wants Better Program

Can the Digest help us in Rochester, N. Y. to secure better broadcasting, or suggest a way whereby we Radio listeners can accomplish the result? The story is this—

Two newspapers were after a permit for a station. The Rochester Times-Union beat the Rochester Democrat and Chronicle to it and established station WHQ. After several months the two papers got together and presented a complete station to the University of Rochester, WHAM. This station was installed in the Eastman School of Music and Eastman Theater—all one institution and one building. After many tedious months of testing, the Rochester fans were repaid for their patience by a daily program as follows:

- 2:55 p. m.—Weather forecast.
- 3:00 p. m.—Orchestra music.
- 4:15 p. m.—Organ and orchestra.
- 7:00 p. m.—Orchestra selections.
- 7:30 p. m.—Bedtime story; market report.

Naturally, the weather forecast differs from day to day, yet is given at a time when the farmer, shipper or business man cannot listen in. This should be given in the evening. The bedtime story also is different from day to day. For the balance of the program the organ and orchestra play to the movies, and the music once heard Monday is repeated with monotonous regularity, note for note, on Tuesday, on Wednesday, on Thursday, on Friday and on Saturday. Sunday we are granted a blessed relief.

Now let me tell you of the Eastman School of Music and the theater, housed in a most magnificent building, a gift of George Eastman to the citizens of Rochester, held in trust by the University of Rochester. The theater is on a scale of grandeur and adaptability worthy of a prominent place in the life of a city like Chicago or New York. The organ is the last word in organ construction, the orchestra is a high-class symphony of some sixty pieces and the music as rendered could not be greatly improved, but on the monotony!

This may be overcome if the right pressure is brought to bear for instance: The school of music has a staff of artists teaching violin, cello, piano and voice. The university has a staff of noted professors. I have written to the president of the university, Dr. Rush Rhees, suggesting that the school artists and the university professors devote maybe a half hour on alternate evenings to concert broadcasting and educational talks. My letter was unanswered. I have been to the owners of the two newspapers with my plea for relief of this monotony and they refer me to Mr. George Eastman. I have talked to him and he says see Dr. Rhees—a very tight and interlocking ring for ease in passing the buck.

With a fine Station WHAM has every advantage for diversified entertainment and amusement, yet we get six days of movie music, each performance exactly like its predecessor, the organ even playing the same music as the orchestra with some slight exceptions.

Two to three times a month for one half of one hour we are allowed to listen

to a brief part of the concert given by some very noted artists in the Eastman Theater. Elman, Homer, Bonnet, Paderewski and others perform in person, and their concert is broadcast for just thirty minutes. If 9:15 p. m. comes in the middle of a number the switch is thrown regardless, and the station signs off.

Mr. Editor, I am voicing the complaint of a big lot of listeners in Rochester where we are used to the best. "Rochester Quality" is world-known. Station WHAM has unlimited facilities, but provides movie music. Will you help us smoke this circle in the open and give us diversified music and instruction?—H. H. K., Jr., Rochester, N. Y.

(The situation expressed by this letter is being investigated and will be remedied to the satisfaction of all, it is hoped.—Editor's Note.)

### Flewelling Suggestions

Referring to Question and Answer 1768 MLL, San Diego, Calif., I note that he must keep the coils at right angles, thus securing very little regeneration. I am inclined to think that this is due to the fact that the leads to the coils are wrong. If they are, the induction set up in the coils would be against each other, therefore blocking the induction in both circuits. The receiver would cease to function, therefore, as the coupling is made closer. (This is not so pronounced in H. C. coils as in single layer coils.)

I have found that to make the set work at its best, the lead running from the plate to the tickler coil must be connected to the outside of the H. C. coil and the lead from the grid leak to the other coil should connect to the inside of that coil, or if the first connection is made to the inside, the other connection should be made to the outside.

I have noticed that this very mistake was made in the diagram of the Flewelling circuit shown as R.D.-70, page 14, January 20 issue. By changing the lead from the grid to coil L50 from the right hand side of said coil to the left side and connecting the lead from the .006 mfd. condensers or the ground to the right side of the L50 coil instead of the left, much better results will be obtained.

I trust this information may be passed on to our friend in California, and any

**GOVT RADIO STORAGE BATTERIES**  
New Signal Corps Batteries. Edison 3 cell type BB-4 \$4.50; Edison single cells for W. D.-11 tubes \$1.50; Edison 60 A. H. for W. D.-11 tubes \$5.25; 6 Volts Edison \$7.75; "B" battery, Edison single elements, 4c each, double 10c each.

**FLEWELLING .006 CONDENSERS & PARTS**  
.006 Bakelite mounted Ruby Mica-Copper, N. P. binding posts. Set (3) \$2.90. Var. Grid Leaks (clearer music, louder signals on any cir.) 75c. Var. Grid Cond. .0025 or .0005 max. 45c. Special design Audio Trans. \$3.45.

**FLEWELLING SPIDER COILS**  
Easier tuning, clearer signals; green silk on Bakelite \$1.75 each.

**REINARTZ LATEST COILS**  
Double green silk winding on Bakelite spider \$1.95. Reinartz plate circuit chokes (triple adjustable) \$1.70.

**RADIO FREQUENCY IRON AND PARTS**  
R. F. .003 Iron for cores; special wire and forms to construct R. F. Transf. of highest efficiency. Detailed plans 50c.

**REFLEX CIRCUIT TRANSFORMERS**  
Special design Reflex Cir. Transf. & Diag. that really works \$3.65.

**VERNIER FOR VARIABLE CONDENSER**  
Works with any condenser. Requires no extra space, 95c.

**HI-POWER AMPLIFYING TRANSFORMER**  
Best! Loudest signals! No burn-outs. \$2.95 with special diagram.

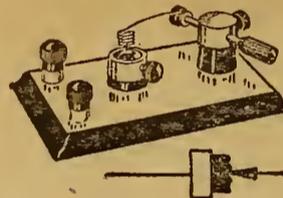
**20 OHM RHEO FOR W. D.-11 OR 201-A**  
tubes \$1.60; 8 ohm for New DeForest tubes \$1.55. Include postage with order. Write for our complete list. **QUALITY RADIO SHOP, RICHMOND, IND.**

others who may be having trouble with their sets refusing to operate except on very loose coupling.—J. H. H., Wayne, Neb.

## About Radio Parts

### The Crystal Detector

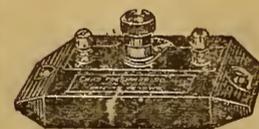
The average person, when first afflicted with Radioitis, begins his activities with a crystal set. That is to say, he uses a crystal detector rather than a



vacuum tube for changing the Radio current or waves as received through the antenna, into direct current to operate

## Freshman Products, Especially Adaptable FOR THE New Flewelling "Super" Circuit

**VARIABLE RESISTANCE LAEK** with .00025 mfd. Micon Condenser combined \$1.00



without Condenser 75c

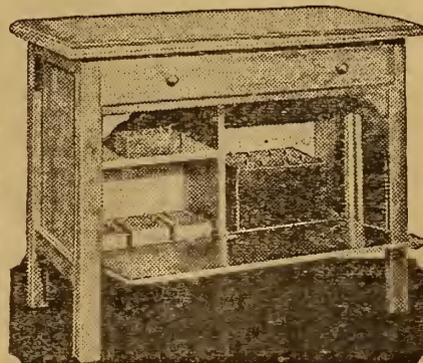


**MICON** .006 Tested Mica Condenser \$1.00

At your dealers—otherwise send purchase price and you will be supplied without further charge.

Chas. Freshman Co., Inc., 97 Beekman St., N. Y. City

## A Place for Your Radio Set



## ROBBINS RADIO DESK

Patents Applied For

PLENTY OF ROOM FOR THE SET

A Place for the Batteries, Extra Appliances, Tools, etc.

ALL APARTMENTS ENCLOSED

Robbins Woodworking Co. Libertyville, Illinois

Height 31 inches, Top 19 x 32 inches OAK or MAHOGANY Price \$22.50 Cash With Order

# Questions and Answers

## Allen Circuit

(1894) CHN, Paoli, Pa.  
Referring to diagram O 1321 (A. J. Allen) which you very kindly furnished me, will you please give me a new diagram of this circuit, introducing Radio frequency? In doing this, will you kindly insert telephone jacks at the detector and each stage of audio amplification.

How many stages of Radio frequency should I have for this hook-up? This question, of course, will be answered in your diagram.

I have purchased DX transformers. They read 170-450 meters. Is it all right to use on each stage of Radio frequency one of these transformers? Or, does each stage of Radio frequency require a different type of DX transformer?

What is the best tube to use for Radio frequency? I understand that the smaller the tube the better.

In regard to the potentiometers, should these be all 200 or 400 ohms resistance? I am using Bradleyometers. Why are potentiometers made with different ohmage?

Is a variable grid condenser better than a fixed grid condenser?

In putting a condenser across the phones at the detector is a large capacity condenser an advantage?

In building this particular set, it is my purpose to put it in units, or sectional, each section being shielded with copper on all sides, this copper being grounded. Does this have to be a separate ground? Or would this ground go right to the regular ground? If it goes to the regular ground, why wouldn't this affect the operation of the set?

What does "Mu" or "Himu" mean?

On my present set which is an ordinary variocoupler, variometer, regenerative hook-up, I get concerts very clearly from as far south as Fort Worth, Texas, and as far north as Minneapolis, Minn. Using the Allen set with Radio frequency, would I be able to increase this range?

Is Radio frequency only of value in connection with the use of a loop? In other words, if a Radiophon has a good set with a range as indicated, is there any advantage in his changing to Radio frequency?

I shall greatly appreciate the courtesy of your answers to the foregoing questions.

A.—Referring to your desire to employ Radio frequency amplification to A. J. Allen circuit, would advise that its value is negligible and would not warrant making the addition.

The same type of Radio frequency transformer will function on each stage. Tubes of the highest internal capacity are best for Radio frequency amplification.

Potentiometers may be of two or four hundred ohms resistance; it makes no material difference.

A variable grid condenser is not superior to a fixed grid condenser. A .001 condenser across the fones is advantageous, beyond that capacity has no advantage.

Copper shielding ground may go to the regular ground. Shielding is not wholly desirable since about ten per cent of energy will be lost.

"Mu" and "Himu" tubes are simple trade names of Myer's tubes.

In our opinion the employment of Radio frequency with the circuit in question would not increase its range.

While Radio frequency is not advantageous with the Allen circuit it has its virtues with a standard regenerative circuit in which case it is worthy of experimentation.

## More Flewelling

(2021) CK, Akron, Ohio.

As I am interested in the Flewelling receiving circuit would you please give me the following information:

First, what distance will it cover? I have been receiving Havana, Cuba, Fort Worth and Dallas, Texas, Denver, Colorado and Winnipeg, Canada, besides the East Coast stations, Atlanta, Ga., etc., on my single-circuit set. Can this set cover the same range?

By using a 55-foot aerial what is the proper size honeycomb coils I should use? What are the advantages of this set and also how will the amplification compare with that of my single-circuit?

I am interested in this circuit and am anxious to get the results of the contest now on.

A.—The Flewelling circuit will afford you reception equal to that you are enjoying with your present circuit. The advantages enjoyed with this set lie in its selectivity, sensitivity and principally in its amplification and ease of adjustment. It is altogether desirable and we cheerfully recommend it as worthy of all that is claimed for it.

L50 and L75 honeycomb coils are correct with this circuit.

## Resistance and Transformer Coupling

(1879) JCDeP, Port Clinton, O.

What is the relative efficiency that exists between resistance coupled and transformer coupled Radio frequency amplification at 200 meters? At 400 meters? At 5,000 meters?

A few tubes more or less are not particularly important with me; what we want is adjustment which is not critical and a long wave-length range. All round information solicited on the subject.

A.—It is best to use transformer coupling for two or four hundred-meter work and resistance coupling for over eight hundred meters wave length. Noting your reckless attitude toward employment of tubes, more or less, would advise that extreme amplification is not favorable to the uncritical adjustment you are desirous of attaining. Would not advise over three stages of audio frequency amplification.

## Induction Operation

(1890) EB, Akron, O.

In your issue of December 16 a regenerative tuner and detector circuit is described. I have been reading it over and it certainly looks good, but I would like some additional information on it. I would like a sketch showing this hook-up, for two additional steps of amplification with automatic filament jacks. Also would like to know how primary of tuning coil works, not being connected in any way with secondary and tickler.

A.—For employment of amplification with receiver cited, merely add in the usual manner; output of detector to input of amplifier.

In explanation of the operation of unconnected tuning coil: this is known as inductive coupling; that is, electricity flowing through the primary circuit creates a magnetic field which acts as a medium for conducting or inducing current in the secondary circuit.

## 1 1/2-Volt Tube

(1931) RB, Tiffin, Ohio

I would like to know if I could use a 1 1/2 volt vacuum tube and a I-cell battery instead of the 6-volt vacuum tube and 3-cell battery without changing the hook-up? If so, please show how it is accomplished on the diagram in the letter?

A.—A 1 1/2-volt tube and dry cell battery can be employed in any standard circuit without change other than substitution of 1 1/2 for usual 6-volt A battery.

## A Time and Labor Saver

Always lay out the various instruments on an experimental table and try out the circuit before building up a receiving set. This may eliminate the necessity of tearing the system apart and rebuilding after being once assembled in the cabinet.

# FREE

## Your Choice

BOUND VOLUMES  
Numbers Two or Three

with One Year's Subscription  
to RADIO DIGEST

POSTPAID  
BY PARCEL  
POST

Limited  
Quantity



Radio Digest  
Illustrated  
TRADE-MARK  
Volume Two

Radio Digest  
Illustrated  
TRADE-MARK  
Volume Three

Better  
Hurry

GREATEST COLLECTION OF RADIO INFORMATION EVER PUBLISHED

VOLUME TWO

Questions Answered .....	300
Simple Instruction Articles.....	30
Receiving Set Diagrams.....	3
How to Make Articles.....	66
New Apparatus .....	46
Pictures and Illustrations.....	350
Hookup Diagrams .....	142
Broadcasting Stations .....	17
Technical Articles .....	10
Book Reviews .....	78

VOLUME THREE

Questions Answered .....	300
Simple Instruction Articles.....	28
Receiving Set Diagrams.....	5
How to Make Articles.....	100
New Apparatus .....	29
Pictures and Illustrations.....	360
Hookup Diagrams .....	75
Broadcasting Stations .....	10
Technical Articles .....	10
Book Reviews .....	77

# 65 Numbers

13 NUMBERS IN THE BOUND VOLUME  
52 NUMBERS IN YEAR'S SUBSCRIPTION

VOLUMES TWO AND THREE

Now Ready for Delivery. Parcel Post  
Prepaid, Each Only.....

One year subscription to Radio Digest  
and both bound volumes 2 and 3.....

\$2.00

\$7.00

On account of the limited supply, the sale of these bound volumes is limited strictly to those readers of the Radio Digest who have subscribed for a year.

By subscribing now for one year to the Radio Digest you get both BOUND VOLUMES 2 AND 3, 26 numbers, with one year's subscription, for \$7.00.

ALL ORDERS MUST BE SENT DIRECT—No orders on this offer will be accepted through subscription agencies, news dealers or other sources. Check, money or express orders (no stamps) must accompany all orders.

COUPON

PUBLISHER, RADIO DIGEST,  
123 West Madison St., Chicago, Illinois.

Please reserve me Bound Volume Number Two and also Number Three and one year's subscription to the Radio Digest, for which I am inclosing check—M. O. for Seven Dollars.

Please reserve me Bound Volume Number Two or Three and one year's subscription to the Radio Digest, for which I am enclosing check—M. O. for Five Dollars.

Name.....

Address.....

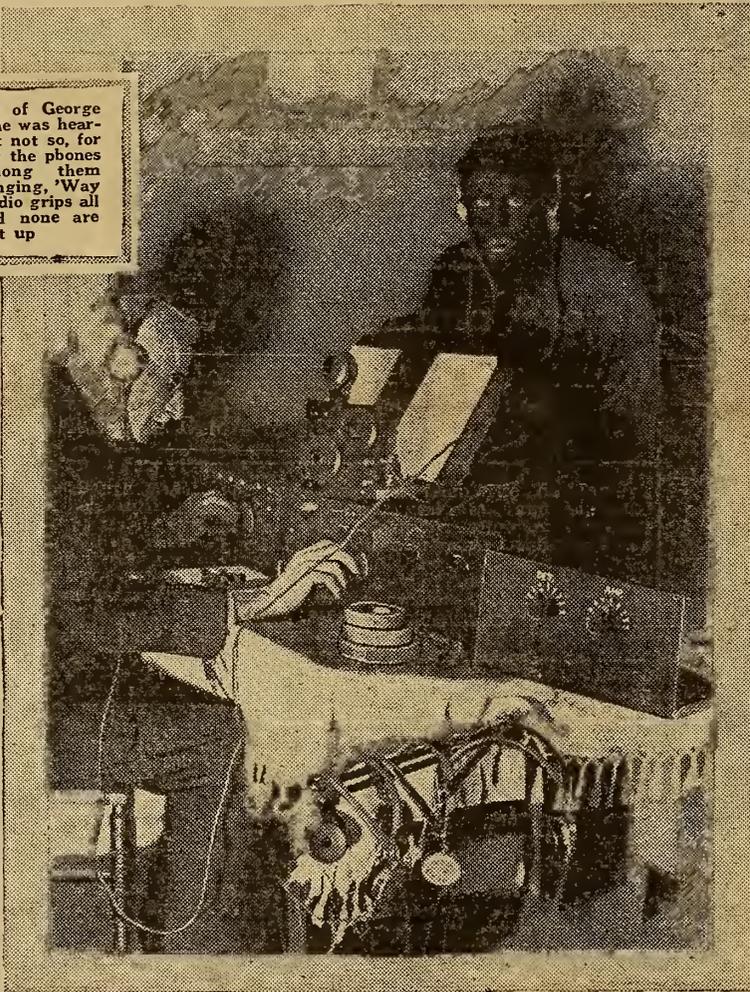
City..... State.....

# Radio Illustrated

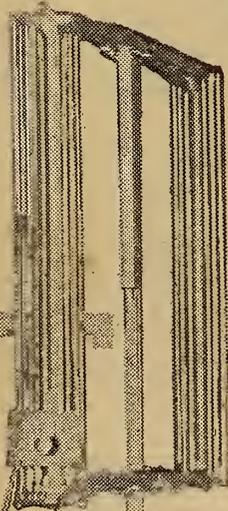
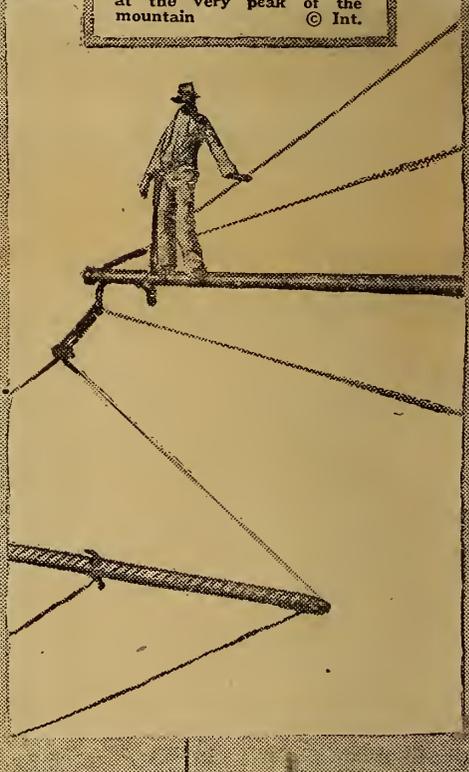


It is worth while to see the eyes of the waifs brighten and smiles of contentment come over their faces when they listen in on music at the Kentucky Children's Home Society at Louisville, Kentucky

From the appearance of George you would think that he was hearing a ghost story, but not so, for there are coming over the phones sweet melodies, among them "Hear Dem Banjos Ringing, 'Way Down in Alabam." Radio grips all nationalities alike and none are prone to pass it up



Erecting aerials for the highest Radio station in the world on Mt. Corcovado, Rio de Janeiro, where the workmen experienced many thrills and faced death in the depths below if they made a misstep. The station is placed at the very peak of the mountain © Int.



Little Miss Wagoner listens in on a new Radio receiving set which is operated with the new peanut tube. The set is entirely void of storage cells © Int.



Concentrated fire of twelve-inch guns operated by Radio. This test took place recently to see if such control could be made accurately and with safety © News Events

