

# Radio Digest

EVERY WEEK

## Illustrated

TEN CENTS

REG. U. S. PAT. OFF.

Vol. IV

Copyright, 1923  
R. D. P. Co. Inc.

CHICAGO, ILL., SATURDAY, MARCH 24, 1923

No. 11

# RADIO BRINGS HEALTH

## WHAS PLANT BUILDS BODY VIA AIRPHONE

### Health Broadcasting from Louisville Station Becomes Popular Feature

### Aids Physical Culture

### Charts Help to Secure Results from Body-Building Program

(By Special Correspondent)  
LOUISVILLE, KY.—Physical culture enthusiasts and other persons seeking to regain their health are now enabled to do their "daily dozen" to the commands that come over the ether from WHAS, the Courier-Journal station of this city. This was an innovation and novel form of entertainment that proved quite satisfactory to physical directors when first instituted on the phonograph records. But now science has given the people who would be healthy one step farther to go.

The lessons in physical culture along with setting-up exercises are broadcast by the Courier-Journal station each eve-



## JANESVILLE FAN GETS 2LO-LONDON STATION

JANESVILLE, WIS.—Dr. Stewart F. Richards, of Janesville, is the first Radiophan in this section of the country to tune in 2LO, London, England, successfully. Dr. Richards had the British station on two successive days. The feat was accomplished on a regenerative tuner using two stages of Audio frequency and a loud speaker. Reception was said to be very clear.

ning, excepting Sundays, at nine o'clock and last for the best part of an hour. The exercises are directed by Charles L.



It is hardly necessary to tell you the charming lady at the right is Anna Q. Nilsson, for surely by this time you have seen her in "The Isle of Lost Ships," her latest movie. It was while working in this production that Anna turned Radiophan and now she can tell you the call of any station on the Pacific coast. Below is Mrs. Pearl Calhoun, a popular star at WBAP

## TRADE COMMISSION WILL INVESTIGATE

### Formal Order Is Issued to Make Inquiry of Alleged Monopoly

(Special to RADIO DIGEST)  
WASHINGTON, D. C.—The Federal Trade Commission has formally ordered an investigation of Radio patents and an alleged monopoly, as called for by the White resolution which passed the House during the last days of Congress.

An official copy of the resolution was submitted to the commission on Friday, when the commission formally ordered an

## BUFFALO TO HAVE 1,250-WATT STATION

### NEW PLANT SHOULD BE HEARD IN EUROPE

### Will Have 1,000 Square Feet Space on Eighteenth Floor of New Hotel Statler

By Warner Bates

BUFFALO, N. Y.—The Federal Telephone & Telegraph Company of this city, will establish one of the most modern broadcasting stations in the United States atop the eighteen-story Hotel Statler that is just being finished here. The installation will be made in the early spring and it is anticipated that the sending apparatus to be constructed will be powerful enough to broadcast to Europe.

The Hotels Statler Company has allotted 1,000 feet of floor space on the eighteenth floor for the studio and reception room of the Federal Company and the



Wah-Wah Taysee, full blooded Princess of the Sioux Dakota Tribe, who entertained from Station WOR of L. Bamberg & Company, Newark, N. J., Thursday afternoon, March 1

Shontz, physical director of the Louisville Y. M. C. A.

### Allow Use of Headset

Mr. Shontz has selected and put in use a series of movements that are well-adapted to one wearing headphones. This in itself was one of the largest features to be worked out of the project. The movements to be used had to be selected to give the average person the greatest benefit in the least time or it was feared that the public would soon tire of the lessons.

Also the question of the connecting cord of the headset figured in. The exercises had to be selected so that one would not become humorously entangled in the receiver connection.

### Publish Charts for Listeners

To allow listeners the maximum advantage of the broadcast health, the Courier-Journal and the Louisville Times have published charts showing eighteen positions to be used in following the Radio exercises. With the illustrations of the various movements are directions and explanations for taking the exercises.

(Continued on page 2)

investigation. The rest of the matter is merely routine and it is not probable that a report will be made public until the next session of Congress convenes.

## EGYPTIAN CONCERT IS GIVEN TO HONOR TUT

### WJAX Zips Up Ether With Nile Flavored Jazz

CLEVELAND, O.—Songs of a distinctly Egyptian flavor, jazz with a regular Nile zip to it and to top it all off a travelog by Archie Bell, dramatic and music critic of the Cleveland News and News-Leader, world traveler and author, in which he told of his visit to the Valley of the Kings, marked the Cleveland News Radio concert in honor of King Tut broadcast recently from Station WJAX of the Union Trust company. As an added attraction in the "Radio night in Egypt," selections in the State Music Memory Contest were presented.

power room broadcasting house will be above this, on the roof. The antenna will be hung between two large steel towers capable of withstanding a 90-mile gale, and will be visible for many miles around.

### To Use 1,250 Watts Power

The new set, now being designed by the engineering department of the Federal Telephone & Telegraph Company, will use

(Continued on page 2)

## BOY DECIDES TO SKIP; FOUND BY BROADCAST

COLUMBUS, O.—Radio pulled a regular, Sherlock Holmes trick, and as a result Charles Martin, aged eleven, son of Detective Clarence Martin, missing for the past week, is back home. A message sent out from a Columbus broadcasting station, giving a description of the missing youth, was picked up at a garage at South Bloomfield, where Charles was located.

# BUREAU TRANSMITS TEST WAVE SIGNALS

## FIRST "CHECK-UP" COVERS 1,000-MILE RADIUS

### Government Is Enabling Fans to Standardize Wavemeters and Other Equipment

By L. M. Lamm  
WASHINGTON, D. C.—The Bureau of Standards has been conducting preliminary tests to determine the practicability of regularly transmitting signals of known wave lengths. This has been followed by the bureau by the first regular transmission of such signals. The object of the work is to enable persons having Radio apparatus to standardize their wavemeters and other equipment.

The preliminary tests included wave length measurements by observers located within 1,000 miles of Washington, and demonstrated the practicability of transmitting such waves. In general, the results were in fair agreement, but differences as high as 7 per cent existed. Wavemeters must be in closer accord than this and it is hoped that this system of standard wave transmission will result in more accurate measurement and adjustment of Radio apparatus of all kinds.

### Make First Transmission March 7

From the information obtained, it appeared desirable to transmit standard wave signals after 11:00 P. M. Eastern Standard Time, when broadcasting stations are through with their programs. Therefore, the first regular transmission of standard waves on March 6 and 7 took place from 11 P. M. to 1:30 A. M., and included wave lengths from 550 to 1,500 meters.

The general call for the transmission of standard wave lengths is "QST de WWV Standard Wave Signals" repeated and on the same frequency as the test signal. The standard wave signal is "WWV" repeated.

In the announcements, the wave length of the test signal is stated. The general call and announcements are made by both Radiophony and Radiotelegraphy. For the standard wave signal and for announcement by Radiotelegraphy, unmodulated continuous waves are used.

## RESTORES HEALTH

(Continued from page 1)

The project is only one of the many achieved by Station WHAS in line with its policy of giving something a little better than that ordinarily heard by the invisible audience in the vicinity of Louisville. Credo Harris, director and manager of the station, is an idealist and has already done much toward the establishment of this reputation of the station.

### Many Plants to Build Health

Some time ago, Station WGI, Medford Hillside, Mass., inaugurated the policy of transmitting setting-up exercises each morning. These were followed by weight increasing and then weight reducing exercises. The range of WGI, however, has been somewhat restricted to the New England states on account of the peculiar geological strata of that vicinity.

The wider range and larger audience of Station WHAS, it is believed, will popularize the Radiophone method of health-building. Several other stations have taken up the promotion of sports in their broadcast programs, and it is known that many of the plants are considering the upbuilding of the nation's health by the airphone.

## Frisco Radio Show Will Open April 3

### Exhibits Include Latest Developments and Inventions in Bath Receiving and Transmitting Apparatus

SAN FRANCISCO.—A complete Radio and Electrical show will open to the public Tuesday morning, April 3rd and will continue daily up to and including Sunday, April 8th. The entire Civic Auditorium here has been leased and arrangements for special display booth construction and decorations are under way.

The Radio Exhibits will include the latest inventions and developments in both receiving and transmitting equipment and everything electrical will be displayed from electrically heated curling irons to mammoth motors and power apparatus.

### Special Features for Visitors

J. C. Johnson, local manager for the American Radio and Electrical Exposition Company, reports that display booths are being provided for 144 exhibitors. He stated that in addition to the exhibits, special features would be provided for the public education and entertainment. An entirely new program is promised for each day.

The Exposition has been endorsed by the Pacific Radio Trade Association, the California State Association of Electrical Contractors and Dealers, the San Francisco Electrical Development League and the Electrical Contractors and Dealers Association of San Francisco.

# Canadian Ether Cops Are on the Job to Check on Amateur Wave Lengths

## Fans in Canada Are Given More Latitude Than in Any Other Country—Yet They Co-operate to Fullest Extent in Complying with Regulations on Transmission

"Free as the air we breathe" has its limitations since Canada's "ether cops" are on the job checking up Radio amateurs who start agitating the upper strata with their sending apparatus and incidentally straying from the straight and narrow path of their prescribed wave length.

Canada today has some 9,000 persons operating Radio outfits on receiving licenses and another 1,800 with transmitting licenses, in addition to the 50 licensed commercial stations which are operating in the Dominion. But with this number "in the air" at various times every day, there is little confusion or interference with commercial work, according to officials of the Radio Telegraphy Branch of the Department of Marine and Fisheries.

Every person operating a Radio outfit in the Dominion is required to take out a license, classified according to station. Receiving stations are on a flat license rate of one dollar per year, these licenses being secured through postoffices all over the Dominion. When sending licenses are issued the licensee is given a specified wave length on which he may transmit. Amateur transmission stations are thus kept down to a wave length which cannot interfere with the work of commercial stations.

In order to check the wave length which the amateur "fans" are using, inspectors have been appointed in cities of over 15,000 people, who work on a part time basis for a small salary and spend their evenings "listening in" to the various signals and gauging the wave lengths on which they are sent. These inspectors also deal with complaints from receiving stations whose work is interfered with by any amateur sender.

Some twenty-five of these "ether cops," as they are called, have thus far been appointed, and the results have more than justified the steps taken, according to officials at Ottawa. Amateur senders have cheerfully complied with the regulations, it is stated, and during the forbidden hours, 7:30 to 10 p. m., which are reserved for the larger stations sending concerts and similar material, there has of late been very little difficulty with persons who formerly delighted in "jazzing up the air" to the discomfort of their hearers.

The expense of maintaining the "ether cops" brigade, which is composed chiefly of ex-service men who took up aerial communication work during the war, is more than met by the money received from license fees, it is stated at the Department, and as a result Canada probably suffers less from interference in aerial communication than any other country in the world. In many cases it has been found by investigation that when complaints against amateurs were received, the signals complained of really came from ships many hundreds of miles away, whose signals were clearly transmitted through some freak of atmospherical conditions.

Amateurs in Canada are given more latitude than in any other country where Radio has become popular, officials of the Department claim, and with this they have earned the respect of commercial senders everywhere by their adherence to the regulations under which they may work.

New licenses are being issued every day in great numbers, it is stated, and indications are that during the last few months more people have taken to Radio as a fad than had ever thought of it previously.

# FANS DISSENT WITH PLAN FOR SILENCE

## "STAGGERED HOUR" FAILS TO REGISTER

### Chicago Broadcasting Stations Fear Proposed Project Would Be Costly to Them

CHICAGO.—The "staggered-hour" plan for enabling fans to reach into the ether and bring in the waves broadcast by distant stations is not meeting with the approval that was anticipated by the authors of the idea. Instead of the one hour of silence each day, the majority of fans who have expressed their view prefer to have the silent-night plan continued.

There is also a feeling among the broadcasters in Chicago that if they are to keep off the air they should do so for economic reasons on one night rather than cancel programs at varied hours throughout the week.

### Idea of Plan

The staggered-hour plan would close stations in Chicago between 6 and 7 o'clock Monday evening, between 7 and 8 Tuesday evening, between 8 and 9 Wednesday, between 9 and 10 Thursday, between 10 and 11 Friday and between 11 and 12 o'clock Saturday. Opposition to this plan has sprung up among persons who object to simultaneous broadcasting, because they fear that under the staggered-hour plan there will never be a time when only one Chicago station is in the air.

It is feared that under the silent-hour plan stations might book programs too extensive for broadcasting before being compelled to shut down for the silent hour, and rather than release the talent the stations would open up at the conclusion of the silent hour, when some other station on a different wave-length was supposed to have the air without interference.

## WGR—STATLER PLANT

(Continued from page 1)

five 250-watt tubes, three acting as oscillators and two as modulators.

The present Federal station, WGR, is a 500-watt station with a 2,000 mile range. Its messages have been picked up at points in Florida, Texas, California, Oregon, Saskatchewan and other points in northern Canada. None of the present apparatus will be used in the new installation, the old station being retained for experimental purposes only.

L. C. F. Horie, chief engineer of the Federal Company, will have charge of the new installation. M. A. Riggs will be in charge of the studio. L. B. Wellen will be announcer.

### Special Cables Throughout Hotel

A feature of the new installation is that special cables will connect with all the public rooms in the hotel, so that by plugging in a switch, a speech being made or music in any of the public rooms will be broadcast.

The Buffalo Hotel Statler is installing two large, specially constructed Wurlitzer organs, one in the ball room and the other in the main dining room, and organ recitals will be regular features from the Federal station. The Statler Company is also bringing to Buffalo from the Hotel Pennsylvania, New York, Vincent Lopez and his famous orchestra. They will be in the city for the opening of the hotel and remain for some time. While here, there will be daily concerts by the Vincent Lopez orchestra.

### Plant Shows Steady Growth

The Federal Telephone & Telegraph Company secured its broadcasting license in March, 1922, and started with a set having a radius of 100 miles. May 21 of that year a set was completed with a calculated radius of from five to 800 miles, at which time WGR was opened.

The present location of the station WGR on the outskirts of Buffalo, has mitigated against securing all the best talent coming to the city, as many artists have declined to make the long trip to the plant, either because of lack of time or the inconvenience. It is anticipated that the new location, in the business heart of the city, will result in a great improvement in the quality of the concerts broadcast from WGR.

## Passenger on Moving Train Gets Message Through Air

BUFFALO, N. Y.—The first recorded instance of a commercial Radiogram reaching a passenger on a moving train recently occurred on the Lackawanna Railroad, when a message received by telegraph at a station en route after the train had passed was relayed to it from the railroad broadcast station.

## Fans Fight Induction

CHILLICOTHE, O.—Walter Barrett and Charles Wissler, of this city, are making an experiment that is being watched by local Radiophans. They are endeavoring to get rid of the noise caused by induction from the city arc lights and other high tension electric lines.

# CONTENTS

Radio Digest, Illustrated, Volume 4, Number 11, published Chicago, Illinois, March 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 7 |
| Receiving Records Contest.....   | 4      |
| New Orleans Boasts Three Plants, by Vera Brady Shipman.....  | 5      |
| Microbes on the Microphone, Comic Strip; Station WGI Blind Experiments.....  | 7      |
| Directory of Broadcasting Stations, Part III, Schedules and Station-State, City Index.....                                       | 8, 9   |
| Editorials; Condensed by Diectric; Indigest, "Humor Column".....   | 10     |
| A-B-C Lessons for Radio Beginners, Chapter XII—Regenerative Radio Receivers, by Arthur G. Mohaupt.....                           | 11     |
| Use of Two Aerials Eliminates QRM.....   | 12     |
| Latest Reflex Is "Inverse Duplex," a Description of the Grimes Inverted Reflex Receiver.....                                     | 13     |
| How to Construct a Flewelling Super Set, the Third Prize Winner in the \$100 Flewelling Set Contest, by A. J. Barclay, C. E..... | 14     |
| About Radio Parts; Book Reviews.....   | 16     |
| Construction of the Ultra Reinartz Receiver, Part I—The Circuit and How to Make Tuning Unit, by H. J. Marx.....                  | 17     |
| Hook-Up R.D. 77, How to Add Radio Frequency; Five Workshop Kinks.....  | 18     |
| Questions and Answers.....   | 19     |
| Radio Illustrated, a Page of Pictures.....   | 20     |

## Looking Ahead

The Second Prize Flewelling Set, designed by F. P. Hall, Owego, New York, will be described by Mr. Hall in the next issue of the Digest. Mr. Hall has shown very unique design and it will pay all Flewelling fans to read this article. The first prize winner, designed by Lawrence M. Blakey, student at Georgia Tech, will appear in the April 7 issue.

The Ultra Reinartz Receiver, Part II, next week will tell how to go about laying out the panel. This improved, long distanced receiving set, designed by H. J. Marx, has many advantages to its credit.

A-B-C Lessons for Beginners, Chapter Thirteen, next week will deal with Radio frequency amplification. The successful use of Radio frequency amplification demands a complete knowledge of its peculiar traits. Read A. G. Mohaupt's Chapter 12 in this issue and continue reading next week.

E. T. Flewelling in Part VIII of His Series, to appear next week, will describe the construction of a Flivver Super for both long and short wave reception.

The Only Complete and Weekly Directory of Broadcasting Stations appears in Radio Digest. Part I will appear next issue. The directory lists every broadcasting station in operation in Canada, Cuba, Alaska, Hawaii, Porto Rico, and, of course, the United States.

More Pictures of Announcers—Stanley W. Barnett of WOC, Davenport, J. N. Cartier, of CKAC, Montreal, and Emory L. O'Connell of WGAT, the American Legion station in Omaha, Nebraska, will be the mysterious voices pictured in the next issue of the Digest.

Did You Ever See a Real Cave-Man? Well, Radio Digest has located one down in Virginia and found that he was able to build himself a complete receiving outfit capable of reaching across the Continent. Watch for the story by Armstrong Perry in next issue.

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.

Please find enclosed check \$1.00 for Five Dollars (Six, Foreign) for One Year's Subscription to Radio Digest, Illustrated.

Name .....

Address .....

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



## ENGLAND PLANS TO ERECT GIANT PLANT

WILL ALSO LICENSE MANY PRIVATE STATIONS

Is No Longer Considered Necessary to Exclude Non-Governmental Enterprises Says Bonar Law

LONDON.—The British Government has decided to erect a Radio station for communication with the Dominions so Premier Bonar Law announced in the House of Commons. The Government has also decided to license the erection of private Radio stations in Great Britain for World-wide communication, the Premier stated.

Asked as to whether he was aware of the disappointment on the part of the Dominions because of the delay in announcing an imperial Radio policy and whether he was able now to state the Government's policy, Premier Bonar Law replied that the policy had been recently reviewed by the Imperial Communications Committee, the chairman of which was the First Lord of the Admiralty, Col. L. C. Amery, and its recommendations had been considered by the Government.

### Favors State Supported Chain

In view of the development of Radio and other circumstances since the late Government decided in favor of a state supported Radio chain, Bonar Law, said it was no longer considered necessary to exclude private enterprise from participation in Radio communication within the Empire.

This statement was received with cheers.

Proceeding the Premier said the Government therefore decided to grant licenses for the erection of Radio stations in Great Britain for communication with the Dominions and colonies and foreign countries subject to conditions necessary to secure British control.

At the same time the Government had decided that it was necessary in the interests of national security that there should be a Radio station in Great Britain capable of communicating with the Dominions wholly operated by the state. Such station, the Premier said would be erected as soon as possible and would be available for commercial traffic when necessary.

### Will Promote News

Asked as to whether private enterprise would now be allowed to go ahead unopposed by subsidized state services, Bonar Law replied, "Except the opposition of competition."

An Empire Radio policy has long been urged upon the Government, as well as the encouragement of private Radio enterprise.

The London Times has been one of the strong advocates of an Empire Radio chain under central control, and it recently said: "At present it is often a matter of comment that more news of the Dominions does not appear in the newspapers here. A substantial part of the reason for any dearth there may be of news from overseas lies in the high cable rates."

### Offers Reduced Rates

"One of the first results that it is hoped to reap from a co-ordinated Radio system is a cheap news service. Such a service would be of the utmost value both to the Empire as a whole and to the many countries that compose it, for it is frequently regretted that people at home know so little of the people in, say, the Antipodes and Canada, and vice versa. It would be in the power of the newspapers to dispel this mutual ignorance of they could get efficient news service by Radio at cheap rates."

## SWEDISH EXPERT BUYS AMERICAN APPARATUS

United States' Company Out-Bids All Competitors

WASHINGTON, D. C.—Siffer Lemoine, Radio engineer of the Royal Board of Swedish Telegraphs, has spent the past two months in the United States making arrangements for the delivery of apparatus and equipment for the new high-power Radio station to be erected at Goteborg. The contract for this equipment, which was secured by an American company in competition with British, French, and German bidders, provides for the supplying of a 200-kilowatt Alexanderson generator, with all necessary equipment, apparatus, plans and specifications for complete installation.

The steel towers to be erected for the antennae will be similar in height and arrangements to those used in the latest American high power Radio stations, but the actual design of the towers and the material will be furnished by a Swedish firm. It is expected that the installation will be completed and the initial tests made before the end of the year.

## HOOT OWLS' SHRIEKS MAKE NIGHT HIDEOUS

PORTLAND, ORE.—The Hoot Owls are making the night hideous with their hoots in the vicinity of Portland several nights each week, since KYG, the Portland Oregonian broadcasting station, has organized this order of Radio maniacs. Members are initiated both in person and via the ether. So far hundreds of night owls all over the nation have been initiated.

## MISSISSIPPI DIVIDES K AND W ETHER PLANTS

WASHINGTON.—The Mississippi River is now the dividing line between the K calls of the West and the W calls of the East, as far as broadcasting stations are concerned. All new calls issued to broadcasting stations east of the Mississippi will begin with W and those west with K. Stations already listed will retain their original calls.

## TINY LIGHT WARNS FAIR MISS



The Radiophan rushing to bed after a late concert is apt to forget to disconnect the battery wires of the power speaker. This is especially possible where (as in many cases) a separate battery is used for coil excitation. To prevent this, this pretty Radio Miss has placed a small six-volt lamp in parallel with the power speaker, and the burning of same is a continual reminder that the current is on. Result: no rundown batteries next morning © K. E. H.

## HOTEL GUEST FANS MAKE MORE WORK

Big Demand for Top Floor Suites Cause Porters to Grumble

BOSTON, MASS.—There is a shortage in top floor suites at local hotels, owing to the demand by Radio bugs. Radio apparatus salesmen and travelers compete with each other for the choice top floor rooms and suites, so that they can string aerials far above the ground, either on the roof or set-ups inside.

"It ain't bad enough to have all we can do in regular hotel work, but to have to string eye-rails for a lot of fat old ladies and fat men—'ts too much," grumbled one hotel porter. "About every other guest wants a top floor room or suite so he can get better reception on his portable set, and if there ain't eye rails in the room, he calls for some porter to put them up."

A lot of travelers these days are taking sets about with them in their trunks and spend their time listening in instead of going down to the dance floor. Many all-winter guests, too, in Boston hotels have had sets installed, with permanent aerial set-ups.

Restrictions in Japan have kept Radio a mystery to the general public. Only colleges, newspapers and government institutions have been licensed to operate receiving sets.

## Locate Microphone After Six Months' Experiments

Find Ideal Spot to Gather Cathedral's Vibrations

By Jean Sargent

BOSTON, MASS.—Relocation of microphones at St. Paul's Cathedral, following more than six months research work by broadcast experts at Station WNAC, has finally resulted in locating a transmitter in the organ chamber in the choir loft which reproduces every note both high and low. This work which has just been done by Sam Curtis, chief operator, and other officials at the Shepard Stores Station, has resulted in their organ music being declared the best ever broadcast.

Since Radio broadcasting was first done, experts have been experimenting with microphones in trying to locate them advantageously to reproduce true church organ music. Until the present time it has been unsuccessful, as the locations of the microphones or transmitters have either slighted the very high or low tones of the pipes.

It has been usual in broadcast organ recitals to use several microphones in order to secure the lower tones.

The construction of the organ and the location of the pipes in the organ chamber caused Operator Curtis to try out a microphone in among the pipes inside the organ chamber. Several days have been taken up with tests, and such authority as Sewell Cabot and others declare the broadcasting of organ music to be the best they ever listened in on.

## 'SALTS' RELY MORE ON RADIO COMPASS

PAST YEAR BRINGS FORTH MANY DEVELOPMENTS

Government Orders Equipment for New Fog Signals to Be Installed—Five in Use Now

WASHINGTON, D. C.—Important progress has been made in the past year in the development and use of the Radio compass as a navigational instrument on board ship, according to officials of the Lighthouse Service of the Department of Commerce. Subsequent to the conference held at the Department of Commerce last May two of the largest Radio manufacturing companies have announced their undertaking of the supplying of Radio compasses or direction finders and instruments of foreign manufacture are also available.

Installations of improved types of Radio compasses have been made on a number of vessels, including the largest coast-wise steamer on the Pacific coast, some of the largest steamers on the Atlantic, and several Government vessels.

These instruments are in actual use in navigation and satisfactory results are being uniformly reported from the vessels with recent installations, both in obtaining positions by bearings taken on Radio stations on shore to locate the vessel, and by bearings on approaching vessels to avoid collision.

### Fog Signals Increased

The number of Radio fog-signal stations in operation by the United States Lighthouse Service has been increased to five, namely, Fire Island Light Vessel, N. Y., Ambrose Channel Light Vessel, N. Y., Sea Girt Light Station, N. J., Diamond Shoal Light Vessel, N. C., and San Francisco Light Vessel, Calif. Radio fog signals will soon be installed at seven other stations, for which equipment has already been purchased; Boston Light Vessel, Mass., Nantucket Shoals Light Vessel, Mass., Cape Charles Light Vessel, Va., Cape Henry Light Station, Va., Swiftsure Light Vessel, Wash., Columbia River Light Vessel, Oreg., and Blunts Reef Light Vessel, Calif. These first installations are being made principally on the important outside lightships for the reason that these are the principal sea guides for a very large amount of shipping and also because in fog the signal on a light vessel has the great advantage of permitting a ship to run directly for it without risk of stranding.

## Letter from Blind Man Opens Case for Charity

Government Experts Urge That Fund be Started

WASHINGTON.—A pathetic letter from a blind man in Highmore, S. D., was received recently by the Department of Commerce asking which branch of the Government was distributing Radio receiving sets to blind people. The Department Radio officials were forced to reply that the Department had no sets to distribute and knew of no appropriation from which such donations could be made.

It occurred to the Government officials, however, that there was an opportunity for some charitable organization to perform a great public service for those who cannot see. Most blind, they point out, have no means of receiving information or instruction except when they are read to. Since Radio offers an audible means of instruction and entertainment and 570 broadcasting stations furnish programs free during practically every hour of the day, Government Radio experts urge that a fund be started from which inexpensive Radio receiving sets could be purchased for those unfortunates who are forced to spend their days in darkness. Radio broadcasters are furnishing the material, and some believe there are individuals or organizations who will bring these broadcasts to the ears of those who need them most of all.

## Harry F. Higgins, Northwest Broadcast Pioneer, Dies

TACOMA, WASH.—The recent death of Harry F. Higgins, managing editor of the Tacoma Ledger, deprived Radio of one of the figures who played an important part in its development in the Northwest. It was under Mr. Higgins' leadership that KGB, The Ledger-Mullins Electric Company station, one of the best known in the West, was established. His efforts also advanced the cause of broadcasting and brought the entertainment standard to a higher plane than they had been. Many Radiophans attended his funeral.



# NEW ORLEANS BOASTS THREE PLANTS

### Digest Writer Visits Southern Stations During Pre-Lenten Festival

## Have to Fight Heavy QRM

### A Newspaper, a Business Concern and a University Unite to Promote Broadcasting

By Vera Bradley Shipman

New Orleans at Mardi Gras time. A quaint southern city, with its narrow twisted cobbled streets, its overhanging balconies and sunken courts. The French and Italian quarters, miniature cameos of foreign lands, a city of mystery, of romance, a city in its entirety given over to revelers. Mardi Gras—when King Rex rules the day. But my primal interest was Radio and the day following my arrival I paid the New Orleans broadcasting station a visit in the interest of the Digest.

There are three New Orleans broadcasting stations: Tulane University (broadcasting on 100 watts) on Friday evenings and occasional Wednesday bulletins; Interstate Electrical Company with its Saturday evening musical programs under the direction of William A. Oppenheimer, and the Daily States, broadcasting a minstrel frolic each Thursday evening. Hubert De Ben is Radio editor of the States, featuring a Sunday page of Radio interest each week.

### Heavy Interference Encountered

Crowded by heavy interference from the U. S. Naval Station and United Fruit Company wireless messages on the coast line, New Orleans broadcasting is still in its youth. However, it fills its local mission of crystal set listeners in requirements with programs of interest.

Tulane University has several good distance records and its programs are scholastic. Its director, Daniel S. Elliott, a Johns Hopkins University man, is the professor of College Physics. The senior year of Electrical Engineering at Tulane contains a Radio course of research problems. Lectures include Radio engineering and practical construction.

Extension courses of general university work are broadcasted weekly. The Tulane station WAAC, stresses particularly upon its outside aerial for good broadcasting. Dr. Elliott contends especial value in this.

### New Station Being Built

A new 500 watt station is now under construction at Tulane, being entirely assembled by the students within the Electrical Engineering department and will be in operation in the spring. Tulane has been developed thru the personal efforts of Pendleton Lehde, president of the Electron Engineering Company of New Orleans, a staff Radio engineer for Tulane. Mr. Lehde has acted in the capacity of chief announcer, working in conjunction with the physics department of the college. This station evolving from the war Radio station, has developed instructive capacity. Dr. A. B. Dinwiddie, the president of Tulane, is a man of strong technical interest and has aided the Radio course and WAAC station in its greater mission of collegiate broadcasting.

### Big Future Predicted

Talent for New Orleans programs is local with occasional visiting supplement. Tulane recruiting many of its programs from Newcombe College, the women's department of Tulane occupying adjoining grounds.

The Interstate Electric Company operates its Radio studio on top of its office building on Baronne street and the grand piano encourages good musical programs. Mr. Oppenheimer, director of WGV, is president of the Radio Association of New Orleans, meeting monthly in evening session with visiting speakers.

Three stations can mean a great future to New Orleans broadcasting. A newspaper, a business concern and a university: these three broadcasting. Each has the opportunity to carry the vanguard of New Orleans to the unseen audience listening in every evening in homes all over the country.

## TWO STATIONS PLAY "ROSARY" IN HARMONY

BOSTON, MASS.—White George W. Russell, Jr., of this city, was tuning out WNAC, WNAC announced "The Rosary" by a quartet, and at that exact time he picked up WGY, and there, "on top" of WNAC was WGY announcing "The Rosary," by a violinist.

Russell held both stations during the selection, the violin playing in almost perfect time with the singers.



Here you have a peep back stage in the broadcasting studio of Station WJY, New Orleans, La. At the time the photographer made his visit to the plant, four pretty high school girls were entertaining the Pelican State fans with instrumental and vocal numbers. The girls shown in the picture are students at the McDonald High School, of New Orleans, and have won favor from listeners in from the first time they volunteered their services to the station. In fact, they are one of the most popular quartets of any southern station

## WJZ and 2LO Negotiate for Trans-Atlantic Test

### Other Stations Will Maintain Silence During Program

NEWARK, N. J.—Tentative arrangements have been made between WJZ, the Westinghouse broadcasting station here, and 2LO, the London station of the British Broadcasting Corporation, for a special program from the latter station, in an attempt to reach the United States.

It is planned to have reception of the English program by the American station named above, after the completion of a new powerful transmitter for 2LO, which will be about April 1. The latter will conduct its tests on 360 meters, enabling fans equipped with sets to receive that length to tune in and listen direct. Newark will stand by during the test and cooperation of other stations to be silent during the period between 7:00 and 7:30 P. M. Eastern time, will be requested.

Station 2LO has been heard several times in this country by amateurs. Newark, in this case will merely listen in, and keep records of the reception and other data. It is possible that this test, if successful will open up a field for international broadcasting, by which the best music and speakers of the world may be heard in all countries.

There are more than 100 different types of receiving sets now made by 30 manufacturers.

## 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.

## STATION ESTABLISHED IN FROZEN NORTHLAND

### Norwegian Plant to Give Storm Warning to Ships

NEW YORK.—What will be known as the farthest north Radio station has just been erected in Jan Mayen, the tiny cone of an extinct volcano in the Arctic Ocean, north of Iceland. Akbard Ekerold is the constructor, and should become the world's greatest weather man. All science is agreed that the place where the world's weather, good or bad, originates is the Arctic zone and if storm warnings could be sent out from this region many lives might be saved and thousands of shipwrecks avoided. Until the advent of the Radio this was not possible, but now Mr. Ekerold proposes to put three stations in

the Arctic, to work in co-operation in broadcasting weather forecasts daily. The Norwegian government is financing Mr. Ekerold's undertakings.

### National Guard Teaches Radio

BUFFALO, N. Y.—The 174th Regiment of Buffalo is one of the first of the federalized National Guard outfits to comply with the new army regulations providing for instruction in Radio telephony in all battalion headquarters.

**AGENTS WANTED** Radio Apparatus for our guaranteed Liberal Commission. We handle all high-grade lines.

**BADGER RADIO CO.**  
495 E. WATER STREET MILWAUKEE WISCONSIN

# How to Make a Reinartz Receiver

**COMPLETE BLUE PRINTS**  
for the construction of a Reinartz Receiving Unit and two step amplifier.

**INSTRUCTIONS FOR ASSEMBLY**  
Description of apparatus and accessories and details of tuning.

**WINDING A REINARTZ COIL**  
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¢**

# U. S.—JAPAN SYSTEM BLOCKED BY JAPS

## R.C.A. CONTINUES TO HOLD COMPLETE MONOPOLY

### New Ministry of Communications Not so Friendly to Plan as Predecessor

TOKYO.—The impetus which the Pan-Pacific Commercial Conference at Honolulu last October gave towards obtaining better telegraphic facilities for American-Japanese news communication has almost died away. For a time it seemed that definite and beneficial results would follow, but, as previously, sustained and concentrated effort has been lacking.

The Pan-Pacific Conference, though devoted primarily to commercial questions, took up as a major point the subject of trans-Pacific news communication. It was decided that the only present hope for relief lay in the possibility of an agreement between the Japanese and United States governments which would insure co-operation between the Radio stations of the two countries. A resolution to this effect was introduced by Baron Yasushi Togo, head of the Japanese delegation, and adopted. It was resolved "that the governments of the respective countries bordering on the Pacific be urged to use their Radio facilities and other means of communication, in co-operation with each other and with other agencies, to provide means of inter-communication for the public, whenever and wherever such services cannot be obtained through privately operated agencies, to accomplish the following purposes: (1) the transmission of commercial messages at the usual commercial rates, (2) the transmission of news messages promptly and in the low rates necessary for establishing regular news reports."

### Radio Corporation Monopoly

The resolution itself was weak-kneed, for in the matter of news reports the points in the Far East from which "such services cannot be obtained through privately operated agencies" are exceedingly few and usually unimportant.

The Radio Corporation's arrangement with the Japanese Government, which exercises a monopoly over all means of communication in Japan and between Japan and other countries, affords "such services." The objections which are raised so justly are directed against the quality of service rendered and the price which must be paid.

In spite of the over-cautious wording, however, the delegates understood that an American-Japanese agreement was contemplated when they adopted the resolution. This view was shared by the Pan-Pacific Association of Japan, to which the making of necessary arrangements in this country was delegated.

### Document Hangs Fire

The inalienable right of committees to procrastinate has been largely responsible for the fact that nothing has been done here yet. When Baron Togo returned to Japan, after a tour of the United States, he conferred with Prince Tokugawa, president of the Pan-Pacific Association in this country. The Pan-Pacific Association of Japan is an auxiliary organization of the Pan-Pacific Union and helped materially to promote Japanese attendance at the conference. Prince Tokugawa himself was not present.

Into Prince Tokugawa's hands, Baron Togo placed the matter upon his return from the conference and his American tour. The Prince was to draft a document to be presented to the Department of Communications, recommending favorable action along the lines proposed in the resolution. As far as can be learned, the drafting of this document is still unfinished and the proposal has yet to be brought officially to the attention of the Department of Communications. The Imperial Diet is now in session and Prince Tokugawa, who is president of the House of Peers, has many demands upon his time. Baron Togo, who is a member of the Upper House, also has an unusual amount of his time occupied by official duties.

## CALIFORNIA CONTINUES TO HOLD FIRST PLACE

### Texas Claims Second Honors with 36 Broadcasting Stations

WASHINGTON.—California still continues to lead in number of broadcasting stations, with 59 in operation, while Texas has climbed to second place with 36. Every state except Mississippi had one or more stations on March 10 when the total of broadcasting stations had reached 588, the highest point since this art was undertaken in September, 1921.

Out of these stations 66 represent educational institutions, and 67 newspapers and periodicals dispensing information and news as well as entertainment. Several cities, a number of churches, theaters and, of course, many electrical apparatus manufacturers and distributors are also included.

# British Broadcasters Must Pay for Printed Programs as Regular Ads

## In London Papers Alone Announcements Run as High as One Hun- dred Agate Lines—Entail a Cost of \$500 Per Day

LONDON.—British Radio broadcasting is passing through a baptism of fire. In recent weeks the newspapers have been printing as news the daily and week-end programs of the British Broadcasting Company—the combination of Radio apparatus manufacturers which has been entrusted by the postmaster general with the arrangements for daily broadcasting programs. Two weeks ago members of the Newspaper Proprietors' Association and the Newspaper Society notified the broadcasting company that the programs would not be inserted unless paid for at regular rates. The broadcasting company replied that it would not use advertising space to announce its programs, a decision that will be watched in its results on the Radio boom, for undoubtedly these published announcements have played a large part in its development.

### Would Be \$500 Daily

In the London papers alone, these programs have occupied spaces of some hundred or more agate lines, and at an average might mean an outlay by the broadcasting company of at least \$500 daily. The provincial press forms another proposition of some magnitude.

Radio broadcasting has been booming in England recently. At first no news was given in the programs, but with the formation of the broadcasting company arrangements were made for the reception and broadcasting of news from Reuters, Ltd., the Press Association and the Ex-

change Telegraph Company. Broadcasting is now a daily feature from London, Birmingham, Manchester and Newcastle, with Cardiff and Glasgow to be added shortly.

### No Sunday Evening Papers

There are no morning or afternoon programs at all, broadcasting taking place at 5 p. m. (children's stories till 6 p. m.) and from 7 to 10:30 p. m. News bulletins are given at 7 to 9 o'clock, and are preceded by announcement that the news items are the copyright of the three distributing agencies.

The bulletin gives weather reports, rates of foreign exchange and sundry news items, followed on Saturdays by football results. Up to now, no sensational event has happened to give the broadcasting service any big boost, though it was expected by many that the domestic event in which Princess Mary, Viscountess Lascelles, figured, would have been a "big noise" for the broadcasting.

In any case, it would appear that the Radio news bulletin in its present form is hardly likely to present any serious opposition to the daily newspapers, practically only the 9 o'clock items offering any opportunity for freshness and new news, the Sunday evening bulletin being the only one at all that provides a real boom in news service, since Britain has no Sunday evening papers, and there is consequently a gap of 24 otherwise newsless hours between Sunday morning and the next day.

## Station WPAL Broadcasts Second Midnight Program

COLUMBUS, O.—Station WPAL, of the Superior Radio & Telephone Equipment Company, recently transmitted its second midnight program, beginning at midnight and continuing one hour. The previous late concert of the station was given three weeks ago and was so well thought of that Station WPAL is making plans to make the midnight entertainment a regular part of its weekly program.

On its first late transmission, Station WPAL made an intensive effort to reach listeners in Philadelphia and other large cities of the eastern seaboard where many of its friends were listening. That the attempt was entirely successful was shown by the large number of communications received by the station during the week following.

### Cornell on Air as WEAI

ITHACA, N. Y.—The value of the higher education will be demonstrated by Cornell University through the medium of Radio. The Radio transmitter at the university was installed recently and is accomplishing good work. Members of the College of Electrical Engineering are sending out nightly talks by President Livingston Farrand and other members of the faculty, all of which deal with university topics. The new station is WEAI.

A Radio receiving set has been installed at the leper colony at San Juan, Porto Rico.

# CUT PRICES on Well-Known Lines

- Baldwin Phones .....\$6.65
- Baldwin Single Units..... 3.65
- Guaranteed 2000 Ohm Phones..... 2.95
- Silk Reinartz Coils..... 1.25
- Condensers, Bakelite Ends:
- 3 Plate ..... .65
- 11 Plate ..... .95
- 23 Plate ..... 1.10
- 11 Vernier with Dials..... 2.00
- 23 Vernier with Dials..... 2.35
- 43 Vernier with Dials..... 2.95
- Charger with Tungar Bulb..... 9.85
- Jacks, All Circuits..... .45
- Sockets ..... .30
- Rheostats ..... .35
- Dials, Bakelite, 3 in..... .21
- Honeycomb Coils, 50 and 75..... .40
- Phone Plugs ..... .45
- C. R. L. Adjustable Grid Leak and  
Dubilier Condenser ..... 1.25
- Transformers:
- R. F. .... 1.95
- A. F., 10-1 and 5-1 Shielded..... 3.00
- A. F., 3-1 Shielded..... 2.95
- Lattice Variometers ..... 2.95
- Lattice Variocouplers ..... 2.75

Prompt deliveries—Mail Orders Only

## CHI-CITY RADIO CO.

945 CRESCENT PLACE  
CHICAGO

# "JERSEY" JONES GIVES SPORT TALKS AT WHN

## Writer Will Gossip to Fans Three Nights Each Week

NEW YORK.—"Jersey" Jones, the popular and well known sport writer and boxing expert of the New York Globe, will broadcast gossip three times weekly from the WHN Radiophone Station, Ridgewood, this city. Mr. Jones has been associated with the Globe for several years and is a recognized authority on all sports.

Many letters to WHN and to the New York newspapers have shown conclusively that there is a great demand by Radiophans for live sport news and authoritative comment on all athletic activities—amateur and professional. Mr. Jones's first talks from WHN will be in the nature of an experiment, as he intends, as soon as possible, to adjust his programs to wishes of his listeners in as they are expressed to him in writing. Mondays, Wednesdays and Fridays are the days the sport talks are given and the time is 10:30 P. M. It is proposed to maintain this schedule for the time being until the fans' opinions are had.

# RADIOGRAM

## Mr. Crystal Set:

Vicinity—Any Broadcasting Station.  
Anywhere.

Sir:  
You are not doing your duty.  
You are not 100% efficient—  
Unless you are equipped with the best crystal obtainable.  
If you are not equipped with a HOT SPOT CRYSTAL, you are not 100% efficient.  
HOT SPOT CRYSTALS make your set talk louder. The new principle involved in mounting, insures the utmost in sensitivity to Radio impulses and dependability. Thousands of satisfied users of HOT SPOT CRYSTALS attest to this.  
Spend 25c and be convinced.

## PYRAMID PRODUCTS CO.

117 N. Dearborn St., Chicago, Ill.  
Distributor for North Central States  
MOST LIVE JOBBERS & DEALERS  
SELL HOT SPOTS

## To Issue New Technical Paper

WASHINGTON.—The Bureau of Standards will shortly issue Letter Circular 87 entitled "Methods of Measuring Properties of Electron Tubes." It is a technical paper intended to advise manufacturers and engineers how the Bureau makes its tests.

Boise, Idaho, has a \$10,000 Radio outfit in its high school.

# RADIO

## Manufacturer Direct to You

Lowest Prices      Highest Quality

**Everything guaranteed as represented.**

## Coast to Coast Receiving Apparatus of the Very Best Material

We are including all standard articles of the highest class in the sets herein described. Have a number always on hand, packed for immediate shipment.

### REINARTZ COMPLETE PARTS

Consisting of 7x18 panel, 23 plate condenser, 11 plate condenser Barrehas inductance coil used in Reinartz circuit, 2 dials, one bakelite socket, 3 switch levers, contact points, Freshman variable grid leak, vernier rheostat, 8 binding posts, 25 feet wire, and \$10.95 diagram for construction, for only.....

### FLEWELLING COMPLETE PARTS

Consisting of 6x14 panel, one 23 plate condenser, one composition dial, 2 honeycomb coils, one double adjustable coil mount, 3 .006 condensers, one Freshman variable grid leak, one condenser, one vernier rheostat, one bakelite socket, 8 binding posts, 25 feet \$11.95 wire and construction diagram, for only.....

### THIS WEEK'S SPECIAL—3,000 OHM HEADSETS

These phones are unusual bargains, excellent standard make, with patented universal joint, adjustment on receiver, and comfortable band for head. Regular list, \$7.50..... **\$3.95**


- Vernier dial control, 75c value.....42c
- Vernier rheostat, \$1.25 value.....92c
- 4 Phone Control post, 75c value.....42c
- 2-inch Composition dials.....22c
- W.D.-11 Bakelite sockets, 75c value.....60c
- 75c Value phone plugs.....46c
- V. T. Bakelite sockets, 75c value.....28c
- Battery hydrometers, 75c value.....40c
- Plain rheostat, \$1.00 value.....48c
- Soldering outfits, \$1.00 value.....85c
- Super crystal .....20c
- Glass crystal detectors.....65c
- Single open circuit jacks.....35c
- Series parallel switch lever.....39c
- Double closed circuit jacks.....45c
- Double open circuit jacks.....40c
- 75 Turn coils mounted.....90c
- Inductance switches .....\$1.20

180 degree VARIOCOUPERS, Silk wire wound, with special bakelite discs at soldering points. Regular \$4.50 value.....\$2.90  
Basket wound VARIOMETERS (no dielectric interference).....\$2.90  
Two-coil mountings, bakelite, knob control, \$3.50 value.....\$2.60  
Three-coil mountings with graduated dials on top.....\$3.45  
Woodhorn loud speakers, look like Western Electrics.....\$7.50

Everything guaranteed exactly as presented.  
Please send money order whenever possible. This insures quicker delivery.  
Correspondence cheerfully answered. Write us.

Write us. *The House of Service and Quality*

# RADIO



## MANUFACTURERS' OUTLET CO.

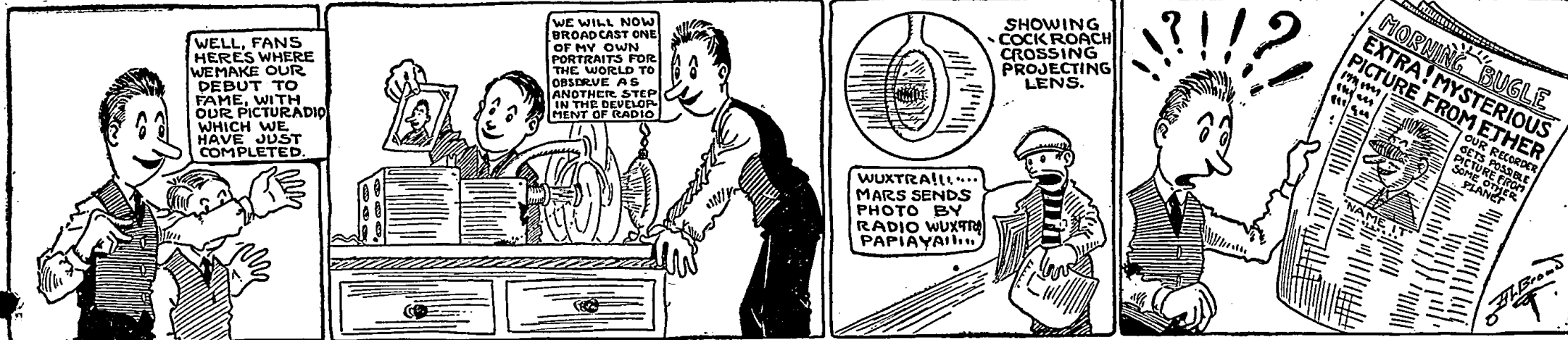
Moco Products      28 So. Wells Street, Chicago, Ill.



THE ANTENNA BROTHERS

Spir L. and Lew P.

Microbes on the Microphone



PLANES USE KITES FOR SOS ANTENNAE

ALL SHIPS OF AEROMARINE AIRWAYS ARE EQUIPPED

Recent Test of Flying Aerial Proves Successful at Miami Bay—Seaplanes Call Aid

MIAMI, FLA.—Further equipment to insure safety of passengers riding in commercial airships has been added to the seaplanes run by the Aeromarine Airways, Inc. The latest device is a signal kite equipped with a Radio aerial which makes it possible for seaplanes forced to the water to acquire a wider range in sending calls for help.

The kite, which is roughly six feet square, carries to a height of 400 or 500 feet an intense antenna for the Radio equipment inside the seaplane. It has been found that when a plane rests on the water the aerial across the wings of the ship does not give sufficient range because it is too low.

Does Double Work

While in flight, the seaplane can produce its own antenna by having a lead attached to a wire drop and swing beneath the pontoon. A kite flying at sea acts as a signal to passing ships as well as provides an antenna for Radio work.

Tests of the kite aerial were recently made by the Aeromarine Airways in Miami bay. All of the ships of the corporation are equipped with the kite, it was said. This is a second step in safety in applications installed this year, the first being the inclusion of smoke pots for signalling when a plane is in distress.

STUDENTS PERK UP TO STUDY AIRPHONE

New Subject Awakes Keen Interest Among Pupils in Canadian School

TORONTO, ONT.—The keen interest being shown in the advancement of Radio throughout the world by school-children is one of the most interesting features of the Radio world, and one that is daily growing in popularity. That the school children of Canada are not lacking in their interest was recently indicated when a discussion on the advantages and disadvantages on the Radio as compared with the telephone was held in one of the largest schools in Toronto.

The discussion lasted two hours, and, according to the principal and teachers, never had so much interest been displayed in any other subject. It was afterwards found out that of the seven hundred pupils, more than four hundred were Radiphans. Of the number, three hundred and ten owned their own Radio sets.

Catch Speed Messages

The United States army has perfected a method by which the fastest Radio message can be caught on wax cylinders and reproduced at lower speed on dictaphone machines, making the message easy to read.

Station WGI Makes Intensive Study of Visualization of Invisible Drama

Amrad Studio Conducting Experiments with Blind to Ascertain Method of Giving Plays for Listeners In—Offerings Are Complete in Every Detail Excepting Scenery

By H. M. Taylor

The Radio broadcasting station, WGI, at Medford Hillside, Massachusetts, has caught the vision of the educational possibilities of the Radio. A glance at the programs presented will be convincing as to this assertion. On the staff at Amrad are trained men in several different lines, each of whom is carrying on experiments with a view to methods of educational extension.



Professor W. Eugene Hammett, musical and dramatic director at Station WGI, the man who has charge of the "blind" experiments

Professor W. Eugene Hammett, a teacher in Boston, is one of the Amrad staff; the director of the musical and dramatic clubs. For some time Professor Hammett has been experimenting on dramatic art as associated with Radio. One of the clubs at Amrad is known as the Amrad Players, made up of Radio enthusiasts. This club is being used in the experimenting and from the reports of their work, it is proving successful.

Experiments Made with Blind

The basic principle of dramatic broadcasting is the stimulation of the imagination. Theoretically Radio listeners are

"blind" and it is therefore necessary to reach the imagination through the medium of the ear. Experiments have and are being made with blind people. Careful data is kept of the results of these experiments from a physical and psychological standpoint. The data thus obtained is used in the broadcasting of plays and recitations. This data together with the comments received from Radio listeners is carefully studied. Out of this material Amrad is developing a unique method of educating the public in spoken drama.

Must Substitute for "Business"

How is the imagination to be stimulated? In previous broadcasting of plays the continuity of thought and interest has been broken. There are necessarily pauses in spoken drama during which dramatic action will take place. To those who actually see the action the attention is held. To those who are "blind" there must be some satisfactory substitute for the eye if attention is to be held. Attempts have been made to announce the stage business, but the past tense has been used. This method fails in that it does not stimulate the imagination. It does not awaken the "sensation of personal experience" of the action, which arises from a mental activity. Remember Radio listeners are theoretically "blind", and that with them the mental activity must be the imagination. Only through the ear will the imagination be aroused.

Use Present Tense

The substitute for the eye must be the voice of the announcer. Experiments have shown that if the voice has in it the spirit of the dramatic action; if the announcement of the dramatic action is in the present tense and using the participle form of the verb; if the announcement is made in the same amount of time required to perform the action, there is an effect upon the imagination which will arouse a "sensation of personal experience" of the action.

Announcement of Dramatic Action

To better explain the foregoing para-

RADETEC

Trade Mark

DETECTOR

Latest development. Semi-permanent. Most satisfactory detector on the market. Manufacturers who use them can't make sets fast enough. Tested to music three times.

Satisfaction Guaranteed.

For sale at your dealers or we will send one for a dollar and your dealer's name.

Dealers and Jobbers, Write.

TOWNER RADIO MFG. CO.

2620 Victor St.

KANSAS CITY, MO.

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

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.

graph an example follows. In a certain play there is a long pause between the speaking lines. In order to fill up this gap and thus hold the attention of the Radio listeners, an announcement of the dramatic action is made.

"Sophie is entering, her hair and dress are disarrayed, her eye is registering ferocity, a knife is extending from the bodice of her dress. She is moving stealthily toward the Prince, she is grasping the hilt of the knife savagely, she is making ready to strike." (The speaking lines of the Prince begin here abruptly.)

This action is being performed in the studio, the announcer is affected and his voice will register the "sensation of personal experience" of action. The spirit which is in the voice will arouse the imagination of the Radio listener, who, will in turn enjoy that "sensation of personal experience" of action.

The "Human Program"

Another interesting feature has been worked out, namely, the "human program". The announcer supplies with his voice the material provided on a printed program. The method of presenting the program is based upon the habit people have formed of reading a printed one. For instance the cover page is read giving the name of the play, the writer, and the company presenting it; the cast of characters and their descriptions; the descriptions of the acts and scenes; the synopsis of the play.

The modulations of the voice, the (Continued on page 15)

RADIO At Cut Prices

Standard parts only in original packing. Sold on a "money-back" basis.

PHONES

Table listing phone models and prices: \$7.50 Gilbert Phones \$3.95, 7.50 Royal Fones 3.75, 8.00 Brandes Superior 5.95, 12.00 Nathaniel Baldwin Type C Double 8.95, 6.00 Nathaniel Baldwin Type C Single 4.50, 8.00 Dictograph 5.95

TUBES

Table listing tube models and prices: 1 1/2 Volt Peanut Tube 2.00, U. V. 200 3.95, U. V. 201 5.50, 1 1/2 Volt Special 4.95

CABINETS

Made in our factory

Table listing cabinet sizes and prices: 7" x 10" 1.45, 7" x 18" 2.15, 7" x 24" 2.95

MISCELLANEOUS

Table listing various radio parts and prices: Morrison Loud Speaker with Siren Horn 18.50, Branch Outdoor Lightning Arrester 2.50, Solderall Tube .25, \$12.00 Amptone, Nickel Horn 4.95, 25.00 Arcex Crystal Set 9.95, 50.00 Regenerative Single Tube Set 25.00, DURATEK Permanent Crystal Detector 2.00, W.D.-11 Adapter .65, \$1.50 Lightning Arrester, Indoor and Outdoor Type .85, Murdock Loud Speaker Horn with Phone 5.00, 5.50 18" Morse Variocoupler on Bakelite, Silk Wound Wire 2.45, Ammeter for Testing "B" Batteries .49, \$5.00 43-Plate Condenser 1.95, 4.00 23-Plate Condenser 1.55, 2-inch Bakelite Dials .25, 4-inch Electros Dials .75, 3-inch Bakelite Dials .75, W.D.-12 Transformer for W.D.-11 Tube 4.65, \$1.00 Freshman Variable Grid Leak and Condenser Combined .65, Genuine All-Wave Coupler 7.90, \$10.00-3000 Meter Coupler 4.95, 18.50 Homocharger DeLuxe 13.95, 1.00 Bakelite Socket .50, 20.00 Dictograph Loud Speaker 13.95

WHEN ORDERING BY MAIL

Add Postage by the Following Scale

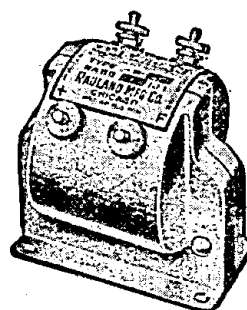
PURCHASES

Table showing postage scales for purchases: Up to \$1.00 add 10c, \$1.01 to \$2.00 15c, 2.01 to 3.00 20c, 3.01 to 5.00 25c, 5.01 to 7.00 30c, 7.01 to 10.00 40c

Money Order or Personal Check Accepted

Modell's

ESTABLISHED 1889 RADIO STORES Dept. F. 4, 191 Fulton Street, N.Y.C.



ALL AMERICAN SHIELDED AUDIO TRANSFORMERS

Table listing transformer specifications and prices: 10-1 for 1st stage \$4.75, 5-1 for 2nd stage 4.75, 3-1 for 3rd stage 4.50

REAL DEALER DISCOUNTS

DUNGAN RADIO CO.

68 WEST WASHINGTON STREET, CHICAGO

# Radiophone Broadcasting Stations

## Corrected Every Week—Part III

| State, City, Call  | State, City, Call   | State, City, Call   | State, City, Call  | State, City, Call  | State, City, Call   |
|--|---|---|--|--|---|
| <b>Alabama:</b><br>Auburn, WMAV<br>Birmingham, WOAY, WSY<br>Mobile, WEAP<br>Montgomery, WKAN   | <b>Alabama:</b><br>Gainesville, WKAY<br>Macon, WGAK, WMAZ<br>Savannah, WHAO, WRAB   | <b>Louisiana:</b><br>New Orleans, WAAB,<br>WAAC, WCAZ, WGV,<br>WIAF, WWL<br>Shreveport, WGAQ  | <b>Oak, KFEO</b><br>Omaha, KFCE, WAAW,<br>WIAK, WNAL, WOAW,<br>WOU, WOV<br>Rushville, WEAV<br>Tecumseh, WTAU<br>University Place, WCAJ<br>York, KFDR   | <b>Norman, WNAD</b><br>Okemah, WKAK<br>Oklahoma City, WKY,<br>WMAZ<br>Okmulgee, WPAC<br>Tulsa, WEH, WGAF,<br>WLAL  | <b>Waco, WJAD, WLAJ,</b><br>WWAC<br>Wichita Falls, WKAF   |
| <b>Arizona:</b><br>Phoenix, KDIW, KFAD,<br>KFCE<br>Tucson, KDZA, KFDH  | <b>Idaho:</b><br>Boise, KFAU, KFDD<br>Moscow, KLAN<br>Thomasville, WPAX<br>Wallace, KFCC  | <b>Maine:</b><br>Auburn, WMB<br>Bangor, WPAZ<br>Houlton, WVLN   | <b>Nevada:</b><br>Reno, KDZK, KFAS,<br><b>New Hampshire:</b><br>Laconia, WKAV  | <b>Oregon:</b><br>Astoria, KFGG<br>Baker, KFDA<br>Corvallis, KFDD<br>Eugene, KFAT<br>Hood River, KQP<br>Marshfield, KFBH<br>Medford, KFAY<br>Pendleton, KFFE<br>Portland, KDYQ, KFEC,<br>KGG, KGN, KGW, KQY<br>Salem, KFCD   | <b>Utah:</b><br>Ogden, KDZL, KFCE<br>Salt Lake City, KDYL,<br>KDYV, KZN   |
| <b>Arkansas:</b><br>Fayetteville, KFDD<br>Fort Smith, WCAZ, WGAR<br>Little Rock, WCAV,<br>WEAX<br>Pine Bluff, WOK  | <b>Illinois:</b><br>Belvidere, WOAG<br>Carthage, WCAZ<br>Chicago, KYW, WAAF,<br>WBU, WDAF, WJAZ,<br>WMAQ, WPAZ, WSAH,<br>WWAY<br>Decatur, WBAO, WCAP,<br>WHAP<br>Elgin, WTAS<br>Galesburg, WRAM<br>Mattoon, WQAL<br>Peoria, WJAN<br>Quincy, WCAW<br>Rockford, WIAB<br>Springfield, WDAC<br>Tuscola, WDJ<br>Urbana, WRM  | <b>Maryland:</b><br>Baltimore, WCAO, WEAR,<br>WKC, WNAV<br>Frostburg, WPAQ  | <b>New Jersey:</b><br>Atlantic City, WHAR<br>Camden, WRP<br>Jersey City, WNO<br>Moorestown, WBAF<br>Newark, WAAM, WBS,<br>WJZ, WOR<br>N. Plainfield, WEAM<br>Ocean City, WIAD<br>Paterson, WBAW<br>Trenton, WMAL, WOAX   | <b>Pennsylvania:</b><br>Altoona, WGAW<br>Clearfield, WPI<br>Easton, WMAP<br>Erie, WOAV<br>Grove City, WSAJ<br>Johnstown, WTAC<br>Lancaster, WGAL<br>McKeesport, WIK<br>Parkersburg, WQAA<br>Philadelphia, WCAA,<br>WFI, WGL, WIP,<br>WNAT, WOO, WWAD<br>Pittsburgh, KDKA, KQV,<br>WCAE, WJAS<br>Scranton, WQAN, WRAY<br>State College, WPAB<br>Villanova, WCAM<br>Wilkes-Barre, WBAX,<br>WNAH  | <b>Vermont:</b><br>Bellows Falls, WLAK<br>Burlington, WCAZ<br>Springfield, WQAE   |
| <b>California:</b><br>Altadena, KGO<br>Bakersfield, KDZE, KYI<br>Berkeley, KQI, KRE<br>Del Monte, KLN<br>El Monte, KUY<br>Eureka, KNI<br>Fresno, KDZH, KMJ<br>Hanford, KFBD<br>Hollywood, KFAR<br>Long Beach, KSS<br>Los Angeles, KDZF,<br>KFCL, KFI, KHJ, KJS,<br>KNN, KNV, KOG, KUS,<br>KWH, KXS<br>Modesto, KXD<br>Oakland, KLX, KZM<br>Pasadena, KLB<br>Reedley, KFAZ<br>Richmond, KFCE<br>Sacramento, KFBE<br>San Diego, KDPT, KDYM,<br>KFBC, KFFA, KON<br>San Francisco, AGI, KDN,<br>KDZG, KDZX, KFDB,<br>KLS, KPO, KSL, KUO<br>San Jose, KFAQ, KQW,<br>San Luis Obispo, KFBE<br>Santa Ana, KFAW<br>Santa Barbara, KFJH<br>Stanford Univ., KFGH<br>Stockton, KJQ, KWG<br>Sunnyvale, KJJ<br>Taft, KFEB<br>Venice, KFAV | <b>Indiana:</b><br>Anderson, WEAW<br>Brookville, WSAW<br>Evansville, WOAU<br>Fort Wayne, WFAS<br>Greencastle, WLAX<br>Huntington, WHAY<br>Indianapolis, WLK<br>Marion, WIAQ<br>Mishawaka, WOAO<br>Muncie, WJAF<br>South Bend, WGAZ<br>Terre Haute, WEAC<br>West Lafayette, WBAA   | <b>Massachusetts:</b><br>Boston, WAAJ, WFAU,<br>WNAC<br>Dartmouth, WMAF<br>Lowell, WQAS<br>Medford Hillside, WGI<br>New Bedford, WDAU<br>Springfield, WZB<br>Worcester, WCN, WDAS   | <b>New Mexico:</b><br>Roswell, KNJ<br>State College, KOB   | <b>Rhode Island:</b><br>Cranston, WKAP<br>Edgewood, WEAG<br>Providence, WEAN, WJAR   | <b>Wisconsin:</b><br>Beloit, WKAW<br>Kenosha, WOAR<br>Madison, WGAY, WEA<br>Milwaukee, WAAK,<br>WCAV, WHAD, WIAO<br>Neenah, WIAJ<br>Superior, WFAC<br>Waupaca, WPAH   |
| <b>Colorado:</b><br>Boulder, KFAJ<br>Colorado Springs, KFTQ,<br>KFBV, KFCK, KHD<br>Denver, DD5, DN4,<br>KDZQ, KEBP, KFAF,<br>KFDL, KLZ<br>Pueblo, KFGB<br>Trinidad, KFBS   | <b>Iowa:</b><br>Ames, WOI<br>Burlington, WIAS, WLAT<br>Cedar Rapids, WJAM,<br>WKAA<br>Centerville, WDX<br>Council Bluffs, WPAF<br>Davenport, WHAI, WOC<br>Des Moines, KFDP, WGF,<br>WEX<br>Dubuque, WQAK<br>Fort Dodge, KFEB, WEAB<br>Iowa City, WHAA<br>Le Mars, KFCE, WIAU<br>Newton, WIAH<br>Shenandoah, WGAJ<br>Sioux City, WEAU, WHAE<br>Vinton, WIAE<br>Waterloo, WHAC, WMAR,<br>WRAN | <b>Michigan:</b><br>Ann Arbor, WMAX,<br>WQAJ<br>Bay City, WTP<br>Dearborn, WWI<br>Detroit, KOP, WCX, WWJ<br>East Lansing, WKAR<br>Flint, WEA<br>Kalamazoo, WOAP, WLAQ<br>Lansing, WHAL<br>Laurium, WPAV<br>Rogers, WCAV<br>Saginaw, WIAW  | <b>New York:</b><br>Albany, WNJ<br>Amsterdam, WPAS<br>Binghamton, WIAV<br>Buffalo, WGR, WWT<br>Canton, WCAD<br>Cazenovia, WMAC<br>Ithaca, WEA<br>Lockport, WMAK<br>Newburgh, WCAW<br>New York, KDOW, WBAY,<br>WDT, WEA, WJX,<br>WLAW<br>Poughkeepsie, WPAF<br>Rochester, WHAM<br>Ridgewood, WHN<br>Schenectady, WGY, WRL<br>Syracuse, WBAB, WDAI,<br>WFAE, WLAH, WNAH<br>Tarrytown, WRW<br>Troy, WHAZ<br>Utica, WSL<br>Waterford, WFAQ | <b>South Carolina:</b><br>Charleston, WFAZ,<br>WNAQ, WOA<br>Clemson College, WSAC<br>Greenville, WQAV<br>Orangeburg, WGAM  | <b>West Virginia:</b><br>Arlington, NAA<br>Clarksburg, WHAK<br>Morgantown, WHD  |
| <b>Connecticut:</b><br>Bridgeport, WKAX<br>Greenwich, WAAQ<br>Hartford, WDAK<br>Middleton, WOAS<br>New Haven, WGAH,<br>WPAJ<br>Waterbury, WQAD   | <b>Kansas:</b><br>Anthony, WBL<br>Atwood, WEAD<br>Beloit, WPAR<br>Emporia, WAAZ<br>Hutchinson, WLAS<br>Independence, WPAF<br>Liberal, WMAG<br>Lindsborg, WDAW<br>Manhattan, WNAK, WTG<br>Marion, WRAD<br>Parsons, WOAJ<br>Salina, WPAW<br>Topeka, WJAO, WPAM<br>Wichita, WAAW, WBAH,<br>WBY   | <b>Minnesota:</b><br>Duluth, WJAP, WMAT<br>Hutchinson, WFAN<br>Minneapolis, WBEA,<br>WBAH, WCAS, WLAG,<br>WLB<br>Moorhead, WPAU<br>Northfield, WCAL<br>St. Cloud, WFAM<br>St. Paul, AV7, WAAH   | <b>North Carolina:</b><br>Asheville, WFAJ<br>Charlotte, WBT<br>Raleigh, WLAC   | <b>South Dakota:</b><br>Rapid City, WCAT<br>Sioux Falls, WFAT<br>Vermillion, WEAJ  | <b>Wyoming:</b><br>Casper, KFCE, KFDF<br>Douglas, KFEB<br>Laramie, KFBU   |
| <b>Delaware:</b><br>Wilmington, WHAU,<br>WOAT, WPAW  | <b>Kentucky:</b><br>Bowling Green, WNAB<br>Frankfort, WQAK<br>Lexington, WQAH<br>Louisville, WHAS WLAP<br>Paducah, WIAR   | <b>Missouri:</b><br>Cameron, WFAQ<br>Cape Girardeau, WSAB<br>Columbia, WIAU<br>Independence, WPAQ<br>Jefferson City, WOS<br>Joplin, WHAH<br>Kansas City, WDAF,<br>WBB, WMAJ, WOQ<br>Marshall, WJAT<br>Rockport, WMAD<br>St. Joseph, WEA<br>St. Louis, KSD, WCK,<br>WEB, WEW, WMAJ,<br>WRAO<br>Springfield, WIAL, WKAS,<br>WQAB<br>Tarkio, WIAT<br>Webster Grove, WOAL | <b>North Dakota:</b><br>Fargo, WDAY, WPAK<br>Grand Forks, WOAB<br>Mayville, WRAK<br>Wahpeton, WMAW   | <b>Tennessee:</b><br>Knoxville, WNAV<br>Lawrenceburg, WOAN<br>Memphis, WKN, WMC  | <b>Hawaii:</b><br>Honolulu, KDYX, KGU,<br>KYQ   |
| <b>District of Columbia:</b><br>Washington, WDM,<br>WEAS, WHAQ, WIL,<br>WIAV, WJH, WMU,<br>WPM, WQAW   | <b>Florida:</b><br>Jacksonville, WDAL<br>Miami, WIAZ, WQAM<br>Pensacola, WGAN, WLAV<br>Tampa, WDAE, WEAT,<br>WHAW<br>West Palm Beach, WKAH  | <b>Montana:</b><br>Billings, KFCH<br>Bozeman, KFDO<br>Butte, KFAP<br>Great Falls, KDYS<br>Havre, KFBE   | <b>Ohio:</b><br>Canton, WWB<br>Cincinnati, WAAD,<br>WLAG, WIZ, WLW,<br>WMI<br>Cleveland, KDPM, WHK,<br>WJAX<br>Columbus, WBAV, WCAH,<br>WEO, WMAN, WPAW<br>Dayton, WAI, WJAJ<br>Fairfield, WL2<br>Granville, WJD<br>Hamilton, WBAU, WRK<br>Lebanon, WPG<br>Lima, WOAC<br>Marietta, WBAW<br>Sandusky, WQAF<br>Springfield, WLAM, WNAP<br>Stockdale, WJAK<br>Warren, WLAZ<br>Washington C. O., WGAX<br>Wooster, WGAU<br>Youngstown, WAAV | <b>Texas:</b><br>Abilene, WQAO<br>Amarillo, WDAG, WRAU<br>WRAU<br>Austin, WCM, WNAS<br>Beaumont, WMAM<br>College Station, WTAW<br>Dallas, WDAO, WFAA,<br>WRR<br>El Paso, WPAT<br>Fort Worth, WBAP, WPA<br>Galveston, WHAB, WIAC<br>Houston, WCAK, WBAV,<br>WEV, WGAB, WRAA,<br>WSAV<br>Laredo, WWAX<br>Orange, WKAL<br>Plainview, WSAT<br>Port Arthur, WFAH<br>San Antonio, AS6, DM7,<br>WCAR, WQAI<br>Stanford, WOAZ<br>Tyler, WOAF | <b>Porto Rico:</b><br>Ensenada, WGAD<br>San Juan, WKAQ  |
| <b>Georgia:</b><br>Atlanta, WGM, WSB<br>College Park, WDAJ<br>Decatur, WAAS  |   | <b>Nebraska:</b><br>David City, WRAR<br>Fremont, WOAE<br>Hastings, WQAY<br>Lincoln, KFDD, WFAV,<br>WGAT, WJAB, WKAC,<br>WMAH, WQAP, WSAS<br>Norfolk, WJAG   | <b>Oklahoma:</b><br>Ardmore, WQAA  | <b>Alabama:</b><br>Merced College. Daily ex Sat & Sun, 12 m. weather, markets; 7 pm. weather, codes; 10:15, U. S. Navy press. Sun, 11 am, 7:30 pm, church service. Central.  | <b>Canada:</b><br>Calgary, CHBC, CHCQ,<br>CFAC, CFCN, CJCY<br>Edmonton, CJCA<br>Fort Frances, CFPC<br>Halifax, CFCE, CJCS<br>Hamilton, CKOC<br>Iroquois Falls, CFCH<br>Kitchener, CJCF<br>London, CFCX, CHCS,<br>CJGC, CKQC<br>Montreal, CFCF, CHCX,<br>CHYC, CJCB, CKAC<br>Nelson, CJCB<br>Ottawa, CHXC<br>Regina, CKCK<br>St. John, CJCI, CKCR<br>Toronto, CFCA, CFTC,<br>CHCB, CHVC, CJCD,<br>CJCH, CJCN, CJSC,<br>CKCE, CKZC, CKKC<br>Vancouver, CFCE, CFYC,<br>CHCA, CJCE<br>Winnipeg, CHCF, CJCG,<br>CKCB, CKZC, CJNC |

(NOTE.—The third and last part of the schedule list appears below. Next week the first part will appear.)

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

**WLV, Cincinnati, O.** 2,000 ml. Crosley Mfg. Co. Daily ex Sun, 10 am, 1 pm, 3, 4, Mon, Wed, 8-11 pm, Tues, Thurs, 10-12 pm, music, news. Sun, 10 am, church service. Central.

**WMAB, Oklahoma City, Okla.** 500 ml. Radio Supply Co. Mon, Wed, Thurs, 8:30-9:30 pm, concert. Central.

**WMAC, Cazenovia, N. Y.** 330, 250, 275 only. 500 ml. C. B. Meredith. No definite schedule.

**WMAD, Rock Port, Mo.** Atchinson County Mail.

**WMAF, Dartmouth, Mass.** Round Hills Radio Corp.

**WMAF, Liberal, Kan.** 75 ml. Tucker Elec. Co. Daily ex Fri, Sun, 7:30-8:30 pm, music, news. Fri, 8-9 pm, concert. Central.

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

**WMAJ, Kansas City, Mo.** 485 only. 600 ml. Kansas City Daily Drivers Telegram. Daily ex Sun, 8:15 am, 9:15, 10:15, 11:15, 12:15 pm, 1:15, 2:15, weather, markets, news. Central.

**WMAK, Lockport, N. Y.** 485 also. 1,500 ml. Norton Labs. Tues, 8-9:30 pm, music. Eastern.

**WMAI, Trenton, N. J.** 100 ml. Trenton Hdwe. Co. Mon, Thurs, 7:30-9 pm, music, lecture. Eastern.

**WMAM, Beaumont, Tex.** Beaumont Radio Equipment Co.

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

**WMAP, Easton, Pa.** 400 ml. Utility Battery Service Co. Daily ex Sun, 4-5 pm, 6-6:45. Wed, 8-9:55 pm, entertainment. Eastern.

**WMAQ, Chicago, Ill.** 1,500 ml. The Chicago Daily News (Fair Department Store). Daily ex Mon, 4:35-5 pm, 9:15-10. Wed, Fri, Sat, 7-7:30 pm, Tues, Thurs, 7-8 pm, Central.

**WMAR, Waterloo, Iowa.** Waterloo Electrical Supply Co. Schedule not established.

**WMAT, Duluth, Minn.** 485 also. 500 ml. Paramount Radio Corp. Daily ex Sun, 11:20 am, 4:20 pm, weather; 6:15-7:30 pm, markets. Tues, Fri, 8-9:30 pm, concert. Central.

**WMAV, Auburn, Ala.** Ala. Polytechnic Inst.

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

**WMAX, Ann Arbor, Mich.** K & K Radio Supply Co.

**WMAY, St. Louis, Mo.** 1,000 ml. Kingshighway Presbyterian Church. Sun, 11 am, 8 pm. Tues, 7-8 pm, church services. Central.

**WMAZ, Macon, Ga.** 250 ml. Mercer University. Daily ex Sun, 5:30-6 pm, 7-7:30, 8:30-9:30, music. Tues, Wed, Thurs, 10:30-11 am, chapel. Eastern.

**WMB, Auburn, Me.** Auburn Elec. Co.

**WMC, Memphis, Tenn.** 400, 485 only. 2,000 ml. The Commercial Appeal. Daily, 9:30 am, 12 m, 3:20 pm, weather, markets; 8 pm, entertainment. Tues, Fri, 11 pm, Midnight Frolic. Central.

**WMM, Cincinnati, O.** Precision Equipment Co. Temporarily discontinued.

**WML, Washington, D. C.** 100 ml. Doubleday-Hill Elec. Co. Daily, 4:30 pm, concert, sports. Thurs, 8-9 concert. Eastern.

**WNAB, Bowling Green, Ky.** 500 ml. R. D. Nichols. Daily ex Tues, 4-5 pm, 7-7:30, music. Central.

**WNAC, Boston, Mass.** 200 ml. Shepard Stores. Daily ex Sun, 4-5 pm, dance music. Tues, Thurs, 7-8:30 pm, Wed, Sat, 9:30-11 pm, Fri, 8-9:30 pm, Sun, 11-12 am, 2:30-4 pm, 6:30-8:30 pm, church services. Eastern.

**WNAD, Norman, Okla.** 200 ml. Okla. Radio Engineering Co. Daily ex Sun, 7:45-8:15 pm, news. Central.

**WNAK, Manhattan, Kans.** Manhattan Radio Supply Co.

**WNAI, Omaha, Neb.** R. J. Rockwell

**WNAM, Evansville, Ind.** 200 ml. 485 also. Ideal Apparatus Co., Inc. Mon, Wed, Fri, Sat, 10-11 am, music, reports; 3-4 pm, 7-8, entertainment. Sun, 3-4 pm, music. Central.

**WNAN, Syracuse, N. Y.** 1,000 ml. Syracuse Radio Tel. Co. Mon, Wed, Sat, 7:30-9:30 pm, concert, agriograms, etc. Eastern.

**WNAB, Charleston, S. C.** Charleston Radio Elec. Co.

**WNAP, Springfield, O.** 200 ml. Wittenberg College.

**WNAR, Butler, Mo.** C. C. Rhodes.

**WNAS, Austin, Tex.** Tex. Radio Corp. (Austin Statesman).

**WNAT, Philadelphia, Pa.** 500 ml. Lennig Bros. Co. Daily ex Sun, 12:15-1 pm, Wed, Sat, 7:30-9:30 pm, Sun, 2:30 pm, 4:30, church services. Eastern.

**WNAV, Knoxville, Tenn.** People's Tel. & Telg. Co.

**WNAW, Fortress Monroe, Va.** Henry Kunzmann.

**WNAX, Yankton, S. D.** Dakota Radio Apparatus Co.

**WNB, Baltimore, Md.** Shipowners Radio Service.

**WNI, Albany, N. Y.** 50 ml. Shotton Radio Mfg. Co. Daily ex Sun, 10-10:15 am, market reports. Wed, 8:15 pm, concert. Eastern.

**WNO, Jersey City, N. J.** Wireless Telephone Co. of Hudson Co., N. J.

**WOAA, Ardmore, Okla.** Dr. Walter Hardy.

**WOAB, Grand Forks, N. Dak.** 50 ml. 485 also. Valley Radio. Daily ex Sun, 10-11 am, 2-2:30 pm, entertainment, reports. Sun, 3-4 pm, music, church service. Central.

**WOAC, Lima, O.** Maus Radio Co.

**WOAD, Seymour, Ia.** Friday Battery & Elec. Co.

**WOAE, Fremont, Neb.** Medland College.

**WOAF, Tyler, Tex.** 485 also. 50 ml. The Tyler Commercial College. Daily ex Sat & Sun, 12 m. weather, markets; 7 pm. weather, codes; 10:15, U. S. Navy press. Sun, 11 am, 7:30 pm, church service. Central.

**WOAG, Belvidere, Ill.** Apollo Theatre.

**WOAH, Charleston, S. C.** 200 ml. Palmetto Radio Corp. Mon, Thurs, Sat, Sun, 10 pm-1 am, music. Eastern.

**WOAI, San Antonio, Tex.** 485 also. 1,800 ml. Southwestern Express. (Evening News-Express.) Daily ex Sun, 10:30 am, 12:15 pm, 3, 6, news, markets. Tues, Sun, 9:30-10:30 pm, concert. Thurs, 7:30-8:30 pm, concert. Central.

**WOAJ, Parsons, Kans.** 50 ml. C. E. Ervin. Thurs, 7-8 pm, music, lectures, news. Sun, 3-4:30 pm, Sermon, music, news. Central.

**WOAK, Frankfort, Ky.** Collins Hardware Co.

**WOAL, Webster Groves, Mo.** 300 ml. W. E. Woods. Sun, 3-5 pm, Central.

**WOAN, Lawrenceburg, Tenn.** 1,000 ml. James D. Vaughan. Daily, 8-9 pm, concert. Central.

**WOAO, Mishawaka, Ind.** 200 ml. Lyrdson Mfg. Co.

**WOAP, Kalamazoo, Mich.** Kalamazoo College.

**WOAQ, Portsmouth, Va.** Portsmouth Radio Assn.

**WOAR, Kenosha, Wis.** H. P. Lundskow.

**WOAS, Middletown, Conn.** 100 ml. Bailey's Radio Shop. Daily ex Sun, 4:15-6 pm, music. Sat, 9-12 pm, dance music. Eastern.

**WOAT, Wilmington, Del.** Boyd Martell Hamp.

**WOAV, Evansville, Ind.** Bowyer Bowling Piano Co.

**WOAW, Erie, Pa.** 600 ml. Penna. Nat'l Guard. Tues, Thurs, 8:30-10 pm, music. Fri, 10 pm, sports. Sun, 7:45 pm, church services. Eastern.

**WOAW, Omaha, Neb.** Woodmen of the World.

**WOAX, Trenton, N. J.** 342 only. 300 ml. F. J. Wolff. Intermittent schedule.

**WOAY, Birmingham, Ala.** John M. Wilder.

**WOAZ, Stanford, Tex.** Penick Hughes Co.

**WOC, Davenport, Ia.** 400 and 485 only. 1,000 ml. Palmer School of Chiropractic. Daily ex Sun, Tues, night, 10:55 am, time; 11, weather. 12 m, chimes; 2 pm, markets; 3:30, talk; 5:45 chimes, ex Wed; 6:30, sports; 7, concert; 10 pm, concert, Wed, only; 9:30 pm, concert, Sat only. Sun, 9 am, chimes; 1:45 pm, 6, concert; 7, church services; 8, concert. Central.

**WOI, Ames, Ia.** 485 also. 200 ml. Iowa State College. Daily ex Sun, 9:30 am, 12:45 pm, 9:30, music, weather. Central.

**WOK, Pine Bluff, Ark.** 485 also. 500 ml. Ark. Light & Power Co. Tues, Fri, 9-10 pm, concert. Sun, 11-12 m, 7:30 pm, church services. Central.

**WOO, Philadelphia, Pa.** 400 and 485 only. 500 ml. John Ivanamaker.

**WOO, Kansas City, Mo.** 485 also. 1,000 ml. Western Radio Co. Mon, Tues, Wed, Thurs, 9:45 am, 10:55, 11:30, 12:30 pm, 2, 7:30, time signals, reports, etc. Fri, 1:15 pm, sacred service. Sat, 8 pm, concert. Sun, 7 pm, concert.

**WOR, Newark, N. J.** 400 only. 2,000 ml. L. Bambror & Co. Daily ex Sun, 2:30-4 pm, 6:15-7:30, music, talks. Tues, Fri, 8-11 pm, music, entertainment. Eastern.

**WOS, Jefferson City, Mo.** 485 also. 1,500 ml. Missouri State Marketing Bureau. Daily ex Sun, first 15 min. of every hour from 8 am-2 pm, markets. Daily, 5 pm, music, markets. Mon, Wed, Fri, 8-9:30 pm, concert. Central.

**WOW, Omaha, Neb.** R. B. Howell.

**WOU, Omaha, Neb.** Metropolitan Utilities Dist.

**WPA, Ft. Worth, Tex.** 485 also. 1,000 ml. Fort Worth Record. Daily ex Sun, 10:58-11 am, 11:30-12 m, 1:30-2 pm, 2:30-3, 6-6:30. Daily ex Sun, Mon, Wed, 8:30-9:30 pm, 10-10:05, Mon, 11-12 mid. Sun, 3-3:30 pm, 9-9:30, Central.

**WPAW, Waco, Neb.** Anderson & Webster Elec. Co.

**WPAB, State College, Pa.** Pa. State College.

**WPAC, Okmulgee, Okla.** Donaldson Radio Co.

**WPAD, Chicago, Ill.** 500 ml. W. A. Wieboldt & Co. Daily ex Sun, 11:30-1:30 pm, 6:30-7 pm, music. Wed, Fri, 10-11 pm, Sun, 2:30-3:30 pm, Central.

**WPAE, Council Bluffs, Ia.** Peterson's Radio Co.

**WPAF, Independence, Mo.** Central Radio Co., Inc.

**WPAH, Waupaca, Wis.** 485 only. 3,000 ml. Wisconsin Dept. of Markets. Daily ex Sun, 8:30 am, 9:30, 10:30, 11:30, 3 pm, 5, markets, weather, news, etc. Central.

**WPAJ, New Haven, Conn.** Doolittle Radio Corp.

**WPAK, Fargo, N. D.** North Dakota Agricultural College.

**WPAL, Columbus, O.** Superior Radio & Tel. Equip. Co.

**WPAM, Topeka, Kans.** Averbach & Guettel.

**WPAP, Winchester, Ky.** Theodore D. Phillips.

**WPAQ, Frostburg, Md.** General Sales & Engineering Co.

**WPAR, Beloit, Kan.** 50 ml. R. A. Ward. No definite schedule.

**WPAS, Amsterdam, N. Y.** J. & M. Electric Co.

**WPAT, El Paso, Tex.** Saint Patrick's Cathedral.

**WPAY, Moorhead, Minn.** Concordia College.

**WPAZ, Laurium, Mich.** Tinetti & Sons.

**WPAA, Wilmington, Del.** 50 ml. The Radio Installation Co. Daily ex Sun, 4-6:30 pm, music, code instruction. Wed, 8-10:30 pm, music. Eastern.

**WPAX, Thomasville, Ga.** 25 ml. S-W Radio Co. Daily ex Sun, 5-6 pm, roads, weather, stocks, music. Mon, Wed, Fri, 8:30-9:30 pm, music. Sat, 10-11 am, codes. Sun, 11:30 am-12:30, 8:30 pm-9:30, church service. Eastern.

**WPAY, Bangor, Me.** Bangor Radio Lab.

**WPAC, New Lebanon, O.** 485 also. 1,500 ml. Nushawg Poultry Farm. Daily ex Sun, 12-12:15 pm, news, 6-6:30 pm, markets. Mon, Fri, 8-9:45 pm, music, farm program. Central.

**WPI, Clearfield, Pa.** Elec. Supply Co. pm, news. Mon, 8 pm, concert. Eastern.

(Continued page 9)



STATION SCHEDULES

(Continued from page 8)

WPM, Washington, D. C. 200 mi. Thos. J. Williams, Inc. (Washington Daily News.) Daily ex Sun, 12:30

Largest Radio Store in America

RADIO

BUY HERE FOR LESS

Largest Radio Store in America

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 Ultra Audion Circuit (Known as the Wonder Circuit) \$11.90

Table listing components for Ultra Audion Circuit: 9x10 1/2 Formica Panel, 23-Plate Condenser, Bakelite Socket, etc.

\$11.90

Freund's Wonder Circuit \$13.20

Table listing components for Freund's Wonder Circuit: 9x10 1/2 Formica Panel, 9x10 1/2 Genuine Solid Mahogany Cabinet, etc.

\$13.20

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

\$11.45

Complete Parts for Flewelling Circuit

Can be used to amplify Reinartz, Flewelling, Crystal or any receiving set so that loud speaker 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

\$12.45

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

\$17.95

Complete Parts for 2 Step Amplifier

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

\$12.45

VARIABLE CONDENSERS

Table listing variable condenser models and prices: \$4.30 Value, 43 PLATE, now \$1.75; \$7.00 value 43-plate Vernier Variable Condenser \$3.95, etc.

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

Each Phone Cap is covered with 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 Phones, complete with silk cord and headband. Special at \$4.65

3000 Ohm GUARANTEED HEADSETS, \$8.50 Value \$3.65

MAGNAVOX, LOUD SPEAKER, Type R3 \$27.45

Table listing various radio components and their prices: Jacks, HONEYCOMB COIL, Cabinets, Rheostats, Signal Corps Super Sensitive Microphone, etc.

FORMICA PANEL, 1/8" thick, Black or Brown, Square Inch 1 1/2c

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

Complete Parts for Single Tube Reflex Circuit \$32.65

Table listing components for Single Tube Reflex Circuit: 43-Plate Vernier Variable Condenser, Radion Loop Aerial, Cunningham C301-A Tube, etc.

\$32.65

BUY HERE FOR LESS

CHICAGO SALVAGE STOCK STORE

509 South State Street CHICAGO, ILLINOIS

How to Solder Joints

Anyone who has experimented with a Radio set has encountered troubles due to loose connections. When wires have to be connected together or to nuts, binding posts and the like, great care should be taken to see that every joint is tight and, if possible, soldered.

In your set the only connections that should not be soldered are the ones that you will have to change from time to time, such as telephones and A and B batteries. It might even be well to solder the B battery connections, as the plate batteries usually last six months.

A good electrical joint must first be strong enough to stand any strain of handling. Where two wires are joined they always should be twisted together and soldered in the center, the soldered part making a perfect connection and the splice taking up the strain.



# 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. Smisor, 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, March 24, 1923 No. 11

## University Radio Courses

Large Number of Colleges Now Broadcast

ENGLAND and Germany are planning to broadcast university extension courses. A number of prominent institutions of learning in the United States have made a beginning in this direction and their reports of the encouraging success attending their efforts show us that the possibilities of the new method are not underestimated.

Sixty other educational institutions are broadcasting educational and musical programs, forty-seven of them being colleges and universities. The combined area nominally covered by these institutions has been estimated to be seven or eight times the total area of the United States.

## Air-Borne Religion Aids Church

Congregation Grows Instead of Getting Smaller

THERE are some ministers who declare Radio religion a curse and that there is a disposition to loll in an easy chair and listen in a moment or two at a sermon from some broadcasting station instead of going to church.

There are many listeners in, but is Radio making serious inroads upon church attendance? We have an idea that persons who were pious enough to go to church before Radiophony became popular, still will go to church.

A few years ago, by the way, many ministers regarded the automobile as an invention of the devil because it took more people away from church than it took to church, yet around any country church nowadays on Sundays there is a whole flock of flivvers. The many who go motoring—and not to church—Sundays did not go to church when they could not go motoring. Religion that is killed by gasoline or by Radio never was alive.

## Beginners Have Less Patience

Increase in Ready-Made Instruments Causes Laxity

THE Radio enthusiast developed by the growth of broadcasting has not the same amount of patience, or knack for tinkering with a set to develop and improve its latent possibilities as the boy or man who took up Radio in the days when only code was in the air.

With the great increase in the manufacture of ready-made sets of great range there has been a growth in the number of persons who are inclined to use the set that is the easiest to adjust, instead of the one that will give the best results.

The way for a novice to go about it is to start in with a small set, preferably a crystal set. After he has become familiar with its operation he may safely attempt to work a more powerful receiving set.

Many of the sets now offered for sale are very selective. This means they are capable of receiving a station only when it is tuned very closely, or when the station desired is so close as to require practically no tuning. This is a great advantage as it enables one familiar with the operation of such a set to tune in a distant station that would otherwise, if received at all, be only a jargon because of the interference from other transmitters operating on almost the same wave length.

## Aid to Exploring Parties

Travelers Find Receiving Sets Invaluable

THOSE who make expeditions into desert lands are proceeding with a very much greater feeling of safety since Radio came into wide use. One of the great conveniences that Radio has furnished is the ability to get the correct time.

Scientific observations are greatly dependent upon having the correct time, and heretofore getting this has entailed hard work in the way of calculations. About a year ago an expedition was sent by the American Museum of Natural History to explore the central plateau of Asia. The members first went to Peking and from there to Kaisan and thence to Urga, Mongolia, a distance of about 800 miles.

Traveling heretofore into the desert has involved silences and isolation that often overwhelmed men, but with the present expedition, every evening at sundown, Peking was picked up by Radio and the news of the day learned, and in addition, scientific data procured.

## Condensed

By DIELECTRIC

At the Franklin Institute, in Philadelphia, a very appropriate ceremony took place not long ago. The Elliott Cresson Medal, which has been awarded to only a comparatively few scientists, was bestowed upon Dr. Lee de Forest as the inventor of the audion tube. Every owner of a tube set must feel that the American Society of Civil Engineers has honored itself in honoring so eminent a Radiotrician. This invention is undoubtedly one of the most important to the progress of Radio science. Any Old Timer will verify that statement.

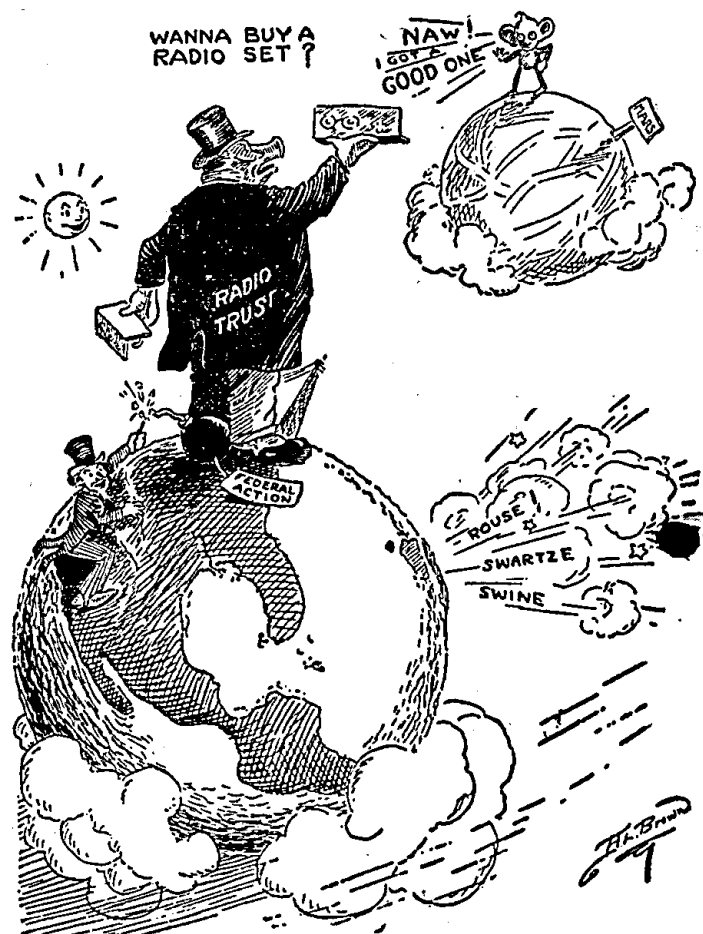
When baseball was in season we listened in for the returns from the World's Series and thousands enjoyed that single feature. Then football came along and many games between the great universities were followed play by play by interested persons scattered all over the country. There is always a Radio audience when sports of any kind are being broadcast and fortunately for them the winter months do not prevent certain types of games being played. Basketball is another of the sporting events receiving some share of attention by broadcasting stations. Evidently a very exciting game of basketball was played by the Universities of Michigan and Wisconsin a short while ago. At least the announcement from Station WHA, at Madison, Wis., and the very audible commendation of the crowd for one or the other team, made one listener in break out in perspiration from the excitement of witnessing a splendid forward pass reach its mark. Yes, you fairly see all that is going on as the plays come through your set. KDKA had to inform the Radio public in the vicinity of New York (as well as elsewhere) of the progress of the fight between Greb and Tunney. You may have to ask someone on the other side of the continent about events transpiring right at home—but it's on the air, if you want it.

The idea of supplying shut-ins with Radio receiving sets is worthy of commendation and emulation. There are several agencies at work seeing to it that unfortunate beings need be without contact with the Radio world no longer. One of the well-known broadcasting stations, WOC, at Davenport, is carrying on just this particular work. They announce from time to time the installation of a new set in the room of a sufferer, who is unable to get about and previously lacking means of hearing the interesting things so many of us have been enjoying for some time. Public subscriptions, provide the means of purchasing sets for these people, and there is no doubt of their genuine appreciation for what is being done along this line. It is difficult to conceive of a gift that would be better suited to conditions surrounding a shut-in than a Radio set. Why not begin an organization with this idea in mind in the locality in which you are living?

In case there may be some of you readers who failed to notice the statement concerning Dr. De Forest's contribution to the advancement of the science of Radio at his alma mater, I shall take this occasion to mention it. He has provided a fund for the purchase of a library of Radio works, and another for a course of lectures by experts for the benefit of advanced students, at Yale University. What Dr. De Forest has done for the science to which he is devoting his remarkable ability, surely others could do for institutions not so favored at present. It is with the hope that someone in the habit of whiling away time in the reading of this column will be inspired to action by duplicating his example, that I pay particular attention to so worthy a subject by so eminent a man.

The first item to which your attention is called this week concerns opera. In New York City the Wagnerian Opera Festival gave permission to WJZ to broadcast a few of their performances. If there is any question in the minds of those who are at the head of things at the Metropolitan Opera House, in that city, as to the advantages to be derived from broadcasting opera music, then they are not open to any argument. Following the broadcasting for the first time from the Manhattan Opera House of one of the Wagner operas there was almost a riot for seats to the next performance. Undoubtedly Radio had nothing to do with this occurrence, so agreeable to the management!! No, the publicity element in broadcasting is unquestionably nil. Why, then, such interest in opera so suddenly manifest? Oh, well, some of the receiving sets couldn't translate the jargon so they came to headquarters to find out what it all meant. That's pretty lame reasoning, but I defy the Metropolitan to produce any better. All objections so far are weak signals and may yet fade out entirely.

It is only natural that having met with so much success the Radiowis should find a competitor in the field of Radio Clubs. The newly organized aggregation of DX Fanatics perhaps wisely eschewed the animal kingdom in looking for a name and chose instead from the vegetable kingdom. I say "wisely" because Michigan is known as the parent state of vegetarian cults, and though Battle Creek is slightly distant from Detroit, it is not so from a DX-er's standpoint. At any rate, the Red Apple Club is a reality, made so by Station WCX, the Detroit Free Press broadcasting station. It is about time for another club with an euphonious name to spring up somewhere. How about forming the Bachelor Button Fraternity, or the Maiden Blush Sorority? If prizes are to be offered by each new club to secure larger membership, then the name really counts for little. The main requirement is to begin at a late hour (late for the particular section) and acknowledge each new member's oath of allegiance before broadcasting any entertaining (!) features. Chicago should start a "Flivver" Society. Then you would see a club with some membership!



## 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.)

### Classify Her as Chickenoradiophan

I must let you in on the following received at the Shepard Stores station:

Dear WNAC,  
Kindly appraise Middleboro Male Singers of our appreciation Sunday Concert. Also ask them to come again. Our set is on the dining table. Yours truly was tuning in when "Mandalay" was announced. Mrs. M. had just got her plate charged with a hot chicken dinner which she had labored long to prepare. Then the problem-climax. Which to let wait; hot dinner or "Road to Mandalay." She got them both by donning receivers, with cord draped across the table carefully dodging the gravy bowl and the boiled onions.

Can you beat that for efficiency? Just try eating and receiving and note the difficulties with only a WD-11 tube.  
—RADIOKNUT JEAN SARGENT.

### Referred to National Museum of Radioknuts

Dear Indi.—In Scientific American supplement No. 134 July 27th, 1878 B. P., appears an article by Prof. C. W. MacCord, captioned "A Mechanical Curiosity," de-

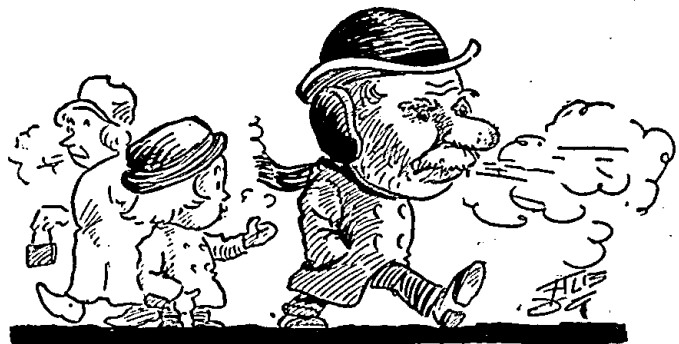


scribing a machine of six gear wheels, which by turning the crank 262,500 times will result in one entire revolution of the smaller wheel.

Can you give me a hook-up whereby I can use this machine as a vernier adjustment in connection with the 11-plate "invariable condenser" shown on page 51 of the catalogue of a well-known Chicago River mail order house?  
E. E. JAYEFF.

### Outdoor Sports Modernized

Dear Indi.—Little Aileen listens each night for the tale of the sandman. One cold afternoon she was taken down town by a neighbor and for the first time in her life saw a man wearing ear-muffs.



Returning home she reported the incident to her mother. "He was walking along the street with his Radio receivers on his ears," she said. POLLY.—IOWAY SHEBA."

# A. B. C. Lessons for Radio Beginners

## Chapter XII—Regenerative Radio Receivers

By Arthur G. Mohaupt

A VERY efficient form of Radio receiving circuit is that known as the regenerative receiver. This circuit employs the so-called feed-back principle, by which is meant that part of the energy of the plate circuit is fed back upon the grid circuit so that it has to pass through

long time and has proven itself satisfactory to thousands of users.

As is illustrated in Figure 43 it consists of a variocoupler and two variometers, one variometer being connected in the grid circuit and the other in the plate circuit. The general operation of the circuit is

should bear in mind that operating a set of this kind involves two distinct and individual processes: First tuning the set to the desired wave length and then cutting in the regeneration. If both are attempted at one time serious difficulties or complications may set in.

Learning to operate a Radio receiving set involving several adjustments is very much like learning to run an automobile. A Radio set has its good qualities just as well as its limitations; and although two sets may be built exactly alike, their operating characteristics may be widely different. Patience is the main quality to be developed by the operator, and after he has learned his set all troubles will disappear and endless enjoyment and pleasure will be in store for him. Never condemn a set until you are sure that all the auxiliary equipment is in perfect operating condition—such as the antenna and ground connections, the A and B batteries, etc.

### The Equipment Needed

The Apparatus needed for constructing a two-variometer set of the kind just described is as follows: In the first place, a convenient size of panel to use is 7 inches by 21 inches by 1/8 inch. The general layout of the panel should be arranged as is illustrated in Figure 44. As far to

ject through the panel and are provided with the three-inch dials. Between the first are connected the taps of the coupler primary.

To the right of the coupler dial and at about the same level with the switch lever on the left, the grid leak is mounted

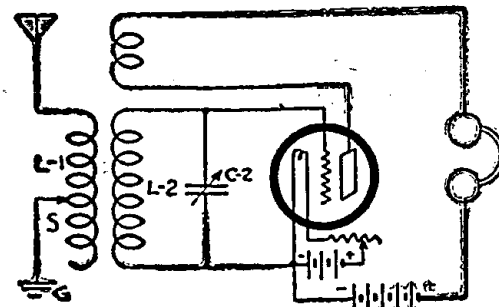
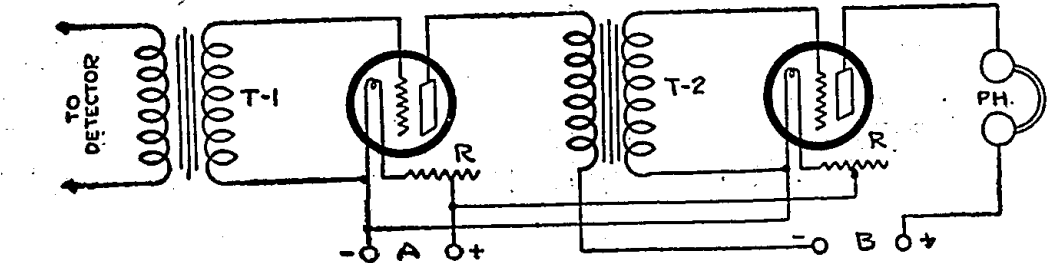


Figure 45

to the panel. This grid leak can be either of the lead pencil mark or of the variable type, although the former is much cheaper and practically just as satisfactory. Further to the right is the second or plate variometer with its control dial. And clear at the right end of the panel is the rheostat for controlling the tube-filament, the socket being mounted directly in back of the rheostat. Above the rheostat a number of small peak holes are drilled

(Continued on page 12)



In Figure 41, Chapter XI, there was an error. One of the secondary leads from T-1 was left open. The diagram above shows the correct connection

the tube a second time with the result that the intensity of the signals heard in the phones is greatly increased. We will now see how this regeneration is accomplished.

### Tuned Circuits Are Necessary

In order to consider the very fundamentals upon which the principles of regeneration are based, it is necessary to again recall the operation of the three-electrode vacuum tube. It will be remembered that under suitable conditions of plate pressure and filament current adjustments, very slight variations in the grid potential will cause relatively large changes in plate current.

Further, if the plate circuit of the system shown in Figure 42 is so adjusted that the maximum values of the current oscillations flowing in it occur at the same instant as those in the grid circuit, the result will be that part of the energy will be transferred from the plate to grid circuit. This energy will strengthen the oscillations induced from the antenna primary circuit and thus cause potential variations of much greater intensity to be impressed on the grid.

### Effect of Feed Back

The effect of this plate circuit energy being fed back upon the grid circuit is that the signals are amplified many times

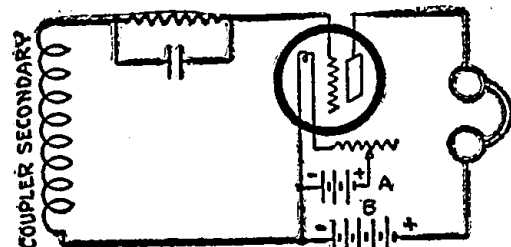


Figure 42

their normal amount in the detector tube. Signals which without regeneration can hardly be heard, can be made very strong by employing the regenerative principle. Signals from much greater distances can also be received with regenerative circuits. Other additional features are that with regenerative receivers tuning is much sharper and less interference is encountered when several nearby stations are operating at or nearly at the same wave lengths.

### Converting Tube Set into Regenerative

To convert an ordinary vacuum tube receiving circuit into a regenerative circuit, one of two schemes can be employed: Either the grid and plate circuits can be tuned so that both oscillate at the same frequency (be in resonance), or some additional device can be introduced into the circuit by means of which some of the energy of the plate circuit will be fed back upon the grid or input circuit. Such

as follows: By means of the switch S the primary L-1 of the variocoupler is adjusted to the wave length of the incoming oscillations. The next step is to tune the grid circuit by adjusting the variometer V-1 until it has the same oscillation frequency as (is in resonance with) the received signals. After this has been accomplished, the degree of coupling is corrected by rotating the secondary L-2 of the coupler until the signals can be

heard with greatest clearness. Finally the plate circuit is tuned by adjusting the variometer V-2. This throws in the regeneration and greatly increases the strength of the sounds produced in the telephone receivers. During the entire tuning process, of course, it may be necessary to make slight readjustments of the various settings in order to obtain best results.

### Operating the Set

In operating a set of this kind, or any other regenerative set, the control knob marked regeneration (sometimes also called the tickler) should first of all be set for minimum or zero, before any tuning is attempted. If this is not done, such a frequency as to partially annul the weaker incoming signals, the result being that it may be very difficult, if not impossible, to catch or tune in anything at all. However, after the set is in tune, the regeneration knob is slowly turned to the right or toward the maximum position. It may be that at first no appreciable or noticeable changes will result, but suddenly a point will be reached at which a surprising increase in signal strength will occur. It is at this point that the frequency of the plate circuit is in synchronism (in resonance) with the grid circuit, and regeneration can take place.

Regeneration should not be increased too much, for otherwise the two circuits will again be thrown out of resonance, and the quality of the signals will be spoiled due to distortion. It is generally more advisable to sacrifice signal strength slightly in favor of purer and more perfect tone qualities.

### Reducing Filament Current

Another worthwhile point to bear in mind is that the filament can be burned at a somewhat reduced brilliancy by increasing the regeneration. Two important advantages are gained from such operation for by burning the filament at a lower temperature the life of the tube will be greatly prolonged and the drain on the A battery will be less severe.

When first learning or attempting to operate a regenerative set of the two variometer type, a little trouble may at first be experienced by the beginner; but he should not be discouraged, for it is only a matter of becoming acquainted with the circuit and learning its peculiarities. He

coupling of the two circuits may be either of the inductive, capacitive or resistance type. With any of these systems, however, very fine adjustments of the coupling devices must be provided so that the correct degree of regeneration can be effected without causing distortion of the signals. Inductive coupling seems to be most satisfactory and most easily operated, and hence is now used to a very great extent in all modern receiving apparatus of the better class.

### Two-Variometer Circuit

The so-called "two-variometer circuit" is a very popular type of receiver employing the principle of tuned plate regeneration. The circuit has been in use for a

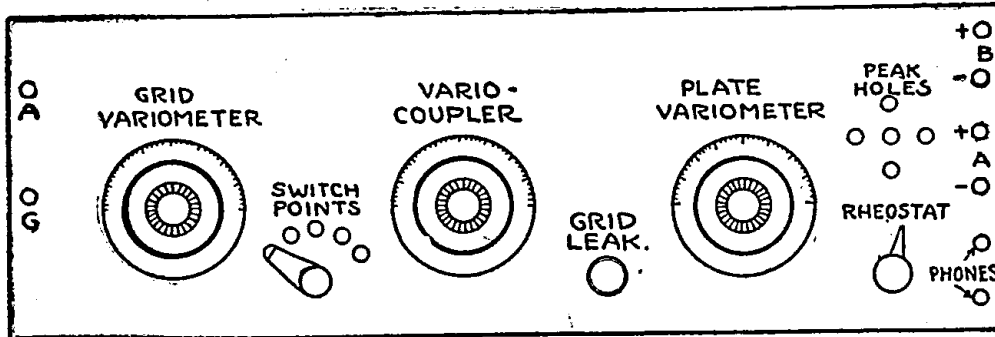


Figure 44

the left as possible is mounted the first variometer, which, as is labeled, is connected into the grid circuit. To the right of the variometer is mounted the variocoupler. The shaft of the coupler, as well as the shafts of the two variometers, pro-

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

ORIGINAL NATHANIEL  
**Baldwin**  
Type C  
**HEAD SET**  
Complete  
SPECIAL PRICE  
**\$11.75**  
**Free** with each pair of these world's best phones we give absolutely free a \$5.00  
**Sheltone Loud Speaker**  
This is a wonderful Loud Speaker. Both for less than the regular price of the phones. Head set can be used in the regular way as well as on Loud Speaker.  
Cash with Order or C. O. D.  
**WALTER SCOTT**  
10 St. Lukes Pl., MONTCLAIR, N. J.

## RADIO SPECIALS

Build Your Own Set. Complete Parts

|   |  |
|---|--|
| <b>FLEWELLING</b><br>Includes 6 in. x 14 in. panel, double coil mount (adjustable), one 23-plate condenser, one dial, two honeycomb coils, one Freshman grid leak and condenser, one rheostat, one socket, eight binding posts, connection wire, 3 .006 condensers, one fixed grid leak and diagram for construction.<br><b>\$12.40</b> | <b>REINARTZ</b><br>Consisting of 7x18 panel, 23-plate condenser, two dials, 11-plate condenser, Reinartz coil, socket, three switch levers, contact points, grid leak and condenser, rheostat, binding posts, wire and diagram for construction.<br><b>\$10.40</b> |
| <b>TWO STAGE AMPLIFIER</b><br>Consists of 6x10 panel, one 3-1 transformer, one 7-1 transformer, two rheostats, two sockets, three jacks, five binding posts and print for construction.<br><b>\$10.40</b>   | <b>ULTRA-AUDION</b><br>Includes one 6x10 1/2 panel, one 75-turn coil, one variable condenser, one grid leak and condenser, one socket, one rheostat, binding posts, wire for connection and print for construction.<br><b>\$5.95</b>                               |

|  |  |  |
|--|--|--|
| 43 Plate Signal Condenser.....\$1.95     | Porcelain V. T. Socket.....\$0.20          | Moulded Variometer.....\$2.98                |
| 23 Plate Condenser.....1.65              | CRL Grid Leak......95                      | Wooden Variometer.....1.95                   |
| 11 Plate Condenser.....1.45              | Phone Plug......35                         | Thordarson 7-1 Trans.....2.95                |
| 5 Plate Condenser.....1.10               | Carter Phone Plug.....1.05                 | All Amer. 10-1 Trans.....3.95                |
| 3 Plate Condenser......90                | Type C Baldwin Unit.....3.65               | All Amer. 5-1.....3.95                       |
| 2 in. and 3 in. Grebe Type......25       | Type C Baldwin Headsets..3.65              | All Amer. 3-1.....3.65                       |
| Dial......25                             | 25-35-50-75 Turn Coils each..40            | Reinartz Coil.....1.25                       |
| R. W. Detectors.....1.40                 | 2200 ohm Fones.....2.98                    | Murdock Loud Speaker.....4.75                |
| 100 ft. 7 strand Aerial Wire......50     | Murdock 2000 ohm Fones.....4.30            | 22 1/2 Volt B Battery, \$3.00 Value.....1.70 |
| Composition Insulators......10           | Murdock 3000.....4.50                      | 45 Volt B Battery, \$5.50 Value.....2.95     |
| Moulded V. T. Socket......25             | 180 Degree Premier Coupler.2.65            |  |
| Freshman Grid Leak and Condenser......75 | Thordarson Amp. Transform-ers 3-1.....2.65 |  |

All the above merchandise is new and in perfect condition and is guaranteed.  
MAIL ORDERS PROMPTLY FILLED  
**WESTERN ARMY STORES**  
227 W. Madison St. CHICAGO, ILL.



# Use of Two Aerials Eliminates QRM

## One or Both Antennae Used on Receiving Set

Local interference caused me considerable trouble until I devised an antenna as shown in the illustration. I have a four-wire antenna about 30 feet long with a

## WORKSHOP KINKS? EARN A DOLLAR—

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

lead-in from the outer end. Another antenna was constructed the same length, but only three wires were used. This was placed 6 inches below the four-wire antenna. The lead-in from this was run down to the switch as shown.  
Either antenna or both can be used by manipulating the switches. Both switches are thrown to ground both antennae when it is desired to cut out interference.  
This sort of a connection may be looked upon as a foolish arrangement but I have been using it for many weeks and it gives very good results.—R. L. Clinton, Hammond, Ind.

## A. B. C. LESSONS

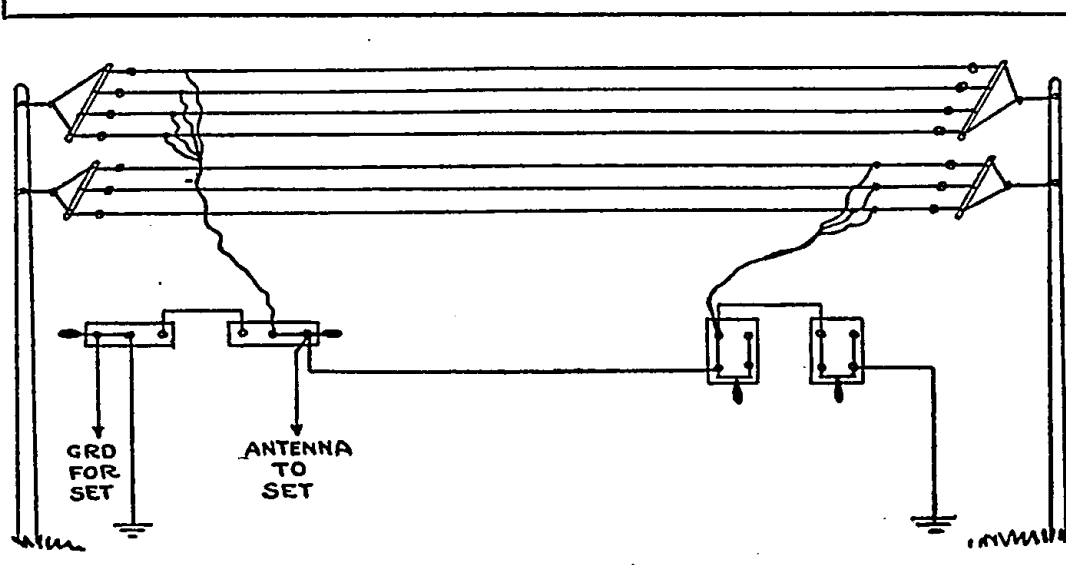
(Continued from page 11)  
through the panel for observing the operation of the tube.  
**Binding Posts Needed**  
Eight binding posts are needed, two for the aerial and ground, two for the A battery, two for the B battery and two for the telephone receivers. The antenna and ground terminals are mounted at the left, the antenna on top and the ground below. The two binding posts for the A battery are inserted at the right end toward the bottom, and the two B battery terminals toward the top on the right. It is a good idea to mark the battery terminals positive and negative, for if the battery connections are reversed the apparatus cannot function properly.

The variometers and variocoupler can be either purchased or made at home, but it is recommended that ready built ones be used, for these are more correctly designed and will hence give better and more satisfactory operation. The wiring should preferably be done with No. 14 or 16 tinned copper wire covered with some form of insulation tubing. To present as neat an appearance as possible all wires should be run in straight lines and bend at right angles. Wherever wires cross they should always do so at right angles so as to prevent any inductive interference of one circuit upon another. Likewise another condition to be avoided as much as possible is to run parallel wires close to each other, for the inductive influence of one upon the other may cause undesirable and disturbing noises in the telephone receivers.

In making connections it is best practice to solder all contacts so as to insure electrical connection and prevent any corrosion of the touching surfaces. Soldering paste can be used to good advantage, but it should be used sparingly and the joint wiped perfectly clean when finished. Better than soldering paste is acid with zinc dissolved in it, but this also should be used sparingly.

**The Inductive Feed-Back Circuit**  
Another very common and efficient regenerative circuit operating on the inductive feed-back principle is illustrated in Figure 45. It is evident that this circuit is merely a modification of the simple vacuum tube detector circuit, regeneration being effected by means of the so-called "tickler coil" which is connected in series with the plate circuit and is in inductive relationship with the secondary of the variocoupler. This coupling, however, must be adjustable in some way so that the degree of regeneration can be altered in order to obtain the necessary amount of feed-back action. The circuit operates in the following manner.  
The circuit is first tuned to the frequency of the incoming signals by adjusting the dial switch S connected to the taps on the primary of the variocoupler. The circuit is next thrown into resonance by adjusting the tuning condenser C-2 and the rotor L-3 of the vario-

## CONNECTIONS MADE TO AERIALS



coupler. Finally regeneration is thrown in by tuning the tickler coil to the right until the signals are heard with maximum loudness in the phones. Due to the action of the tickler coil the current oscillations flowing in the plate circuit induce corresponding potentials in the coupler secondary. These combine with the potentials induced by the coupler primary and thus cause greater variations in potential to be impressed upon the grid of the detector. This in turn causes increased current pulsations to flow in the plate circuit. In general, the circuit is comparatively simple, is easily constructed, and gives very good results.

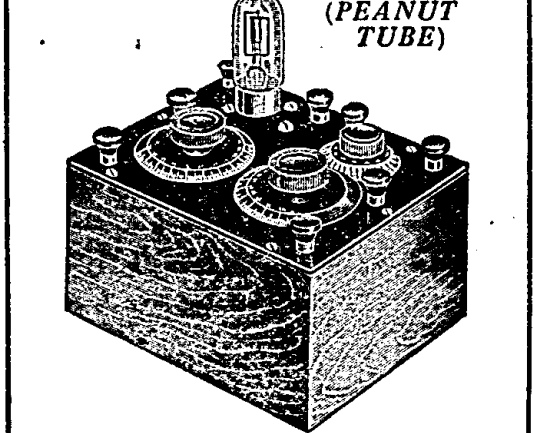
**Chapter thirteen**  
Chapter thirteen, which will appear in the issue of next week, will deal with Radio frequency amplification. Radio frequency amplification it will be remembered plays a very important part in long distance receiving when the incoming signals are too weak to efficiently operate the detector. It is also very important when reception with a loop aerial is attempted. Consequently everyone who wishes to obtain complete information on this important phase of Radio operation should be sure to provide himself with this next chapter.

Wherever possible, the receiving set should be inclosed in a dustproof cabinet.

## 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.

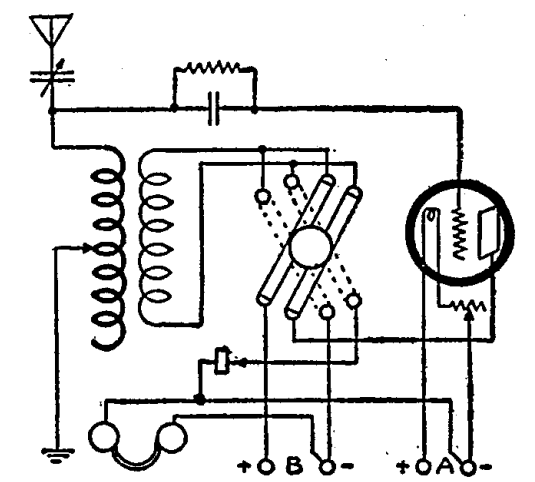
## WD-11 OUTFIT



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.  
Two-stage Amplifier Box to match the above. \$14.15  
Variocouplers, \$4.00 value..... 2.85  
Variometers, \$4.50 value..... 3.10  
Transformers, \$4.50 value..... 3.75  
Reinartz tuning coil, \$3.00 value..... 1.85  
Rheostat, \$1.00 value..... .60  
Sockets, 50c value..... .38  
1/2" switch lever, 50c value..... .30  
Baldwin type "C" phones, \$12.00 value..... 9.00  
Frost or Murdoch phones, \$5.00 value..... 4.25  
Postage extra. No personal checks received. Let us quote on your wants.  
**RADIO PARTS CO.**  
8 So. Austin Boulevard, CHICAGO, ILL.

## Circuit Using Either an Audion or Crystal

In the illustration is shown a simple hook-up in which a crystal and an audion



are used separately as desired. A series parallel switch is used for making a quick change from a crystal to an audion in the circuit.

Radio proved of great value in the flooded areas of Oregon, making possible restoration of electrical connections much earlier than they would otherwise have been made.

## Value of Short Wiring

The reason for the use of short wiring and right-angle turns in connecting a set is a simple one. Every wire carrying an electric current has a magnetic field; if two wires are placed near each other, they will absorb current, but if placed at right angles they will oppose each other, which is just what they should do. If the wires are run long they will, of course, meet with other long leads, and there will be adverse induction.

## Perfect Contact

All electric contacts should be soldered. They provide a continuous metal contact between wires, and this does away, to a large extent, with losses by resistance.

## LEARN RADIO

Here's your opportunity. Radio needs you. Win success in this fascinating field. Trained men in demand at highest salaries. Learn at home, in your spare time.  
**Be a Radio Expert**  
I will train you, quickly and easily, to design, construct, install, operate, repair, maintain, and sell all forms of Radio apparatus. My new methods are the most successful in existence. Learn to earn **\$1,800 to \$10,000 a Year**  
**FREE** Wonderful, home-construction, tube receiving set, of latest design. Write for "Radio Facts" free. Engineer Mohaupt, American Electrical Association, Dept. 243A 4513 Ravenswood Ave., Chicago

W.T.501 PEANUT TUBES, 4 V WITH ADAPTER..... **\$2.75**  
IMPROVED RADIO 6 V. DETECTOR TUBES..... **\$2.75**  
IMPROVED RADIO 6 V. AMPLIFIERS..... **\$3.35**  
*Sent on receipt of price, prepaid*  
**LUX MANUFACTURING CO.**  
1045 No. Wells St. CHICAGO, ILL.

### ADJUSTABLE COIL MOUNTINGS FOR FLEWELLING CIRCUIT

Triple Coil Mounting.....\$5.00 List  
Double Coil Mountings..... 3.50 List

A patented feature locks the coil in place and prevents the coil from being thrown out of adjustment once station is tuned in.  
Dealers write for special discounts  
Licensed under U. S. De Forest Pat. 1365170  
**ASTORLOID MFG. CO., Inc.** 416 Marcy Ave. Brooklyn, N. Y.

### Chi-Rad handbook for this Ad and 10c

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

### INCREASE YOUR RANGE

BY ADDING A PERFECTLY CONSTRUCTED VARIABLE CONDENSER TO YOUR SET

11 PLATE.....\$1.25  
23 PLATE..... 1.40  
43 PLATE..... 1.75  
Mail Orders Filled Same Day  
Postage Extra No Personal Checks Accepted  
**B. K. Ford & Co.** 4343 West Fifth Avenue CHICAGO, ILL.

### WHAT DO YOU SET YOUR RADIO ON?

IS IT CONVENIENT, CONFINED AND ATTRACTIVE?  
IF NOT ORDER TODAY A

## ROBBINS RADIO DESK

IN OAK OR MAHOGANY FINISH \$22.50

THE IDEAL PROVISION COMBINING YOUR RADIO OUTFIT WITH ATTRACTIVE FURNITURE. YOU WILL BE PROUD OF YOUR SET ON A ROBBINS RADIO DESK WITH ALL WIRES, BATTERIES AND OTHER DISPLEASING PARTS HIDDEN FROM VIEW.

For sale by reputable radio and furniture dealers or write  
**ROBBINS WOODWORKING CO., LIBERTYVILLE, ILL.**

# Latest Reflex Is An "Inverse Duplex"

## David Grimes Invents Radical Reflex Design

A NEW type of reflex circuit that has aroused considerable interest is the "Inverse Duplex" shown in the hook-up diagram. It is the invention of David Grimes of Staten Island. The peculiarity of design in this circuit is in the inverted reflex action.

In the popular form of reflex circuit, after the detector stage the audio frequen-

### PARTS NEEDED

- 2 Radio Frequency Transformers.
- 2 Audio Frequency Transformers.
- 2 Amplifier Tubes.
- 1 Detector Tube.
- 3 Tube Sockets.
- 1 Vernier Rheostat.
- 1 Power Rheostat (2 Tubes).
- 4 .001 Mfd. Mica Fixed Condensers.
- 1 .0025 Mfd. Mica Fixed Condenser.
- 1 400-Ohm Potentiometer.
- 1 .0005 Mfd. Vernier Variable Condenser.
- Panel (10 by 18 by 1/4 suggested).
- 8 Binding Posts.

cy amplification follows in consecutive order starting from the first or second tube. The phones are connected in the plate circuit of the second or third tube depending on whether there are one or two stages of audio frequency amplification. In the inverse duplex circuit the reflex is first carried to the second tube, then from the plate circuit of this tube it runs through an audio frequency transformer and is coupled to the first tube. The phones are connected in the plate circuit of the first tube.

### Loaded Distribution More Even

This method distributes the load more evenly between the two tubes under double duty. The second tube is carrying the amplified energy of the first tube in the Radio frequency stages. In the normal reflex, this second tube would again carry the amplified energy of the first tube for the audio frequency stages. However, in the inverse duplex, this second part is reversed, so that the first tube carries the amplified energy of the second tube for the audio frequency stages. In this way the second tube furnishes the most plate energy for the Radio frequency, while the first tube gives the most for audio frequency. This more uniform distribution of the load has resulted in an increased efficiency in the tube action and circuit operation.

### By-Pass Condenser Locations

Another variation of this new circuit is the location of the by-pass condensers. Instead of being placed across the primary and secondary transformer windings they are connected directly in the grid to filament and plate to filament leads.

A potentiometer of 400 ohms resistance is used as a resistance unit for connecting in the secondary of the second audio frequency transformer to the grid circuit of the first tube. In this way the Radio energy is controlled by the resistance in series.

It will be noticed that the grid circuits of all tubes are connected to the negative filaments.

### Apparatus Required

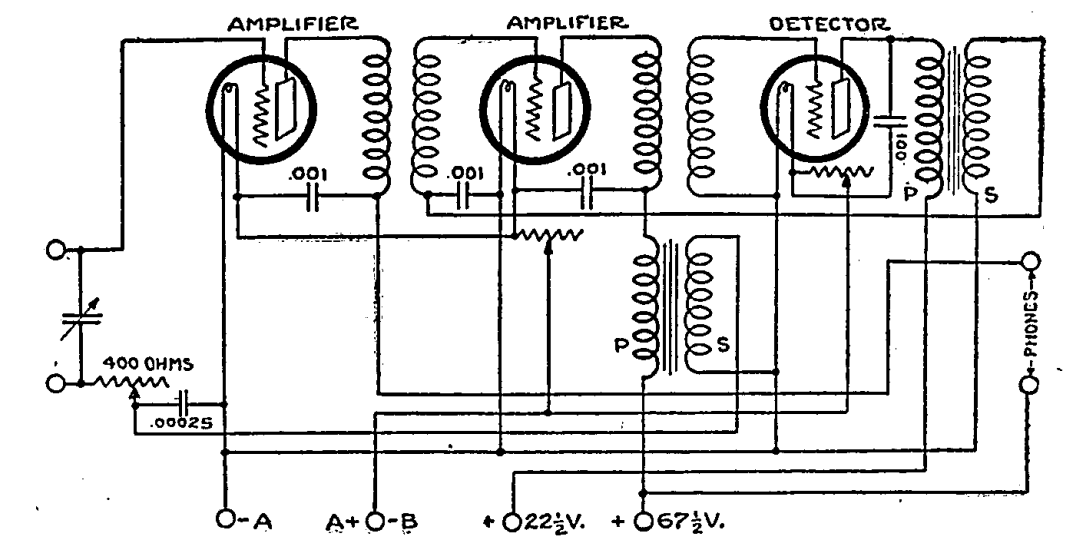
If possible all transformers used should be of the shielded type. The writer has had varied experiences with Radio frequency transformers in reflex circuits. Many of the standard types will not operate satisfactorily at all, while others are only mediocre in results. No doubt special transformers for reflex circuits will soon be on the market.

The quality of the tubes used in reflex circuits is more than an important item. Condensers should all be of the mica

## 1000-1500 MILES ON ONE-TUBE-ONE-CONTROL

150-25,000 METERS  
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. No checks. Nothing left for you to guess about. Build your own Receiver and save 50% or more and get better results. Radio Experimental Lab'y, Box 194F, Berkeley, Cal.

## GRIMES INVERTED REFLEX SET



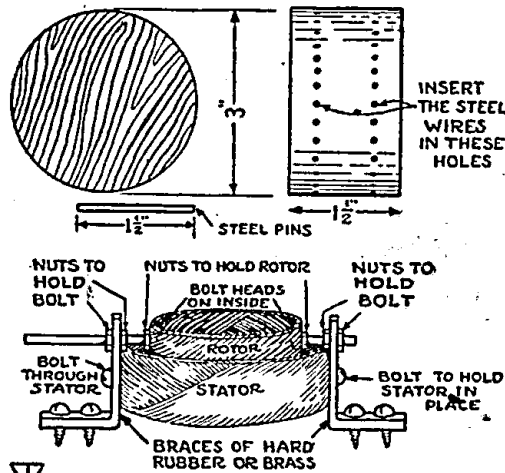
dielectric type. Paper condensers cannot be substituted with any prospects of satisfactory performance.

Only two terminals of the potentiometer are used inasmuch as the connections are made similar to a rheostat.

The battery connections are indicated clearly in the diagram.

### Honeycomb Variometer

A honeycomb variometer combines both the compact and low capacity features of the honeycomb coil with the added variable inductance feature of the variometer. First, to prepare for the making of the coil, procure a round wooden block at least



three inches in diameter and 1 1/2 inches across the end. See that it is perfectly round and then punch 25 holes evenly



### Carter "TU-WAY" Radio Plug

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

### 25 OHM RHEOSTATS

For 201A and 301A Tubes.....\$1.10  
Power Rheostats for Two or More Tubes ..... 1.50

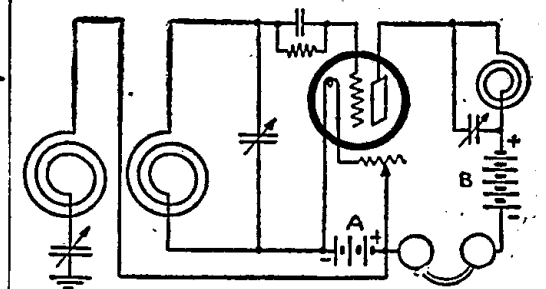
DEALERS: ATTRACTIVE DISCOUNTS

## HUDSON-ROSS

123 W. Madison St. Chicago

## Phantom Circuit Uses Three Spider Web Coils

Upon experimenting with the set using no aerial described in Radio Digest, issue of December 16, 1922, I found a much better circuit, the drawing of which is



shown herewith. For tuning I use three spider web coils, each having 30 turns. Three variable condensers of .001 mfd. capacity are required.—Kenneth Steele, Northumberland, Pa.

exactly like the first, but with only 55 turns. The five turns less on the stator about evens up the amount of wire on each coil. Shellac the second coil very thoroughly and when dry take out the pins and remove the string between the two coils. They will have a perfectly even and close space between them. The coils are mounted on two pieces of brass with brass bolts as shown in the illustration.—Edwin Rust, Phoebus, Va.

Farmers of Michigan and neighboring States are to receive broadcast advice on how to improve their live stock.

PROLONGS LIFE OF TUBES

## AMPERITE

FILAMENT CURRENT ADJUSTER  
ELIMINATES RHEOSTATS

EXPELS ALL TUBE TROUBLES

FROM YOUR DEALER OR  
RADIALL COMPANY  
89 WARRER STREET NEW YORK \$1.10

### Foote's Hand-made Triple-Test Crystal

"Puts its Best Foot Foremost"

Its supersensitive side is up and has loudly received broadcasting. Guaranteed QSA (your signals are strong). Look for the "T" on the back.

Distributors and Travelers Wanted. Liberal Commissions. Large Sales. Quantity Production. Wire Territory Desired.

FOOTE MINERAL CO., Inc. Manufacturers and Wholesalers  
107 North 19th Street, Philadelphia, Pa.  
Established 1876

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

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

### The Best Phone for DX Work

## N AND K-6000 OHM RADIO HEAD SET

Made by Neufeldt & Kuhnke, Germany  
Regular \$14.50 List Price  
By Mail \$8.50 Postpaid

A Large Purchase Makes This Offer Possible

### ALBERT KREH

208 BROAD STREET, ELIZABETH, N. J.  
Money refunded if not satisfactory in 5 days

## Cotogrip

"Built First to Last"

This little beauty was approved by our engineers only when convinced that they had produced the one socket that combines all the essential features of a good socket.

1. Positive Cotogrip Contacts.
2. Hard Rubber Insulation.
3. Rugged Construction.
4. Compact Design.
5. Concealed Mounting.

It is impossible to show the unique mechanical action of Cotogrip contacts in a photograph. It is different from any other socket you have ever seen. This socket will interest you in every way.

You ought to have one.  
Ask Your Dealer

## COTO-COIL CO. PROVIDENCE

## Delicate Soldering

### THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current  
(Large and Small!)

\$6 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



# How to Construct a Flewelling Super Set

## The Third Prize Winner in the \$100 Flewelling Set Contest

By A. J. Barclay, C. E.

*(Editor's Note.—The following article is the third prize manuscript submitted in the \$100.00 Flewelling Set Contest conducted by Radio Digest. The second prize set description will appear next week. The first prize paper will be published in the following issue, that of April 7.)*

WHEN the Flewelling Circuit first made its bow to the Radio public in Radio Digest, last October, it created perhaps no more interest than any of the other new hook-ups which are announced daily in newspapers and Radio journals. But the astonishing results produced by it soon gave evidence that this circuit contained elements which bid fair to make it one of the epochal discoveries of modern Radio science.

Upon hearing of the results obtained by others, the writer decided to try some experiments of his own, the results of which have been so astonishingly and unusually successful that the present article was written in hope of assisting others to obtain equally gratifying results.

The hook-up employed in his set is shown in Figure 1, and is practically the same as the diagram shown in the January 20 issue of Radio Digest. This diagram embodies certain suggestions of the writer, as further outlined herein.

### List of Parts Employed

The parts used in making the set are as follows:

- A. 1 Panel, 6x8x $\frac{1}{8}$  inches, Bakelite.
- B. 1 Panel, 2x4 $\frac{1}{2}$ x $\frac{1}{8}$  inches, Bakelite, for condenser bank.
- C. 1 Mounting board, White Pine, 6x8x $\frac{1}{2}$  inches.
- D. 1 "Asterloid" 3-Coil Honeycomb mount.
- E. 1 23-plate Walnut Variable Vernier Condenser.
- F. 1 Howard Vernier Rheostat.
- G. 1 Federal Double-Circuit Jack.
- H. 3 Giblin-Remler Honeycomb Coils, L-50, L-75 and L-100.
- I. 1 Freshman Variable Grid Leak and Condenser.

photographs and text, to avoid possible confusion.

### Panels and Mounting Board

The panel A should be laid out and drilled as shown in Figure 2. Holes shown by double circles should be countersunk, all others being straight holes. Sizes of

mounting board C, by being screwed against a small block of wood milled to the mounting board.

The mounting board C, which holds all apparatus not fastened to panels, should be boiled in paraffine or heavily varnished to prevent warping. It is fastened at right

away from the fixed condensers. It is apt to spoil them. Use screws or clips for these connections.

### Body Capacity Aids

The knob of the writer's variable grid leak was slotted with a hacksaw, and the adjustments made with a long screw driver. This eliminates body capacity, which otherwise is very bad. This leak is the source of most of the trouble found in using the set, as it is very critical, and must be set just exactly right. The setting will vary with changes in the rheostat setting, and a readily changeable leak of fine graduation is essential.

Connect the stator plates of variable condenser E to the aerial circuit. This will eliminate body capacity effects, which otherwise cause serious annoyance. A vernier condenser at this place is essential, as close enough tuning can hardly be obtained by dial alone. The writer used in addition a Walnut vernier knob, and found the added convenience well worth the outlay.

### How to Operate Set

In operating the set, the following suggestions will be found useful:

Place the coils close together, using middle and one outside plug. Light the filament to proper intensity, and turn condenser knob until the screeching, if any, disappears. Then adjust the variable grid leak until the oscillatory whistle almost, but not quite, disappears.

Then revolve the condenser knob slowly, and listen. First there will be silence, except for the whistle. Further turning may

(Continued on page 15)

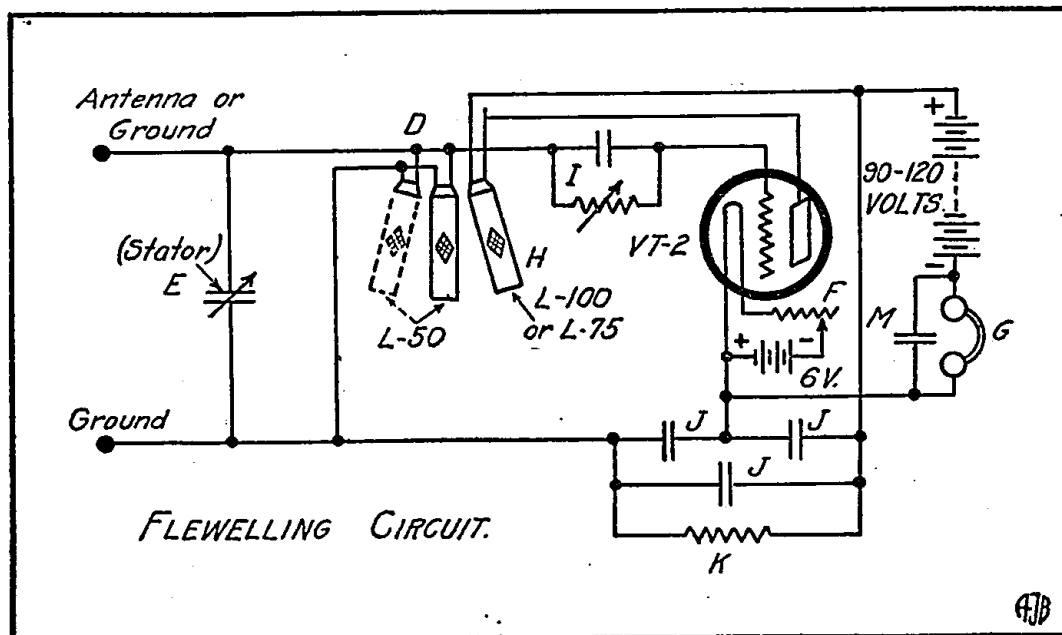


Figure 1

drills have not been specified, and must of course conform to the particular requirements of the apparatus used.

When the panel is drilled, and ready, it should be given a coat of shellac on the back side, and when this has dried to a sticky consistency, the sheet of tinfoil should be laid on it, and carefully rubbed into close contact. The panel holes can then be opened up with a pencil. Remove the foil for a short distance around the holes for condenser shaft, jack and anten-

angles to panel A by means of screws through the three lower holes.

### Coils Used; Assembly Suggestions

The writer used for honeycomb coils (H) an L-50 in the primary circuit and an L-75 or L-100 in the secondary. The larger coil in the secondary gave the best results, but it is suggested that some experimenting be done, as set characteristics will differ.

The photographs show more clearly than any description, the relative locations of the parts. However, a few comments on the assembly may be of value.

Use No. 14 tinned wire for connections. In general all joints should be soldered. Great care should be taken to keep heat

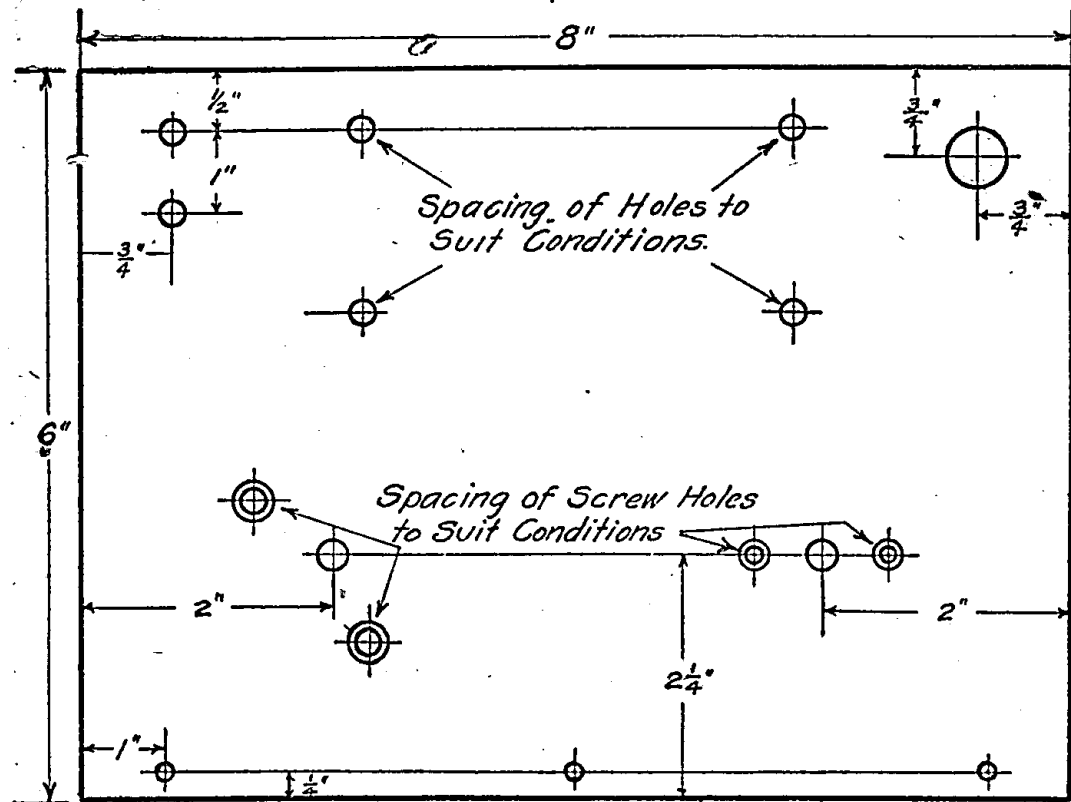


Figure 2

- J. 3 Kellogg Tubular Condensers, .005 MF., with clips.
- K. 1 Kellogg Tubular Grid Leak, 0.4 Meg., with clips.
- L. 1 Kellogg V.T. Socket.
- M. 1 Micadon phone condenser, .001 MF.
- N. 1 V.T.-2, or Western Electric "E" tube.
- O. 1 Sheet tin foil, 6x8 inches.
- P. 1 Walnut Vernier Knob (optional).
- Q. 6 Binding Posts.
- R. Miscellaneous brass nuts, bolts, No. 14 tinned copper wire, etc.

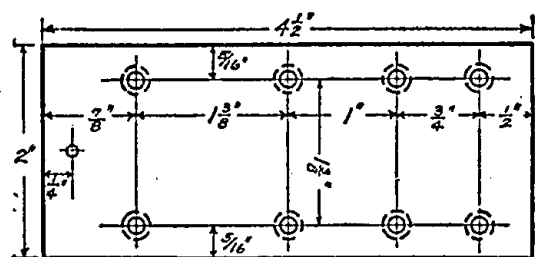


Figure 3

It will be noted that this list contains exact descriptions of each article used. This by no means signifies that this particular make is the best to use. There are on the market many articles that will serve the particular purpose just as well, and maybe even better.

The letters designating the parts above have been uniformly used in drawings,

na post, and be sure to insulate all circuits (except ground) from this shielding. Separate the variable condenser from the shield by sheet mica, or similar insulation.

Lay out and drill panel B as shown in Figure 3, this being a compact and convenient arrangement. All holes are countersunk on the back side. This panel is conveniently mounted upright on the

### GOV'T 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.

### PEANUT TUBES

Wonderful det. and amplifier, smallest tube made; aero-plane style, 1 Volt 1/4 Amp. 1/2" dia. x 2 1/2" long. Just a few at \$9.50. Act quick if you want a real pocket set tube. FULLY GUARANTEED.

### FLEWELLING .005 CONDENSERS & PARTS

.005 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. Spec. Flew. Audio Trans., \$3.45. Spider coils, easier tuned, clearer signals; green silk on Bakelite, \$1.75 each.

### REINARTZ LATEST COILS AND PARTS

Double green silk wire on polished Bakelite spider, \$1.95; Reinartz plate circuit chokes (triple adjustable), \$1.70. Special Reinartz Audio Transformer with diagram, \$3.35. Complete set Reinartz tuner and detector parts, \$10.65. Tuner Det. and 2 stage parts, \$17.95. 2 stage outfit, \$8.35.

### III-Power Loud Speaker with pair latest Baldwin Phones, \$10.90.

### REFLEX CIRCUIT TRANSFORMERS

Special Reflex Trans. and Diag. that really works, \$3.65. 20 OHM RHEO. FOR 201-A or W. D.-11 tubes, \$1.60. 8 ohm for new DeForest tubes, \$1.55. Include postage with order. Write for complete list. QUALITY RADIO SHOP, RICHMOND, IND.

**MESTRO Vernier Adjuster**  
Finest adjustment for all dials. Nickered with screws. Postpaid 50c. Dealers Wanted.

MESTRO RADIO PRODUCTS COMPANY  
514 West Fifth Street  
Iowa Davenport

*This is the Switch*  
that does the trick.  
Turn it till you hear it click

**Four Way Switch Plug**

ASK TO SEE IT

MANUFACTURED BY  
THE FOUR WAY COMPANY  
Springfield, Mass. U.S.A.

PRICE \$1.50 PRICE \$1.50

# 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.

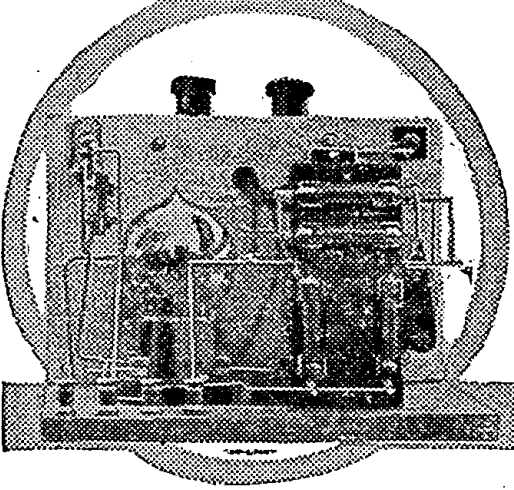
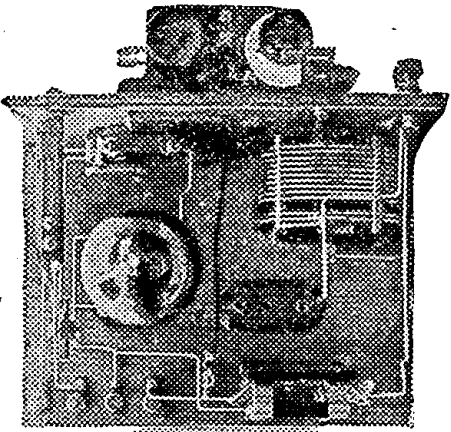
Book Department  
**Radio Digest**  
123 W. Madison Street, Chicago, Ill.

*Only 50¢*

**FLEWELLING SET**

(Continued from page 14)

produce a gradually increasing roaring sound. Continue turning until a "twittering" sound is heard, caused by heterodyne effects within the set. When this point is reached, stop, and continue the adjustment



cleared and intensified by careful adjustments of coils and condenser.

By connecting the center (fixed) and free movable coil in parallel, it is possible to have the primary coil fixed or removable at will. With a movable primary, much looser coupling is obtainable, resulting under certain circumstances in more flexible tuning.

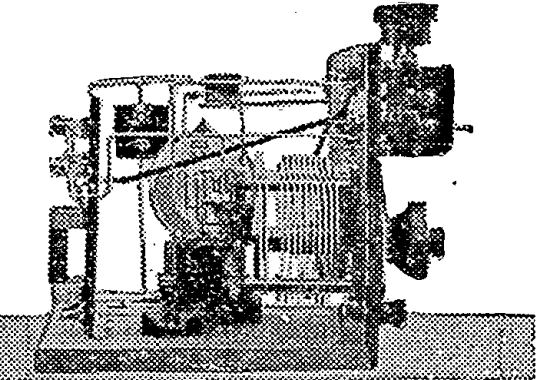
A very small amount of practice will make it very easy to tune in any desired station. The tuning, however, should be done systematically, and an effort made to learn what each sound means, how it is caused, and how to get rid of it if objectionable.

**Results Attained**

Using a set made and operated as just described, the writer has heard clearly the following stations, at his home in Chicago:

Without aerial or ground of any kind; WGM, Atlanta, Ga.; WGY, Schenectady, N. Y.; WHB, Kansas City, Mo.; KDKA, Pittsburgh, Pa.; WDAF, Kansas City, Mo.

With aerial made of 10 feet of lamp cord, and a water pipe ground; WHB, Kansas City, Mo.; WWJ, Detroit, Mich.; WGM, Atlanta, Ga.; WBZ, Springfield, Mass.;



slowly with the vernier plates. As the vernier is turned, the heterodyne effect will sound like a siren, rising to a shrill squeal, then sinking again into silence. These silent points are the ones to watch, as any reception will be effected with the vernier in one of these positions.

**Tuning Refinements**

Should a careful trial of the entire "twittering" portion of the dial bring no result, separate the honeycomb coils about 1/8 inch, and repeat the condenser adjustment. If still no result, separate the coils to 1/4 inch, and try again. And so on. When voice or C.W. is heard, it may be

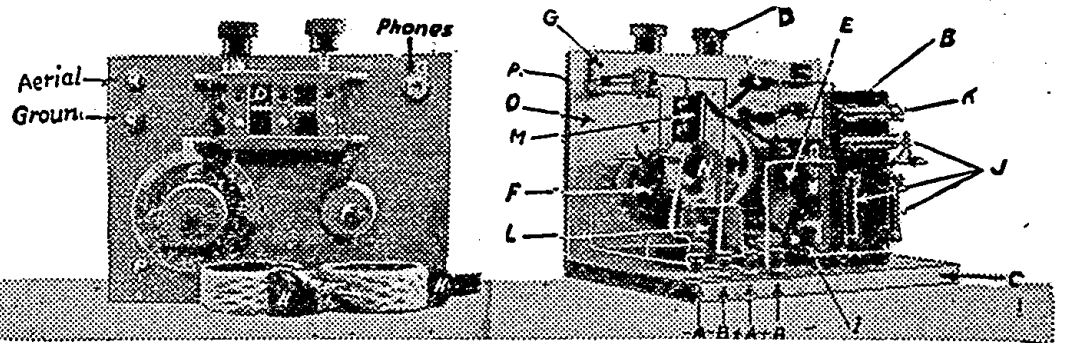
WHAZ, Troy, N. Y.; KSD, St. Louis, Mo.; WDAF, Kansas City, Mo.; WSB, Atlanta, Ga.; WGY, Schenectady, N. Y.

With a 10-foot lamp cord aerial only, no ground; all stations above; WDAJ, College Park, Ga.; WOC, Davenport, Ia.

With ground only; WGM, Atlanta, Ga.; WGY, Schenectady, N. Y.; WDAF, Kansas City, Mo.; KDKA, Pittsburgh, Pa.; WWJ, Detroit, Mich.

**Ground Best on Ground Post**

Although instructions generally say that when the ground only is used, to put it on the antenna post, the writer got his results with the ground wire attached to



the ground post as usual. In this position it really seems to drain off static, and thus to give clearer reception.

The question of a cabinet is left to the desires and ingenuity of the reader.

No amplification of this circuit has been attempted as yet. But certain faint voices, and other indications give rise to the belief that with further elaboration, even greater distances may be covered. Experiments with this circuit seem as yet to have only scratched the surface of its possibilities.

**WGI "BLIND" RESEARCH**

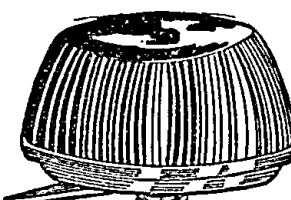
(Continued from page 7)

phraseology used and the power of description are the means by which the

"human programme" places the Radio listener in a receptive attitude and does away with a great deal of explanatory remarks during the progress of the play.

**Victrola Plays Overture**

A third point of interest which is meeting with the approval of Radio listeners is the overture and entr'actes. The victrola has proven to be the best so far. A great deal of careful study is being made as to the kind of music to present. There is a decided difference between a theatre audience and a Radio audience. The familiarity of home surroundings makes it imperative to choose music which will hold the attention. Another factor in this problem is the greater cosmopolitanism of the Radio audience over that of the theatre.



## C R L

### VAR. GRID LEAK

$\frac{1}{4}$  to 10 megohms

*The Last Word in Grid Leaks:*

|         |                   |        |
|---------|-------------------|--------|
| No. 106 | Without Condenser | \$1.50 |
| No. 107 | With Condenser    | \$1.85 |

EVERY ONE GUARANTEED TO GIVE  $\frac{1}{4}$  TO 10 MEGOHMS

**KLENTZ RADIO COMPANY**

EXCLUSIVE DISTRIBUTOR  
508 S. Dearborn Street, CHICAGO, ILL.

MANUFACTURERS, JOBBERS and DEALERS  
Reserve Your Booth at the *PACIFIC COAST*

# Radio & Electrical Exposition

April 3 to 8, inclusive, at the Civic Auditorium  
in San Francisco

Endorsed by the Pacific Coast Radio Trade Association, the San Francisco Electrical Development League, the California State Association of Electrical Contractors and Dealers, and the Electrical Contractors and Dealers of San Francisco.

**144 — BOOTHS — 144**

Standard booth construction, 10 by 10 feet, consisting of solid rear wall, 8 feet high; railing height sides and front, together with your company sign. All ready for occupancy. Price range, for entire exposition period, \$65 to \$225, according to location.

*Contract For Space NOW!*

For details or allotment of space, write or wire

**RADIO AND ELECTRICAL EXPOSITION, 687 Mission St., San Francisco**

J. C. JOHNSON, Manager

*Under the auspices of the American Radio Exposition Co., Inc., New York*



### About Radio Parts

#### Head Receivers

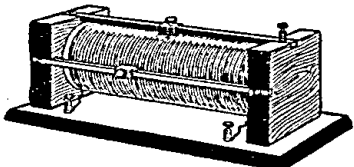
In order to change the electrical or Radio waves into sound waves which are audible to the ear, receivers are employed. These receivers employ the same principles as used in the telephone. A small electro-magnet, operated by the fluctuating electrical currents, causes a diaphragm to vibrate and produce sound waves similar to those received at the



broadcasting station. The cords terminate in two tips; in the illustration above a phone slug has been connected to the tips, but this is only used in conjunction with a set equipped with telephone jacks.

#### Double-Slide Tuning Coil

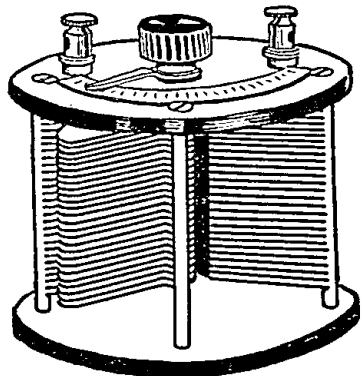
In a single slide tuning coil, only one slider is used for tuning. When a tuning coil is connected in series in the antenna and ground circuit, the antenna and the lead in already provide a certain natural wave length and the tuning coil is used to add the remainder necessary for agreement with that of the broadcast-



ing station. This is in itself then a complete circuit. In addition the current has a circuit passing through the detector not the antenna and lead-in wires in and receivers. This circuit, since it has series, should have a few more turns than the antenna circuit in order to get the best results. A two-slide tuner, then, provides means for tuning this second circuit to closer agreement by adding a few more turns to it.

#### Variable Condenser

Another method of tuning that is often used is by means of a variable condenser. It is sometimes used alone in place of the tuning coil or in conjunction with a tuning coil when it permits much more accurate and closer adjustment. Contrary to the impression of many new fans it does not increase the volume of the

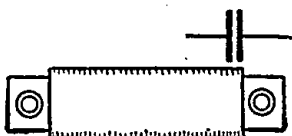


crystal set, except to the extent that more accurate tuning will give better reception. When connected in series it enables the operator to reduce the natural wave length of the set, but does not build up the wave length. It is sometimes provided with one or two rotating plates that are controlled separately from the others. This adjustment permits finer control and is called a "vernier."

#### Fixed Condensers

Fixed condensers as shown are usually built up of copper or tinfoil sheets wrapped in wax paper and are used as phone or grid condensers. Where connected across the receivers, a capacity of .001 or .002 microfarad is most often used and serves as a by-pass for unrectified currents to pass through the phones. With tube sets these condensers are used for grid control and have a capacity of .00025 to .0005 microfarad. Leads should

to the sheets which in turn heat the waxed never be soldered to the terminals of this type of condenser as the heat is conducted



cause short circuits, rendering the con-paper dielectric, soften the wax and denser valueless.

### Book Reviews

**Radio Simplified.** By Kendall and Koehler. New developments of Radio described in non-technical terms. The latest and most efficient hook-ups. Tells about vacuum tune, loose couplers, variocouplers, variometers and everything necessary for those who aim to get the best results in building or operating a Radio outfit. Price \$1.00.

**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. Heslar. 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.

**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.

**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.

**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.

**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.

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

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

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know 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 123 W. Madison St., Chicago, Ill.

### Wireless Operators Wanted

Investigate the opportunities offered thru taking either our residence or home study course of Radio instruction, conducted by the Radio Corporation of America. No new operators accepted by the eastern division of that corporation other than our graduates. Write for complete information.

**Radio Institute of America**  
(Formerly Marconi Institute)  
328-A Broadway, NEW YORK

## FREE Catalogue

Make D X Records  
With D X Supplies

This Catalogue should be called "Recipes for Long Distance." It was written to help amateurs pull in the most distant stations.

To Get Your Copy  
Write Department P. O.

**D-X-Radio Co.**  
123 Liberty Street New York City

# WILLARD

WILLARD RADIO COMPANY  
Dept. R. D., 291 Broadway, New York City  
"The Best for Less"

### REINARTZ CIRCUIT

EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 16 switch points and nuts, 4 switch stops and nuts, 8 binding posts, 2 3" dials, 1 variable grid leak, 1 .002 MFD phone condenser, 23 feet bus bar wire, 1 high-grade RADION panel and diagram and complete instructions ..... **\$10.00**

### FLEWELLING CIRCUIT

EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .0005 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 of Circuit..... **\$11.00**

### TWO STAGE AUDIO FREQUENCY AMPLIFIER

EVERY PART COMPLETE

1 7x9 Panel, 2 Audio Frequency Transformers (5 to 1 Ratio), 2 Rheostats, 2 V. T. Sockets, 3 Jacks (Double Circuit), 7 Binding Posts, 1 Variable Resistance Leak, Necessary Bus Bar Wire. Can be used with either of the above circuits or any other receiver..... **\$11.00**

### TUNING AND DETECTOR UNIT

and 2 stages of audio-frequency amplification

List Price **\$35.00** for each unit

Built in Mahogany finished cabinets measuring 7x7x14 inches for Tuner and Detector Unit and 7x7x8 inches for Amplifying Unit. Affords an unusually high range of program selectivity and local stations can easily be tuned out to secure distant ones. Guaranteed to give excellent results, only the very best material being used in its construction.

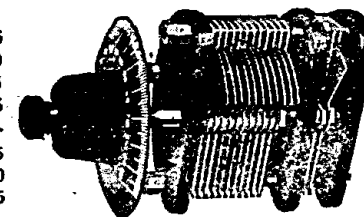
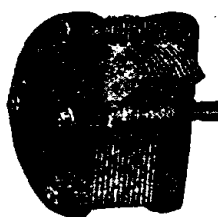
Special Price .. **\$21.75** per unit

Combination ... **\$40.00**

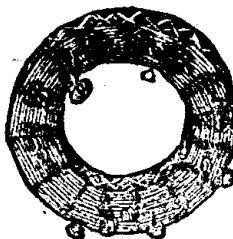
#### CONDENSERS

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.... 1.85

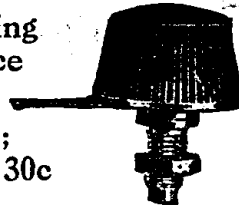
13 Plate VERNIER; value, \$5.50.. 3.75  
23 Plate VERNIER; value, \$6.00.. 4.00  
43 Plate VERNIER; value, \$6.50.. 4.25



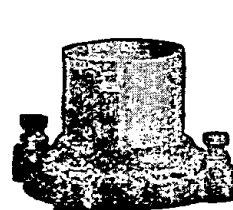
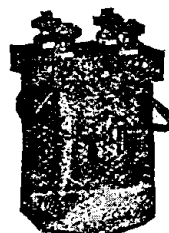
Reinartz  
Coils  
Including  
Mounting  
Value, \$2.50  
**\$1.75**



Ball Bearing  
Inductance  
Switch  
Value, 75c;  
Special at 30c



AUDIO  
FREQUENCY  
TRANSFORMER  
Designed for use with  
W. D. 11 Tubes,  
List, \$4.50;  
Price, \$2.75



V. T.  
SOCKETS  
Nickel  
brass sleeve,  
composition  
base; value,  
\$1.00; special  
at 50c

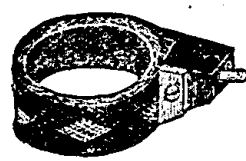
### ALUMINUM LOUD SPEAKING HORN

Nickel plated, highly polished; \$8.00 list.....\$3.75

### EXTRA SPECIAL

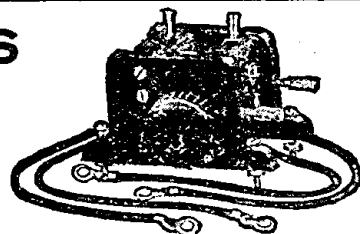
Telephone 3000 Ohms  
Headsets; \$9.00 value; reduced to .....\$3.50

### HONEYCOMB COILS



50 turns mounted  
95c

75 turns mounted  
**\$1.00**



THREE-INCH DIALS—Unbreakable—heat resisting composition—high finish; special...\$0.30

TWO-INCH DIALS—Same design—for rheostats and potentiometer; special..... .25

RAYMOND VERNIER RHEOSTATS—Value, \$1.50; special ..... .95

FILAMENT RHEOSTAT—Condensite base; value, \$1.10; special at..... .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

BEST QUALITY JACKS, Single Circuit; value, 65c; special at..... .30

Double Circuit; value, 90c; special at..... .45

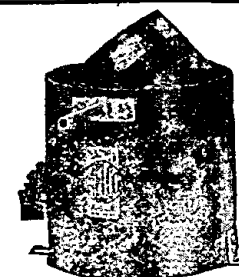
Induction Coils, equipped with standard mountings, 50 turns, 95c; 75 turns..... 1.00

MULTIPLE POINT INDUCTANCE SWITCH with Knob and Dial (15 switch points).... 1.75

LIGHTNING ARRESTERS approved by underwriters .....\$0.90

#### Variocoupler

Celeron condensite and Litz Wire Wound Secondary; value, \$4.50; Special, **\$2.95**



Double Coil Mountings.....\$2.45  
Triple Coil Mountings..... 3.35

TELEPHONE PLUGS ..... .60  
FRESHMAN VARIABLE RESISTANCE LEAK and MICON CONDENSER Combined '75

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of \$5.00 or over east of the Mississippi River. All others include postage.

# Construction of the Ultra Reinartz Receiver

## Part I—The Circuit and How to Make Tuning Unit

By H. J. Marx

THERE is a never-ending demand for new circuits, each one a little better than the preceding, and thus, each one making another step of progress in the science of Radiophony. There are but three or four types of circuits that have promised sufficient possibility of further development and thus furnished sufficient incentive for experimentation.

The Ultra Reinartz circuit then is not a new departure, but rather a development

of the old familiar form of Reinartz, with some of the many improvements that have been made from time to time. The circuit is given herein. In the series of articles complete details will be given for the construction of the set with

of the grid condensers, connected in parallel with one another, one of which is fixed and the other, variable. This method of connection permits a variable control of high capacity values without expensive large capacity variable condensers.

Another departure from the usual form of circuit is the additional condensers in the grid circuit of the amplifying stages.

### The Tuning Unit

The efficiency of any circuit is centered

Another method is to use some Number 20 bare copper wire, winding the two wires together. When finished, the tube and winding are given a coat of celluloid-acetone solution or other "dope". When this is dry the bare copper wire is removed. This leaves the insulated winding fixed in position with even spaces and gives a minimum of between-turns capacity in the coil.

### Turn Numbers and Taps

The primary winding starts with twelve turns tapped every turn. Then nine turns are wound without taps. After leaving a half-inch space nine more untapped turns are wound. The end of this winding is then connected with pigtail braid to the rotor winding.

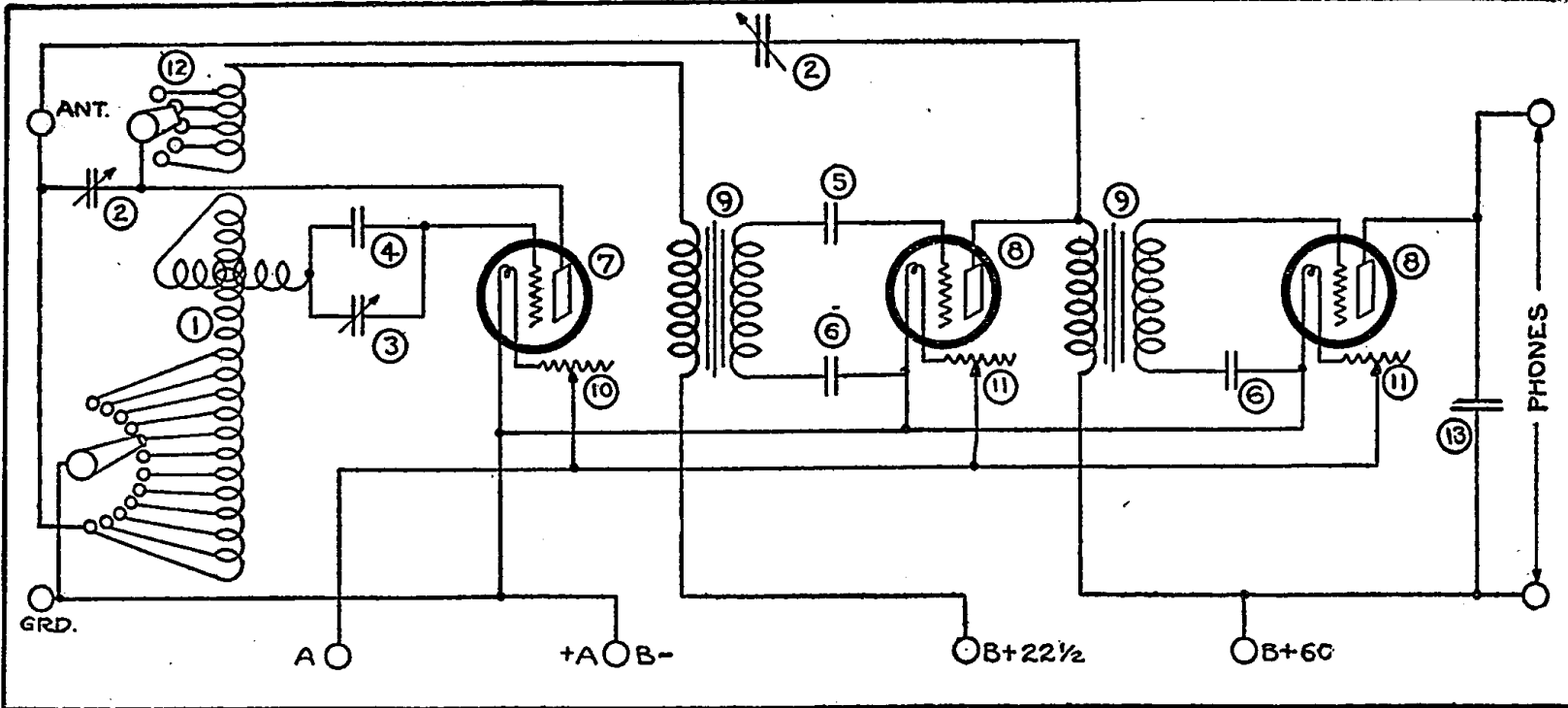
The rotor winding consists of two sets of nine turns each, wound with Number 22 D.C.C. wire not separated by spacing thread. A quarter-inch space is left between the two sets of turns. The free end is connected to a terminal on the large tube by another pigtail connection.

### Tickler Coil Winding

The feed back winding is spaced two inches from the finish of the last winding on the large tube. The first five turns are each tapped but the last five are not.

All taps should be staggered around the tube so that sufficient clearance will be had for making soldered connections to the contact points of the switches without crossing and touching of the leads.

Details for mounting the tuning unit on the panel will be given in the next issue.



of the old familiar form of Reinartz, with some of the many improvements that have been made from time to time.

The circuit is given herein. In the series of articles complete details will be given for the construction of the set with

eight binding posts, three tube sockets, one panel 10 by 22 by 3/4 inches, two switch levers and seventeen contact points.

The primary circuit as in the old form of Reinartz is controlled by a tap switch

to a great extent in the tuning unit. It is important that the dimensions and instructions be followed carefully if results are to be obtained.

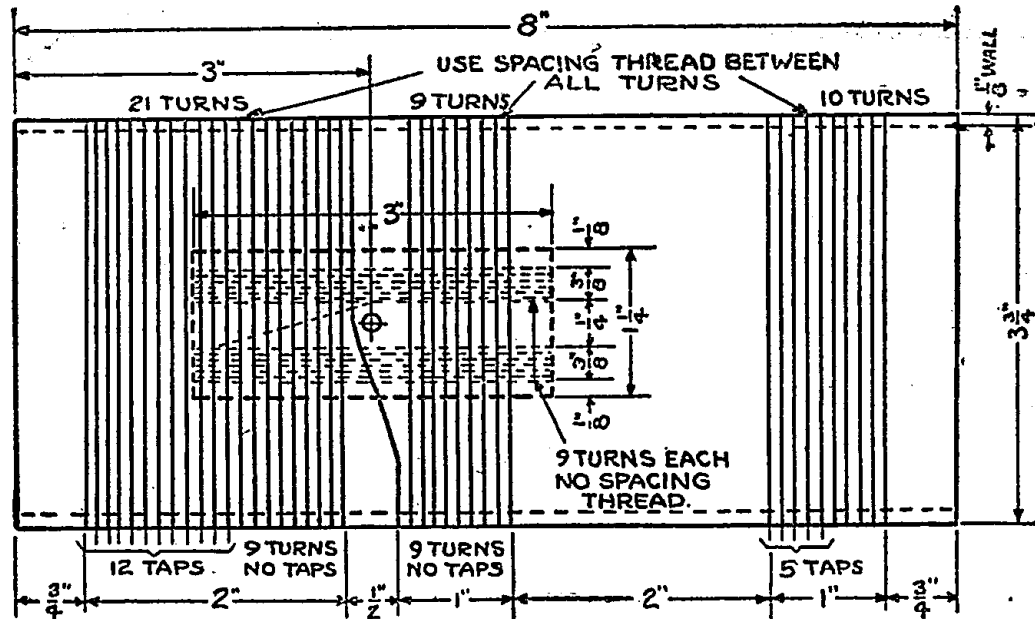
Fiber, bakelite or even cardboard tube can be used. The wire used in winding the tuning unit is Number 18 double cotton covered. In winding a spacing cord—any light weight string or heavy thread will do—is kept between the turns of wire.

## REINARTZ

ALL PARTS NECESSARY  
DEALERS: ATTRACTIVE DISCOUNTS

## HUDSON-ROSS

123 W. Madison St. Chicago



two stages of audio frequency amplification. The addition of Radio frequency amplification has not been attempted as yet and therefore will not be discussed.

### The Ultra Reinartz Circuit

The apparatus required and shown in

which varies the number of turns in use. The grid circuit is controlled by the variation of the self-induction similar to the variometer in the so-called two-variometer circuit.

An unusual feature is the high capacity

## THE BULL DOG MAST SEAT

*Fills a Long Felt Want*

If you are detracting from the appearance of your home by using an unsightly mast (a 2x4 or crooked pole), install in its place the only Aerial Mast Seat on the market today. A solid and substantial base for your Mast, eliminating sagging and swaying, affording permanency and security. Greater range and more satisfactory results from your receiving set.

**ORNAMENTAL  
STRONGLY CONSTRUCTED  
QUICKLY AND EASILY INSTALLED  
GRIPS YOUR MAST LIKE A VICE**

Adjustable to any pitch of roof, either peaked or metal ridge roll type.

Seat for 1 inch Mast . . . . . \$2.00 each  
Seat for 1 1/2 inch Mast . . . . . \$2.50 each

If your dealer cannot supply you, clip coupon and mail with your remittance to

### MAST SEAT MANUFACTURING CO.

119 5th Street S. E., MINNEAPOLIS, MINNESOTA

*Jobbers and Distributors Write for Discount*

MAST SEAT MFG. COMPANY, 119 Fifth St. S. E., Minneapolis, Minnesota

Gentlemen: Enclosed is \$..... Send me Mast Seats to cover remittance.

Name.....

Address.....

City.....

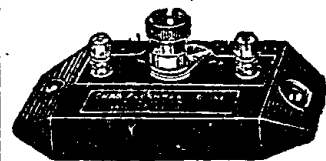
Check, Money Order or Bank Draft

## Freshman Products—Accurate and Dependable

### VARIABLE RESISTANCE LEAK

With .00025 mfd. Micon Condenser **\$1** Without Condenser **75c**  
Combined

Unbroken range—Zero to 5 Megohms—Clarifies signals, lowers filament current, increases battery life, eliminates hissing.



**"MICON"**  
Tested Mica  
CONDENSERS



| Size   | Price |
|--------|-------|
| .00025 | \$.35 |
| .0005  | .35   |
| .001   | .40   |
| .002   | .40   |
| .0025  | .50   |
| .005   | .75   |
| .006   | 1.00  |
| .01    | 1.50  |

Assure absolute noiselessness—clarity of tone—accuracy—constant fixed capacity.

### ANTENELLA

No antenna or aerial needed. Eliminates all the inconveniences in radio, operates from any light socket. Price only \$2.00.

At your dealer's—otherwise send purchase price and you will be supplied postpaid.

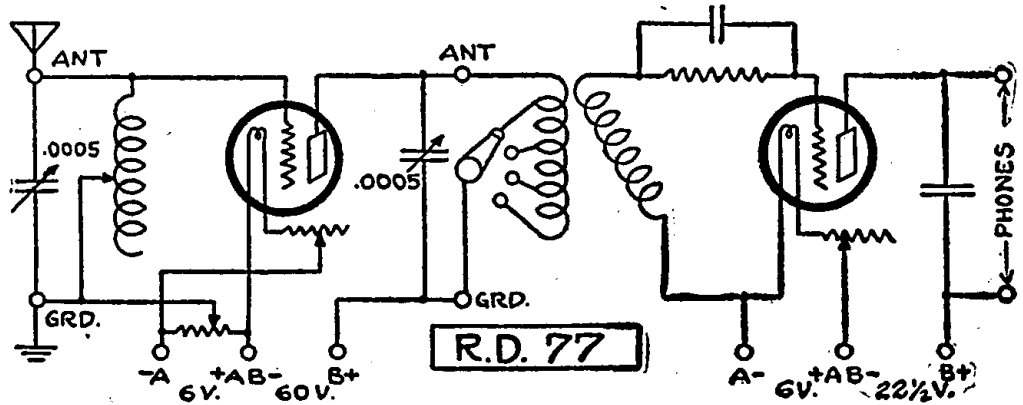
.006 Micons and Variable Resistance Leaks, especially adapted for New Flewelling Super Circuit



**CHAS. FRESHMAN CO., Inc., 106 Seventh Ave., NEW YORK**



## HOW TO ADD RADIO FREQUENCY



THE ONLY drawback in the minds of many Radiophans to the addition of Radio frequency amplification stages to their sets is the lack of definite knowledge concerning the necessary hook-ups. The hook-up diagram R.D. 77 illustrates an inexpensive method of hooking one stage of Radio frequency amplification to a standard type of receiving circuit. The standard type in this case is represented as a simple double-circuit variocoupler set. The parts required for the additional stage of Radio frequency are one single-slide tuning coil, a variable condenser of .0005 mfd. capacity, one hard tube, a socket, a filament rheostat, and one 200 to 400-ohm potentiometer.

The single-slide tuning coil should be one designed for from 200 to 400 meters in order to avoid dead end losses incurred in long wave length tuning units. The variable condenser need not have a vernier

plate inasmuch as the single-turn contact on the tuning coil slider will give sufficiently accurate adjustment.

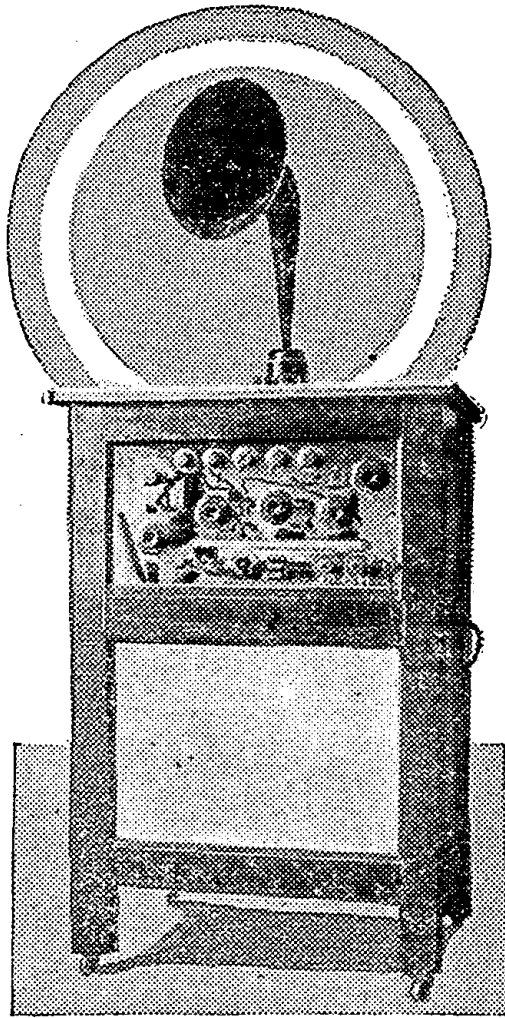
The two binding posts in the original detector set are indicated and marked as antenna and ground. The antenna post connects to the plate of the amplifier tube while the ground post is connected to the positive terminal of the 60-volt plate battery used for the plate potential on the amplifier tube. The same storage battery can be used for both tubes. The plate potential on the detector tube can be controlled by tapping the plate battery of the amplifier tube. The addition of audio frequency amplifying stages will have no effect on the Radio frequency hook-up.

This method of connecting Radio frequency amplification will be found more or less uniform and applicable to most of the receiving circuits now in use. On this account the hook-up has become popular.

### Homemade Glass Panel

Ever since I saw a set with a glass panel I have wanted one. I found by trial that a hole could be drilled in glass easily. Then I made a panel of glass as follows: The panel is 12 to 24 inches, enclosing two stages of Radio with a detector and two stages of audio.

To the fans who want the best I would say by all means don't fail to give the Radio amplification a trial on a glass panel. Anybody that can drill steel can drill glass by using a little care; all that is required is to make a drill of each size you will need out of a three-cornered file, grinding it slowly on a hand emery to prevent heat and drawing the temper. Then



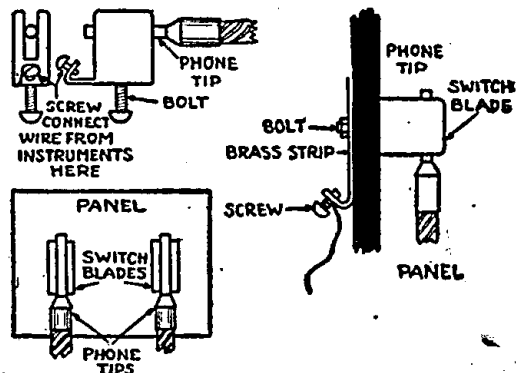
use turpentine in which gum of camphor has been dissolved for a lubricant. Lay the glass on a perfectly smooth surface and use a breast drill, drilling until the point of the drill comes through, then turn the glass over and very carefully finish the hole edge. I drilled my panel in this way, having over fifty holes, and never had a bit of trouble.

I find by using the magnavox with the four stages is much better than trying to use a horn with the receivers, as in this way I can cut back the filament on my audio tubes and eliminate much of the noise while the magnavox will amplify the music to the desired intensity. When receiving from stations in the east and California I can use the full amplifying power of all stages and bring them in loud enough to hear all over the house.—Howard N. Booth, Jackson, Miss.

Radio is being charged with the responsibility for a decrease in fiction reading during 1922.

### Connection for Phone Tips

The clips or parts used to receive the blades of an ordinary knife switch will make good connections for phone tips. These clips are removed from the switch



block and mounted on the panel. The cord tips are pushed into the space used for the switch blade.—Laurence Fensky, Menasha, Wis.

### Advice to Prospective Buyers

When buying a Radio set, ask the dealers to show the inside of the apparatus. If all connections are not soldered, the wires will become loose and reception will be impossible. Paste or acid, if spread carelessly over the wiring, or dirt inside the receiving box, will cause trouble. If fillings have been allowed to get into the telephone receiver, the attraction of the magnets will gradually cause them to make their way through the insulation and render the phones worthless. Watch out for these difficulties and avoid the disappointment that comes when a Radio enthusiast gets all set to listen in, and can't.



**World Radio Batteries**  
**SAVE YOU 50%**

WRITTEN 2YR. GUAR.

In buying WORLD the highest Quality Battery built direct from the manufacturer, you get two profits. First, you get a battery free from extravagant selling expense. Second, you save the profit charged by the middleman.

|                  |                   |
|------------------|-------------------|
| 6 Volt—40 Amps., | 6 Volt—80 Amps.,  |
| <b>\$8.50</b>    | <b>\$12.50</b>    |
| 6 Volt—60 Amps., | 6 Volt—100 Amps., |
| <b>\$10.00</b>   | <b>\$14.50</b>    |

Full Rating Guaranteed  
Out-of-town orders shipped same day as received via express, C. O. D.

**WORLD BATTERY CO.**  
58 EAST ROOSEVELT ROAD  
Phone: Wabash 8360 CHICAGO

## Keeping a Log of the Day's Work in Radio

A log, whether of the Radiophan or ship's officers, is a record of the day's run or the day's work, so to speak, with a record of all the happenings aboard ship or over the Radio and brief accounts of things encountered on the voyage (by ship or Radio). Commercial Radio operators are required to keep such a daily log, and many amateurs have adopted the habit. Whether one be a spark or merely a listening enthusiast, it is not a bad scheme to adopt, and is easily kept; as easily as one's daily office memo pad or the daily diary so affected by some conscientious souls.

The log can be an ordinary blank book without ruling, to give the owner a chance to rule off the spaces for his own log. The spaces will include the date, time, call and remarks and being from page to page can be carried over from one page to another when necessary, for the day, so that the log will give data from the time of sitting in until quitting time, which in

| DATE    | TIME  | CALL | REMARKS                    |
|---------|-------|------|----------------------------|
| 1-15-23 | 4.PM  | —    | One Watch                  |
| "       | 4.55  | 2LD  | London England on 5 Stage  |
| "       | 6.15  | WGI  | Madford-Cole Practice      |
| "       | 7.00  | —    | Several Stations           |
| "       | 7.30  | KDKA | Children's Program         |
| "       | 7.53  | —    | High Pitched Sparks        |
| "       | 8.00  | WNAC | Shepard's Commerce Program |
| "       | 8.30  | —    | Several Local Whistles     |
| "       | 9.00  | WEAF | Signals Strong & Clear     |
| "       | 9.15  | —    | Amateurs Working           |
| "       | 9.55  | WJZ  | Time Signals               |
| "       | 10.05 | NAA  | Weather on 710 meters      |

some cases might be as late as 3 A. M. The more neatly and carefully this is kept, the more satisfaction there will be in it. Any unusual distant signals heard or stations identified should be carefully logged, and in the remarks column any data entered that will serve to check up with proof that such a station was heard. Thus fans in Vancouver getting Havana, Cuba, should always enter some portion of the program, along with the exact time, in order to prove up his claims, together with comment on the quality of the signals received.

To the regular spark this Radio log may

# ATWATER KENT

Dealers LITERATURE and DISCOUNTS ON REQUEST

## HUDSON-ROSS

123 W. Madison St. Chicago

not be such a novelty, but there are many thousands of owners of listening sets to whom such a method of keeping track of the results obtained has never occurred. Appended is a sample log, which can be modified as desired, or amplified to include more columns if deemed necessary.—F. N. Hollingsworth, Boston, Mass.

### Fixed Crystal Detector

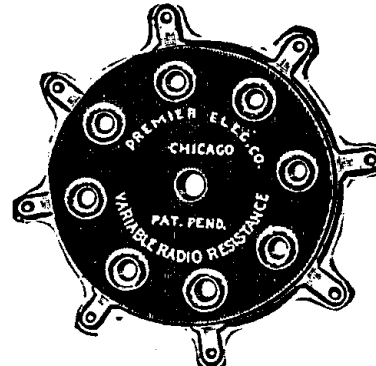
Not being content with the usual type of crystal detector for use with a reflex circuit I proceeded to construct a fixed detector. A small crystal mounted in a metal alloy was fitted in the end of a fiber tube 1/4 inch in diameter and 1/2 inch long so that the bottom of the mounted crystal was flush with the end of the tube. A strip of brass 1/2 x 1 inch was fastened to the bottom of the mounted crystal with a drop of solder. The brass was fastened to a hard wood board with a small screw and was used as one connection to the crystal.

By means of a small brush dipped in shellac the edges of the crystal were coated so as to insulate the lower connection from the upper surface of the crystal. The tube was then filled with brass filings. A wire was led from the brass filings to a binding post on the board for the other connection. Sealing wax was then used to seal the tube.—Frank Currin, Spokane, Wash.

Westinghouse Village, in Pennsylvania, boasts of 143 Radio sets in its 200 homes.

## DON'T GUESS

USE A  
**Premier "7-in-1" Variable Radio Resistance for All Tube Sets**



**PRICE 50 CENTS EACH**

Has seven carefully calibrated values of resistance of approximately 1/2 megohm each between terminals. Protecting bakelite discs assure permanency of resistance. Don't guess—it is important to have resistances properly adjusted to function with your other apparatus to get the best results from all tube sets.

**PREMIER UNIVERSAL RADIO PRODUCTS—ARE** high grade and efficient. Request bulletin covering complete line.

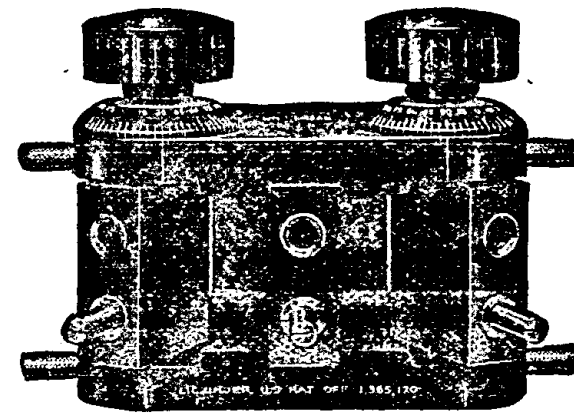
**DISTRIBUTORS:** Some territory open for live, responsible concerns.

**Premier Electric Company**

Manufacturers—Est. 1905  
(Dept. A) 3802-3810 Ravenswood Ave., Chicago, Ill.

## Crown Products For Radio Perfection

**CROWN Coil Mountings**  
especially adapted for  
**Flewelling Circuit**



Licensed under De Forest Patents

**List Price \$5.00**

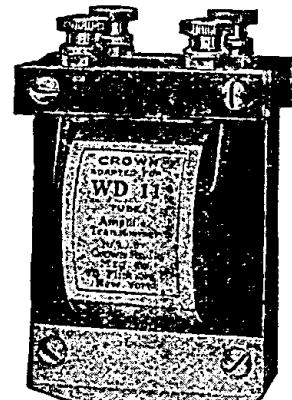
### CROWN "WD 11"

The Transformer Designed Especially for Use with "WD 11" Tubes

The reputation gained by the Crown "W D 11" with jobbers, dealers and users is evidence that there is no other transformer giving such reliable service in amplifying without distortion. The Crown "WD 11" is mechanically perfect, ruggedly constructed and priced right. It is a transformer all jobbers and dealers can back to the limit.

We also manufacture

|                                    |        |
|------------------------------------|--------|
| 23 PLATE VERNIER CONDENSER.....    | \$5.50 |
| 43 PLATE VERNIER CONDENSER.....    | 6.50   |
| BAKELITE MOULDED VARIOMETER.....   | 8.00   |
| BAKELITE MOULDED VARIOCOUPLER..... | 9.00   |



**Audio Frequency, \$5.00**  
**Radio Frequency, \$4.00**  
At your dealer's—otherwise send purchase price and you will be supplied postpaid.

**Crown Radio Manufacturing Corporation**  
78 FIFTH AVENUE  
NEW YORK CITY

# Questions and Answers

**Short and Long Wave Receiver**  
(2479) TW, Kansas City, Mo.  
I am making a short and long wave receiver and am using a variocoupler and honeycomb coils. I have a six-pole double throw switch so I can use either one of the tuners. I would like to have you publish a hook-up using the above and also a detector and three-step amplifier using five-

I have become so enthusiastic over the results attained in my one tube Reflex, that I am going to build the three tube set and there are several questions I wish you would set me right on.  
I would like to know if there is any gain in efficiency by using different ratios in the different stages of the R. F. transformers. I have made several R. F. trans-

current which a set like this must necessarily pass?  
Where can I buy the 50,000 ohm resistance 7A? Can a R. F. transformer be used in this stage efficiently?  
Can a Reinartz or Flewelling tuner be used with the Reflex? If so, how is it connected?  
A.—Noting your success in executing

sibly due to some electrical appliance in close proximity? This would cause such a condition.

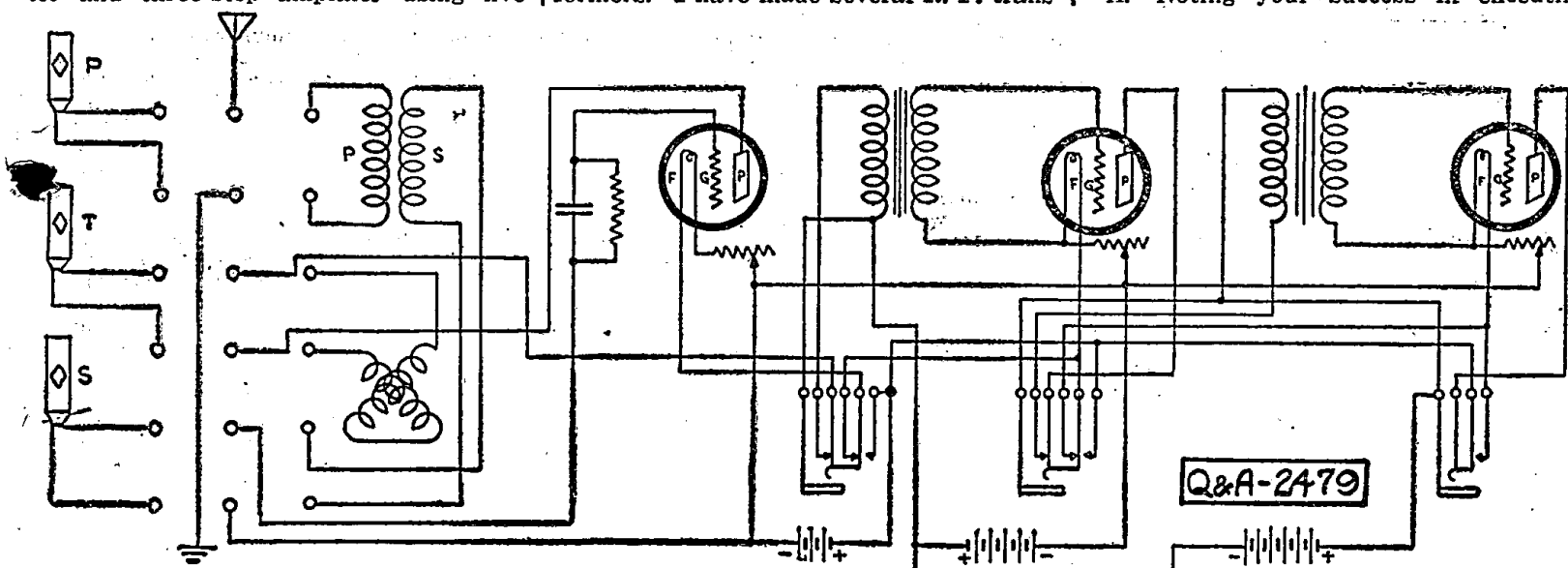
There would be very slight gain in efficiency through using different ratio transformers in proposed amplification. Would advise using the same on all stages. Two layers of number twenty wire should equal one and one-half M. H.

Separate rheostats for control of tubes is advisable. Any type of Galena crystals is good for use in this circuit.

Would suggest that a grid leak will serve as resistance. Do not know, at this writing, where a fifty thousand ohm resistance could be secured.

Radio Frequenc. transformer can be used effectively, as suggested.

It would not be practical to use either Reinartz or Flewelling tuner with this Reflex circuit.



spring filament control jacks. The last step has two jacks; a four-spring for a horn and a three-spring for phones.

A.—Complying with your request we show Diagram Q & R 2479, employing apparatus of your specifications and showing two stages of amplification. Filament control jacks are shown. A third stage of amplification may be added in like manner as those shown.

### Reflex Circuit

(2092) WLF, Newark, N. J.

I am certain that you will be interested to know that I have built the one tube Reflex set described in recent issue and I desire to say that it is some little set. I get all the local stations on a loud speaker with sufficient volume to be heard all over my apartment and would say that the volume is equal to my detector regenerator using one step of audio-frequency amplification. I have also had Atlanta, Ga., on the phones with fair volume and several stations within a hundred mile radius. I am using a Murad R. F. and an Atwater-Kent A. F. transformer, a peanut tube with 67 volts on the plate and a very poor crystal. I cannot note any difference in reception by adjusting the 240 ohm potentiometer and find that the set works just as well when it is removed from the circuit. There is a very bad hum in the set similar to an A. C. hum when listening for long distance when the local stations are off and I have tried to eliminate it by adjusting the potentiometer, B battery current, filament current and even taking the set to another location, but I cannot get rid of it. It is not audible when the local stations are on, that is, tuned in, because of the fact that the music is so strong as to drown it out. What can it be?

formers by winding No. 40 wire on a spool with a slot 1 1/4" diameter and 3/8" wide by about 1/8" deep. The first one I wound, had 90 turns for primary and 180 for secondary. When this was substituted for the Murad, in my one tube set, it was found to operate with about the same efficiency. I built three others with ratios of 1; 1 1/2 to 1; 2 1/2 to 1; 3 but they did not work near as well. Now what I want to know is, shall I use the 1; 2 for the first stage, the 1; 2 1/2 for the second or use the same ratios for each stage?

I have a core of a bundle of wires from an old spark coil which measures one-half in diameter by five inches long. Can I make the 1 1/2 millihenry choke from this and if so, how many turns and what size wire must I wind on it. I would like to cut the length of this core down to make it more compact, so please give me the proper specifications.

Can I use a single rheostat to control the three tubes or is it advisable to have separate ones for each?

What in your estimation, is the best crystal detector to withstand the high

Reflex circuit we are pleased to congratulate you upon the fine D X reception attained!

Referring to "hum" cited; it is difficult to venture an opinion as to its source without a personal inspection. Is it pos-

### RADIO Agents Wanted

#### Make Big Money in Spare Time

Demonstrate, sell and install famous TREGO Long Distance Tube Sets among friends and neighbors. Get Your Own Demonstrating Set at Special Agents' Price. TREGO can be set up in 30 minutes. 2,000 mile receiving range. You sell complete outfit at \$49.50 everything included. Actual worth \$100. Fully guaranteed. Licensed under Armstrong U. S. Patent. Here's a big money-making opportunity. Get Complete Details. TREGO RADIO MFG. CO., 1931 Main Street, Kansas City, Mo.

**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

## DEALERS

Write for our New Catalog listing well known and nationally advertised lines.  
Real discounts to live dealers

**WERNES & PATCH**  
159 NORTH STATE ST.,  
CHICAGO, ILLINOIS

## Prices Slashed!

Buy Here for Much Less; All Merchandise Sold on a "Money Back" Basis.

| FONES                                     |         |
|---|---------|
| \$ 6.00 Manhattan 2000 Ohm Fones.....     | \$ 3.68 |
| 12.00 Nathaniel Baldwin Type C Double.... | 8.35    |
| 6.00 Nathaniel Baldwin Type C Single..... | 3.95    |
| 9.00 Trimm 3000 Ohm Fones.....            | 5.95    |

| TUBES  |      |
|--|------|
| U. V. 200—List, \$5.00.....                              | 3.85 |
| U. V. 201—List, \$6.50.....                              | 5.45 |
| U. V. 201A.....  | 6.50 |
| Improved Detector Tubes.....                             | 2.45 |
| Mercury 1 1/2 Volt; guaranteed better than W. D. 11..... | 6.50 |

| MISCELLANEOUS                                     |       |
|---|-------|
| \$45.00 Magnavox Loud Speaker, Type R3....        | 26.95 |
| 25.00 Atlas Loud Speaker.....                     | 19.95 |
| .50 Dials, 2 and 3-inch.....                      | .25   |
| 1.10 Dayton Rheostats.....                        | .75   |
| 7.50 Moulded Dayton Variocouplers.....            | 4.95  |
| 7.25 Moulded Dayton Varometers.....               | 4.75  |
| 1.00 Erla Sockets.....                            | .49   |
| 1.00 Dayton Dials.....                            | .45   |
| Switch Levers, 50c value (adjustable radius) ..   | .25   |
| Mounted Hot Spot Crystals, 35c value.....         | .20   |
| \$2.00 Grevol Enclosed Crystal Detector....       | 1.55  |
| \$25.00 G-Volt 100 Ampere hour Batteries... 13.95 |       |

A Two-Year Guarantee with Every Battery Sold.

"If it's in Radio, we have it." We guarantee all merchandise purchased from us. Mail orders receive prompt attention. Buy here for much less.

**FEDERAL SALES CO.,**  
Masonic Temple Chicago, Ill.

### HEAR ATLANTA ON CRYSTAL

We receive programs from Atlanta, Minneapolis, Davenport, Fort Worth, Dallas, Kansas City, St. Louis, Denver, San Antonio on crystal without batteries. Your crystal set requires only easy, inexpensive changes. Send stamp for further information, or \$1 for copyrighted drawing and instructions. Everything clearly explained. Satisfaction guaranteed. LEON LAMBERT, 505 South Volusia, Wichita, Kan.

BUYERS OF RADIO MERCHANDISE CAN SEE THE EXHIBITS OF NEARLY A HUNDRED LEADING MANUFACTURERS OF RADIO MERCHANDISE AT THE

## Radio Fair

Don't Miss the Radio Sensation of the World

AT THE

**Permanent Radio Fair, Inc.**  
HOTEL IMPERIAL  
Broadway and 32nd St., New York

# FREE

Your Choice BOUND VOLUMES POSTPAID BY PARCEL POST

Numbers Two or Three with One Year's Subscription to RADIO DIGEST

Limited Quantity Better Hurry

**Radio Digest Illustrated**  
Volume Two  
**Radio Digest Illustrated**  
Volume Three

**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..... **\$2.00**

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.

One year subscription to Radio Digest and both bound volumes 2 and 3..... **\$7.00**

By subscribing now for one year to the Radio Digest you get both BOUND VOLUMES 2 AND 3, 25 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.

**GREATEST COLLECTION OF RADIO INFORMATION EVER PUBLISHED**

**VOLUME TWO**

|                                  |     |
|----------------------------------|-----|
| Questions Answered.....          | 300 |
| Simple Instruction Articles..... | 50  |
| Receiving Set Diagrams.....      | 5   |
| How to Make Articles.....        | 64  |
| New Apparatus.....               | 46  |
| Pictures and Illustrations.....  | 59  |
| Hookup Diagrams.....             | 142 |
| Broadcasting Stations.....       | 17  |
| Technical Articles.....          | 19  |
| Book Reviews.....                | 78  |

**VOLUME THREE**

|                                  |     |
|----------------------------------|-----|
| Questions Answered.....          | 300 |
| Simple Instruction Articles..... | 50  |
| Receiving Set Diagrams.....      | 5   |
| How to Make Articles.....        | 64  |
| New Apparatus.....               | 46  |
| Pictures and Illustrations.....  | 59  |
| Hookup Diagrams.....             | 142 |
| Broadcasting Stations.....       | 17  |
| Technical Articles.....          | 19  |
| Book Reviews.....                | 77  |

**COUPON**

PUBLISHER, RADIO DIGEST,  
122 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 inclosing check—M. O. for Five Dollars.

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



# Illustrated

# Radio

Wouldn't you like to make it tea for two, with Gilda Gray, premiere danseuse of the Follies, pouring from the Radio teapot? Of course Gilda has not the least idea whether the set has marcelled coils or is insulated with mascara, but she can hear music from 1,000 miles away and that is enough to thrill any feminine heart © Photonews



Above is a close-up of the Radio teapot set, one of the most intricate bits of apparatus made by an amateur Radio-phan. It is equipped with both tube and crystal detectors and tuning is accomplished by a 13-point switch and the adjustment of the relation between three spider web coils. The size of the set can be appreciated by comparison with the hand holding it © Photonews

Front and back view of the panel and all the necessary parts on Mr. Flewelling's receiver, which has set the Radio world astir and has brought about reception that has not been equalled by so few parts. At present there has never been published a hook-up which can be used for such distance work as this set will bring in, or can there be found one that requires so little adjusting to get equivalent results

