

Radio Digest

EVERY WEEK

Illustrated

TEN CENTS

TRADE-MARK

Vol. II

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CHICAGO, ILL., SATURDAY, SEPTEMBER 23, 1922

No. 11

TUBE DOES TRIPLE WORK

CLASSES IN HEALTH BY AIR WAVE LATEST

WGI'S "SCHOOL" IS FIRST EVER ATTEMPTED

Expert Conducts Course and Answers All Questions of Invisible Auditors

(Special to RADIO DIGEST)

BOSTON, MASS.—A radio health school is being conducted from Station WGI at Medford Hillside, in charge of Arthur E. Baird of the Caine's College of Physical Culture. Three exercise classes are conducted each morning, each class lasting about fifteen minutes and each followed by a five-minute talk on some subject of interest to those who desire physical efficiency. Each of the three classes are addressed to a special group.

The first is to the normal business man or woman who merely wishes morning setting up exercises. The second is for those who are overweight and wish to reduce, and the third is for those who are underweight and wish to build up. Exercises will be graded; that is, they will from time to time be changed to keep pace with the improvement in condition of those who follow them. Talks during the first week or two have been largely introductory and theoretical, preparing the student for the more specific and practical talks to follow. They deal with all phases of personal hygiene, such as diet, bathing, recreation and the like.

Give Personal Guidance

A notable and valuable feature is the answering of questions and suggestions sent in by auditors who write to the Amrad station. By this means personal problems that might not otherwise be covered in the daily talks can be dealt with by Radio if of sufficient general interest, or by mail if purely personal.

No such course has ever before been attempted by Radio, although one of the western broadcasting stations has conducted a simple course in setting up exercises. The present venture has the added feature of personal guidance for those who seek special advice. The first daily talks considered: "Factors in Health"; "Why Exercise"; "Changing Ideals in Physical Education"; "From Four Feet to Two"; "Posture"; "The Key Muscles of the Body"; and "Why Do We Eat?"

The program as it is given daily except Sunday, stated in Eastern Standard Time, follows:

7:00-7:20—Toning up exercises for business men.

7:20-7:40—Weight reducing exercises.

7:40-8:00—Weight increasing exercises. A short talk follows the work-out.

GERMAN OFFICIAL EYE HARD ON BUGS' SETS

LONDON, ENGLAND.—Radio is ruled with a watchful eye in Germany. Every set sold is licensed. Those using sets are allowed to receive but one kind of news. Government authorities adjust the set for specific wave lengths and then lock it up. The set owner can receive only the kind of messages his license calls for.



SERIES PLAYS TO FANS BY RADIO

WGY Will Give Up-to-the-Minute Reports on Big Baseball Games

(Special to RADIO DIGEST)

SCHENECTADY, N. Y.—Baseball fans who are also Radio fans will be able to follow the World Series at home this year. WGY, the broadcasting station of the General Electric Company, will give a "play-by-play" report of the World Series baseball games. Direct wires from the ball park will carry every play practically the second it happens and these will be relayed by Radio the instant received.

A "Radio Player Board" in the form of a four-column newspaper cut, by means of which the fan, with his Radio receiving set at home, may follow the game, play-by-play, just as closely as from an electric player board, is being furnished the papers by the General Electric Company.

Turn City House Phones Into Air Wave Receivers

Novel Attachment Is Furnished Telephone Subscribers

EVERETT, WASH.—Telephones in Everett, already equipped with a device which measures conversation, are to be made into Radio receivers through the use of an attachment to be supplied by the Puget Sound Telephone Company. The apparatus is known as the Radio adapter.

To hear concerts, news bulletins and other features, broadcasted by stations of Seattle, 30 miles from here, Everett fans who are telephone subscribers will simply hook their sets onto the attachment, which fits into the telephone bell box.

WINFIELD, LA.—W. W. Wood, manager of the Victoria Theater, is planning to offer his patrons the first Radio concerts in connection with motion pictures ever offered by a theater in this part of the state.

'REFLECTION' IS PRINCIPLE OF INVENTION

Received Signals Are Amplified Twice on One Tube by New Circuit

Bostonian Is Inventor

Triumph of William Priess, Radio Engineer, Result of Years of Experiment

(By F. N. Hollingsworth, Staff Correspondent)

BOSTON, MASS.—After years of experiment, William Priess, a Boston Radio engineer, has developed a reflex receiver using an entirely new principle. A single vacuum tube is first made to function as a Radio frequency amplifier, passing the product on to a crystal detector to be rectified, after which the rectified current is returned through the tube for further amplification at audio frequency. At the request of the inventor, the actual diagram of connections is not published at this time, but an outline of the scheme is given through his permission.

Suppose it were light that was being increased in intensity instead of Radio currents. Referring to the sketch, "A" in Figure 1 would be the source of the light. This is thrown on a glass magnifying reflector on the left at point "B," and the reflector passes it over to a mirror on the right at the point "C." This "C" corresponds to the crystal detector, in the Radio circuit. The amplified energy is then passed or reflected back again to the magnifying reflector at "D," for more magnification ending at "E." Total amplification is represented by the distance "F."

Three Tubes Do Work of Six

Many advantages are claimed for the new reflex receiver over some of the other Radio triode tube circuits, and it is as simple to operate as any found on the market. A model that has been adopted for production has three vacuum tubes so interconnected that they will do as much as six. In this model the tubes first act as Radio frequency amplifiers.

(Continued on page 2)

LOUISVILLE HAS RADIO SCHOOL FOR COLORED

LOUISVILLE, KY.—The Radio school idea started by Station WHAS of this city, has been extended now to include a school for colored people. The school is at the colored Y.M.C.A. The colored population of the Louisville territory is estimated at 80,000 and the colored Y.M.C.A. is in the heart of the most important negro district.

TUBE DOES TRIPLE WORK

(Continued from page 1)

and second as satisfactory audio frequency amplifiers.

It is claimed that the three give better results than when six individual tubes are used. Several reasons are given for using the crystal detector in place of the vacuum tubes generally used for rectification. In the first place a good piece of crystal is almost as sensitive as an audion when used on a straight hook-up. Only where the principles of regeneration are employed is the vacuum tube superior to the crystal. Regeneration frequently means distortion. One might say distortion is coincident with regeneration, unless the latter is skillfully employed. The crystal is entirely free from rectifier distortion.

Crystal Needs Little Adjustment

With the Priess reflex receiver, all feeble waves are built up by means of Radio frequency amplification until they are so powerful that practically any point on the crystal will function, thus eliminating the

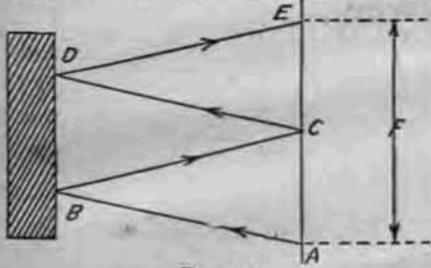


Figure 1

fine adjustment ordinarily required of such detectors.

One of the reasons that have caused audio frequency amplification to be kept down to two or three stages is the fact that tube noises, squeals, crackles and other sounds are magnified along with the signals. But dispensing with the tube detector is said to eliminate the greater part of the noises.

In Figure 2 is shown a diagrammatic scheme of the single tube-crystal detector circuit invented by Mr. Priess. The signals enter the tube after reception at 1, are amplified and leave at 2, entering the crystal detector at 3. They leave the de-

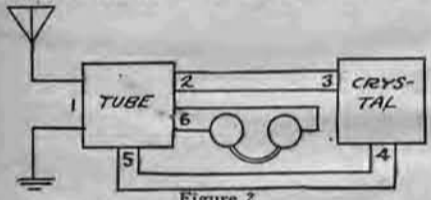


Figure 2

tor at 4 after rectification, going back to the tube at 5 for further amplification. At 6 the rectified and doubly amplified signals leave the tube and enter the telephone receivers or loud speaking device.

The inventor of the new reflex receiver which combines desirable features of the vacuum tube with those of the crystal receiver and the principle of reflection, did considerable research work with the navy in 1917, and with the American Expeditionary Forces in France as a Lieutenant in the United States Signal Corps. There he was developing aircraft receivers and later invented a loop transmitter, which was used by the American troops in the trenches. He is now with the Wireless Specialty Apparatus Company, as their chief Radio engineer.

World Market Survey to New England Firms

First to Receive Latest Business Service

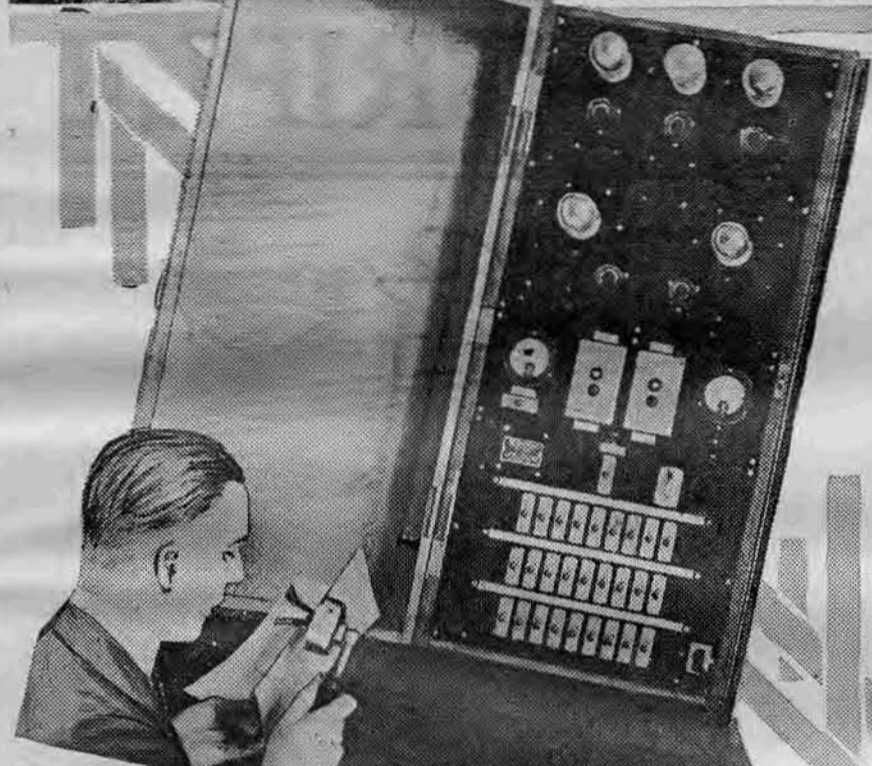
MEDFORD, MASS.—New England is the first section of the country to receive a new Radio business service which represents the highest possible development in the rapid distribution of business information. This service, just started by the New England district office of the Bureau of Foreign and Domestic Commerce, is sent out each Monday evening from Station WGI, at 7:30 o'clock, Eastern Standard Time, and includes a world market survey. The material for the broadcast is forwarded to Medford Hillside in advance by the bureau.

In this way New England manufacturers and exporters are placed in virtually direct communication with live business in foreign countries. Only specific trade information is broadcast, such as textiles, shoes and leather, paper, machinery, electrical goods, etc.

Inquiries from foreign countries for these goods are announced, and business men who are interested are able to obtain the names and addresses of these firms by communicating with the bureau's office in the custom house at Boston.

An Oklahoma doctor who has a large number of hospital patients, has a Radio outfit on his automobile so that he can be instantly reached if needed at the hospital.

HIGH SCHOOL'S 'LOUD SPEAKER' CONNECTED WITH 25 CLASSROOMS HAS RADIO HOOK-UP



Piedmont (California) High School, the first to install a Magnavox telemagaphone equipment, is shown in the top picture. Below the principal of the school is at the master station speaking to the 25 receiving stations. Received broadcasts may be relayed to each room as well

HIGH SCHOOL SETS UP 'LOUD SPEAKER'

Piedmont, Calif., Installation Has Radio Hook-up; Is First of Kind

PIEDMONT, CAL.—A most interesting installation has recently been completed for the Piedmont High School, Piedmont, Cal., involving a distinct improvement over present methods of inter-classroom communication. It was developed by the Magnavox Company and consists of a central or master station and 25 receiving stations, each equipped with a Magnavox telemagaphone, the motor generator and battery being installed in a steel cabinet in the basement.

The master station is operated like an ordinary telephone (see photographs). Talking into the Magnavox in ordinary tones, the speech is amplified in any or all of the 25 classrooms as desired, in sufficient volume to be distinctly audible to all the students.

While similar installations have already been developed for hotel, railroad terminal and similar commercial uses, this is its first application to school service. A distinctly novel feature of this particular installation also is the fact that, by means of a special switch, broadcasted Radio lectures and concerts may be connected so as to be reproduced in any or all the classrooms by the same telemagaphones.

Get Location for Philly Show

PHILADELPHIA, PA.—The Guaranty Industrial Building, Twenty-fourth and Chestnut streets, has been secured for the first Philadelphia Radio show and exhibition, which will be staged September 27 to 30. Lectures, motion pictures and addresses by men prominent in the industry will feature every day of the show.

ARMY PLANS MONTHLY RADIO NIGHTS FOR FANS

Action Is Taken After Success of First Entertainment

NEWARK, N. J.—Following the success of the first Army Night broadcasting entertainment from Station WJZ of the Westinghouse Company at Newark recently, all Army Corps' Commanders have been instructed by the War Department to co-operate with local broadcasting stations in entertaining the fans and especially in establishing regular monthly Army Nights.

Major General H. C. Hale of the 2nd Corps Area at New York, who put on the first Army Radio entertainment, made such a hit that local fans demanded more and arrangements have been made so they will get it once a month.

The nine Corps' Commanders who cannot stage their own show on Army Radio stations, will co-operate with local stations, furnishing band and vocal music, speeches on military science and training, or other forms of entertaining or instructive programs. Very soon now each of the Corps Areas throughout the country will have a new source of Radio shows.

Brooks Field Soon to Have South's Largest Broadcaster

SAN ANTONIO, TEX.—Brooks Field, near San Antonio, which opened a 20-watt broadcasting station, DM-7, September 1, will soon have the largest sending station in the South, according to army officials. The equipment is being shipped here, but has not been assembled. At present, a 750-watt station is in operation at Kelly Field No. 1, also near San Antonio, is one of the largest stations in the South, but is not sending out regular programs. Kelly Field No. 1 uses the call DM-4.

Radio Digest Illustrated

TRADE MARK

Published Weekly by RADIO DIGEST PUBLISHING COMPANY 123 West Madison Street, CHICAGO, ILLINOIS

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

Entered as second-class matter April 27, 1922, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.

Vol. II Chicago, September 23, 1922 No. 11

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Looking Ahead

The fourth of the series by H. M. Towne will appear next week. Mr. Towne for a number of years has been employed in the laboratories of the General Electric Company.

Panel Units for Your Receiving Sets. Details of panel construction will soon begin. This popular feature has been requested by many readers.

Broadcasting Directory. Gets better and larger each week. The only convenient reference to aid you in finding a station heard.

"How to Make Department." Many kinks every week are interchanged here.

Radio Illustrated. The picture page is the best of its kind.

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GREAT LAKES RADIO SAVES TIME, MONEY

WEATHER SERVICE WARNS SHIPS OF DANGER

Advices to Fleets Keep Boats Moving when Safe—Prevent Waste in Delays

WASHINGTON.—More than 2,000 hours of operating time, worth at a conservative estimate \$150,000, has been saved to navigating interests on the Great Lakes in a single season by means of the Radio advices sent out from one of the smaller weather bureau stations on the lakes. There is no way of ascertaining definitely how large is the total saving effected by the Great Lakes Radio weather service, which is one of the many activities of the United States Department of Agriculture.

Vessels are not only warned off the lakes because of approaching storms, but they are also advised when it is safe to proceed and what route to take to avoid heavy seas and adverse currents. When boats are idle the overhead expense averages \$75 an hour, and may be much higher.

Saves Time and Money

A large fleet of 40 boats anchored near Mackinaw, Mich., for example, would not have left before 8 p. m. had not Radio advice assured the leader that it would be safe to proceed at 2 p. m. This difference in time meant a saving of at least \$18,000 to the shipowners. At another time 50 boats sheltered at Detour, Mich., were advised that conditions would permit them to start immediately instead of 10 to 16 hours later. The saving here was estimated at \$37,500.

Last September a steamer assisted by a tug was grounded outside its regular channel. The captain was informed by the local weather bureau that the water would not return to normal until the next morning, and so suspended operations, which were completed in a few minutes when conditions were right. Five hundred dollars for tug hire alone was saved.

Radio-Sent Power Distant; Steinmetz

Expert Declares Particles of Power Received by a Station Yet Too Small

NEW YORK.—In the opinion of Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, it is not within the bounds of probability that power will be transmitted by Radio in the near future.

"In some respects, Radio power transmission exists today, for the message which you receive by Radio has been carried by the power of the electro-magnetic wave from the sending station to the receiving station," said Dr. Steinmetz.

"However, while the sending station sends out electro-magnetic waves of a power of several kilowatts or even hundreds of kilowatts, this power scatters in all directions, and it may be only a fraction of a milliwatt which we receive, that is, less than a millionth of the power sent out. But this small power is sufficient, when amplified, to give us the message."

"The problem of power transmission essentially differs from that of the transmission for communication, that in power transmission most, or at least a large part, of the power sent out by the generating station must arrive at the receiving station, to make it economical to transmit the power."

"Hence, the problem of Radio power transmission is that of directing the Radio waves so closely that a large part of their power remains together so as to be picked up by the receiving station."

RADIO AIDS RED FIRE IN POLITICAL DRIVES

NEW ORLEANS, LA.—Red fire, parades and bands have, up to the present, supplied the necessary stimulant for enthusiasm in New Orleans political campaigns. To those, have been added Radio. The new regular Democratic organization pressed Radio into service as a vote-getter. The doctrines of that faction were broadcasted nightly.

CANADA'S FIRST GIRL OPERATOR IS SIXTEEN

TORONTO, CAN.—Sixteen-year-old Madeline C. Cross, of Bolton, is the first girl in Canada to have a licensed amateur Radio transmitting station. Miss Cross is a full-fledged "bug," and is as intimate with aerials and rheostats as most girls are with—well, whatever most of them are intimate with. But she is modest with it all, regardless of the glory.

KSD IS FIRST TO GET 400-METER LENGTH

41 STATES HEAR STRENGTHENED ST. LOUIS PLANT

Post-Dispatch Station, Meeting Stiff U. S. Requirements, Is Placed in "B" Class

ST. LOUIS, MO.—Station KSD, owned by the Post-Dispatch of this city, was the first Radio broadcasting plant in the United States to be authorized and to start to use the new 400-meter wave length recently innovated by the department of commerce. The rigid requirements necessary to be met, makes the permission to use this wave length quite an honor.

Notice of the change in wave length was announced by Radiophone and the details of the change were described. The great variance in power, range and service among the numerous broadcasting stations in the different states caused the department of commerce recently to determine to establish a new class—to be known as class "B" stations—which would comprise a few stations of great power and efficiency.

Heard in Forty-One States

Station KSD, which has been heard in forty-one states, in the District of Columbia, in four Provinces of Canada, in Old Mexico, and on ships in the Atlantic Ocean and the Gulf of Mexico during July and August, the most difficult transmission months of the year, was first in the nation to be granted the 400-meter wave length.

This wave length will be used for the 4 o'clock and 8 o'clock p. m. concerts. Market reports and news bulletins earlier in the day will be broadcast on the 485-meter wave length as formerly.

The result of the change in wave length will enable persons having receiving sets to choose which station they want to hear. Other broadcasting stations of lesser power and efficiency than Class "B" will continue on the 360-meter wave length, and amateur sending stations on the regulation 300-meter wave length, will have less traveled Radio lanes exclusively for their own use.

Pair Wed as Fans Tune in Ceremony

Bugs Hear Washington Couple Take Vows in Real Radio Marriage

WASHINGTON.—"Do you take this woman as your lawfully wedded wife?" "What's this I hear?" scores of District Radio fans asked themselves shortly after 8 o'clock in the evening recently, as they caught the words of the marriage ceremony. It was no vaudeville "stunt," but one of the first real marriage ceremonies ever broadcast.

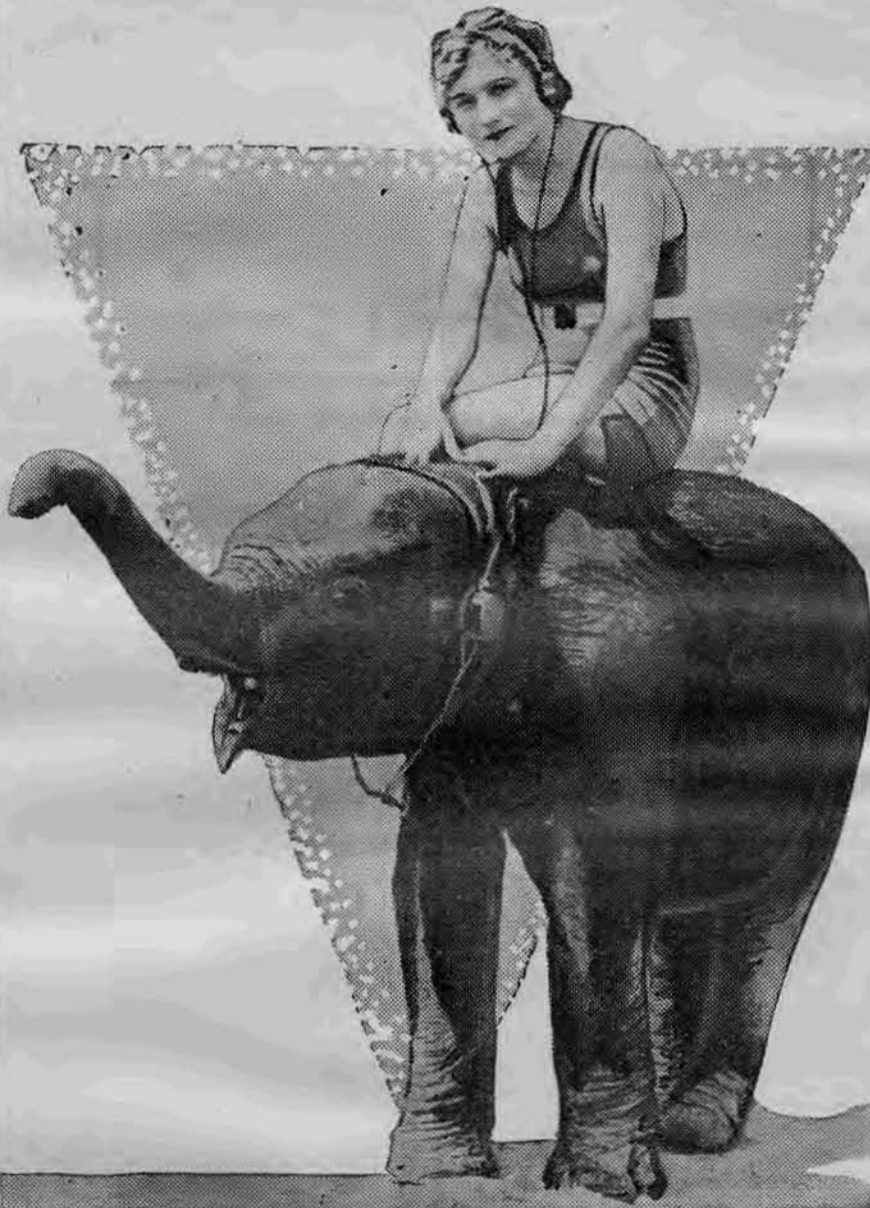
John H. Collier, 1764 N street, northwest, and Miss Helen B. Cook, 1229 Connecticut avenue, northwest, pledged their troth and repeated the fateful vows of marriage before the pulpit in the Church of the Covenant, with Radio broadcasting microphone beside them.

First announcement was made to listeners-in that the ceremony was to be broadcast. Then followed the wedding march, the reading of the ceremonial by the Rev. John C. Palmer, and finally the responses of the bride and bridegroom. Every word was heard distinctly from the church Radio station operated by A. Claverella.

Suggest Radio Swimming Meet

BUFFALO, N. Y.—A Buffalo athletic organization has suggested to the American Radio Relay league that a long distance swimming meet can be arranged with a Hawaiian swimming club and all results—times and events, both at Buffalo and at Hawaii, could be transmitted by amateur Radio.

BEAUTY AND BEAST LISTEN IN



If appearances are not deceiving, the pet baby elephant of Miss Marie Dahm, Follies girl, has heard something through his specially-constructed Radio head set that has tickled his ribs. He has a remarkably expressive trunk, don't you think? © INT.

Amy Lowell Reads Her Free Verse Over WGI

MEDFORD, MASS.—Something new in Radio readings was given by Station WGI, at Medford Hillside recently, when Amy Lowell, widely known as a poetess, gave a reading from her famous unrhymed poems. Among her selections was "Before the Storm." Miss Lowell is known as a leader of the free versifiers, and now that free verse has become accepted, or endured, according to one's temperament, her place in the front rank of modern poets is no longer questioned.

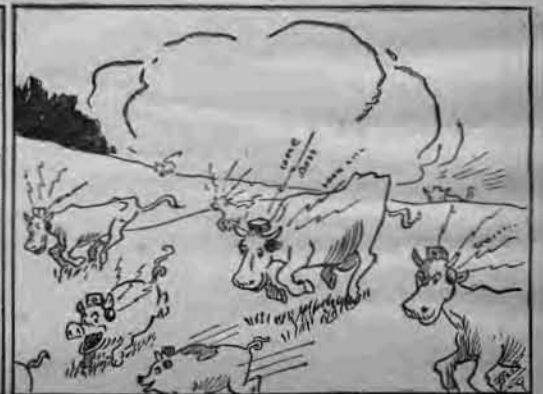
Find Thunder Storms by Using Loop Aerial

LONDON, ENGLAND.—Locating thunderstorms by Radio is one of the operations recently carried out at the Croydon aerodrome meteorological station. A loop aerial is employed and adjusted to a wave length of 30,000 meters. A count is made of the number of atmospheric or static discharges in different directions during a period of 15 seconds. The position of a thunderstorm is then located by finding the direction from which the atmospheric disturbances took place.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Radio Stock Moves Fast



Selective Long Distance Receiver Explained

A. J. Allen, Indianapolis Subscriber, Submits Odd Hook-Up

A CIRCUIT which will enable the fan to secure selectivity and range simultaneously is not found every day. Therefore the following letter from A. J. Allen, a subscriber living in Indianapolis, Indiana, illustrating a noteworthy arrangement of the regenerative circuit, should hold much interest for the typical experimenter.—Editor.

I have been an interested reader of RADIO DIGEST each week for quite a period of time and have profited thereby to an extent that leads me to congratulate you on the very interesting and constructive contents of your publication which has been of great aid to me in experimental Radio receiving.

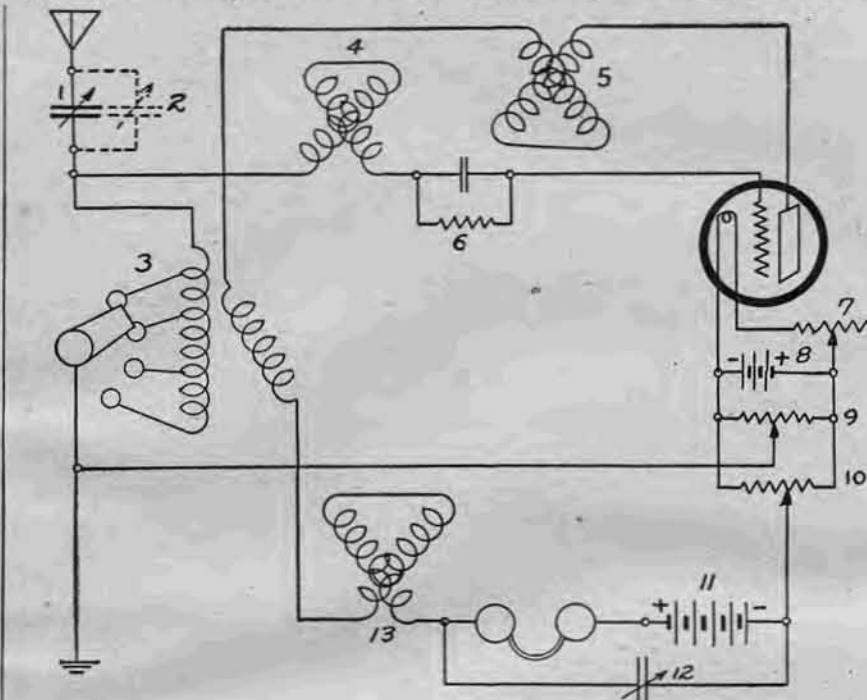
I have also been interested in watching the "Receiving Records" printed each week as submitted by your subscribers and accordingly I submit herewith a few of the stations I have received during the summer static season, to wit:

Station	Miles Distance
KPAF, Denver, Colo.	1,000
DN-4, Denver, Colo.	1,000
NOF, Washington, D. C.	600
WSB, Atlanta, Ga.	450
WDAF, Kansas City, Mo.	500
WHB, Kansas City, Mo.	500
WJZ, Newark, N. J.	700
WGY, Schenectady, N. Y.	690
WHAZ, Troy, N. Y.	700
WHA, Madison, Wis.	300
KDKA, Pittsburgh, Pa.	375

I could name many other stations within a shorter radius such as WWJ and WCX of Detroit, Mich., 250 miles, KSD of St. Louis, Mo., 250 miles, WOE of Akron, Ohio, WLW of Cincinnati, Ohio, WFO of Dayton, Ohio, and many other stations from 100 to 300 miles from Indianapolis.

You will be interested in knowing that I received all of these stations through a circuit using vacuum tube detector with a two-stage amplifier and that I heard all of them through a loud speaker all over the room and in some cases many rooms away.

The conditions under which the records have been established may interest you. During the summer months I have been living about 20 miles out of the city in a summer cottage located in the midst of a densely wooded tract of land near a river bank. All around the house are numerous forest trees two and three times as high as the house itself, yet my aerial



- Description of Constants Used in Circuit
- 1—4-plate variable condenser
 - 2—Vernier variable condenser for fine tuning
 - 3—Variocoupler (or other tuner)
 - 4—Variometer
 - 5—Variometer
 - 6—Grid condenser (.00025 to .0005 mfd.) and variable leak (1 to 2 megohms)
 - 7—Filament rheostat
 - 8—Filament or A battery
 - 9—Potentiometer
 - 10—Potentiometer
 - 11—Plate or B battery
 - 12—23-plate variable condenser
 - 13—Variometer

over which the stations were received simply consists of one stretch of wire ninety feet long shaped like a letter "S," each segment being thirty feet long with a drop of about eight feet to the instruments. The wire is located underneath the roof and my ground consists of a driven well pipe.

The hook-up I am using is shown together with the constants. As far as I know this is the only circuit using three variometers located as I have them placed

and the description accompanying the article will be found quite explanatory. Regardless of the number of controls to be operated in this circuit, I do not find it at all difficult to tune in immediately almost any station within receiving range and in fact it is so selective that I can tune out high powered Indianapolis stations and receive those out of town.

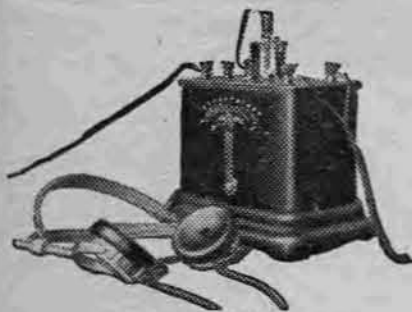
For instance, on Sunday night, August 13th, while the local (Indianapolis) Station WLK was broadcasting, I tuned it out

completely and brought in the Sweeney Automobile School (WHB) of Kansas City, Missouri, through the loud speaker while I could not hear WLK at all. On another recent occasion I tuned out local station WOH and brought the St. Louis Post-Dispatch (KSD) in clear and loud through a horn. When I get tired of listening to some particular station outside of Indianapolis, I can very quickly tune in some other station about as desired. I have done a great deal of experimenting with various tuned circuits and have probably tried out fifty or more, but I like this particular hook-up better than all others so far, because of its range possibilities and the loudness with which it brings signals to the detector for further amplification.

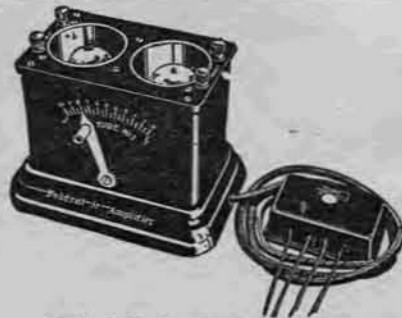
At present I am using Amrad inductances and condenser capacities as indicated. Also I am using a Faradon variable grid condenser No. 1820, which has clips for insertion of tubular leaks. In addition I have connected in the circuit as indicated by number 6 in the diagram a Chelsea variable grid leak. I find that having the condenser and leak variable facilitates the balancing of the circuit when tuning and enables me to split the carrier wave more easily. The two potentiometers, numbers 9 and 10, are useful for the same purpose, since their proper manipulation accurately controls the grid and plate current potentials. Especially is this true of number 9.

Since the detector tube is usually very critical in its adjustment it is of course necessary to pay particular attention to this phase of tuning in the manipulation of any circuit. For my filament or A battery I am using a five-cell Edison alkali battery of 7½ volts, and about 90 volts of B battery for the two amplifier tubes. For the detector I use a 22½-volt B battery. This voltage is variable down to 16 volts through the use of potentiometer number 10 as indicated on the diagram.

I have been using this experimental circuit throughout the summer months with greatest satisfaction and without a bit of trouble. I am now preparing to give it a tryout with an outside aerial and also with one to three stages of Radio frequency amplification inserted ahead of the detector. With this arrangement I feel sure that it will be possible for me to
(Continued on page 5)



Federal Crystal Receiver



Federal Junior Amplifier No. 20

Federal INSTRUMENTS

—ARE SUPERIOR—

The Federal CRYSTAL RECEIVER

is a highly efficient instrument for the reception of RADIO Programs in a clear, soft, pleasant tone—when used within a radius of 30 MILES of a broadcasting station.

WITH THE ADDITION OF

THE Federal JUNIOR AMPLIFIER No. 20

The receiving range is increased to

100 MILES



No. 226-W Voice Frequency Amplifying Transformer

THE Federal JUNIOR AMPLIFIER No. 20

is equipped with Two of the famous

No. 226-W Voice Frequency Amplifying Transformers

THESE INSTRUMENTS are exceedingly simple to operate—No knobs and Dials—merely operate control arms until reception is loudest.

THIS TRANSFORMER was used in ARMY and NAVY radio equipment throughout the war and has been used continuously in commercial equipment.

Federal Telephone & Telegraph Company
BUFFALO, N. Y.
CHICAGO BRANCH OFFICE: 805 STEGER BUILDING, CHICAGO, ILL.

For Those Who Contemplate Making Their Own Outfit

We Recommend **CROSLEY** Radio Parts
Better—Cost Less



The following are the CROSLEY parts necessary for a combination tuner and audion detector set. These parts are of the highest quality and at these prices you cannot afford to be without one.

- 1 CROSLEY Vario-coupler with knob and dial.....\$ 3.00
- 1 CROSLEY Model "A" Variable Condenser with knob and dial..... 1.65
- 1 CROSLEY V-T Socket..... .50
- 1 CROSLEY Tap Switch..... .30
- 1 CROSLEY Rheostat..... .60
- 6 CROSLEY Binding Posts..... .30
- 1 CROSLEY Cabinet 5½" x 13½" x 7" 3.30
- 1 CROSLEY Formica panel 6" x 14" 2.10

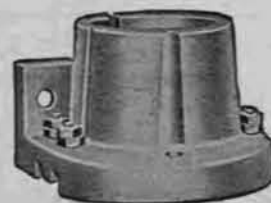
Total\$11.75

In addition to the above, all you will need is a small amount of wire and grid leak condenser which may be had for about 75 cents.

This Combination can be made into a very efficient outfit with a range of several hundred miles and will receive wave lengths from 200 to 600 meters. Any dealer can show you how to hook up the various parts.

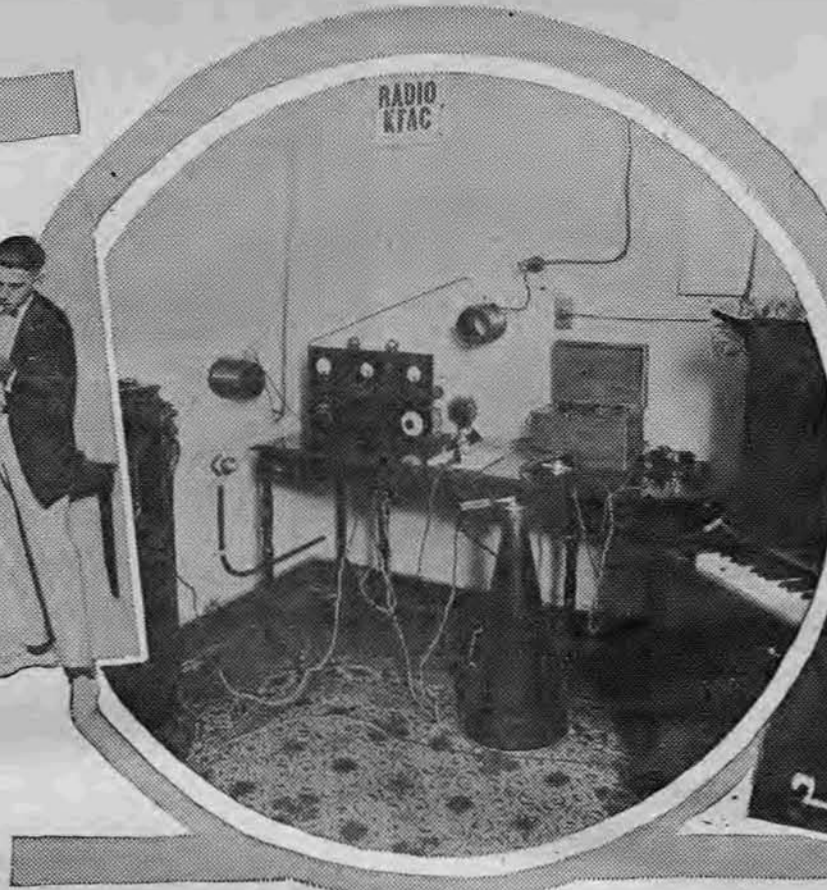
Send for catalog and wiring diagrams

CROSLEY MANUFACTURING COMPANY
DEPT. R. D. I. No. 9 CINCINNATI, OHIO





Directly above is KFAC's own orchestra, the members of which are (left to right) Edward Moniot, Marion Jones, Wilbur Funk and Stanton Smith. In the center is a view of the KFAC outfit, and one the right is N. D. Garver, manager



DISTANCE RECORDS ARE KFAC'S 'HOBBY'

California Fifty-Watt Station, with Own Orchestra, Wins Fans' Favor

GLENDALE, CAL.—KFAC is a fifty-watt Radiophone station using the Colpitts and Helmsing systems of vacuum tube modulation and transmission. In other words, two tubes are used, one as a modulator and one as an oscillator. The station is known as the Glendale Daily Press Radiophone and is located in the Press building at 222 South Brand Blvd., Glendale, Cal. It is owned by the Newton Electric Company of Glendale and is in charge of N. D. Garver, Radio operator with thirteen years of practical experience, amateur and commercial. When KFAC first came on the air, many stations had already started and had afforded an opportunity to find out just what the public wanted. The decision arrived at, was, the public wanted most anything except phonograph music and they wanted a variety. With this information at hand, every effort has been made to please the public, and to a very great extent it is believed that KFAC has succeeded inasmuch as there is no mail coming into the Press office without several letters commending the station. It has won much popularity on account of the clearness of its practically perfect modulation.

Makes Distance Records
Modulation is not the only thing, for this station has been listed in the columns of RADIO DIGEST practically every week for long distance records. The latest record made was a report from an amateur 10 miles south of Wichita, Kan., by the name of Coerce. The files of Radio KFAC also contain reports from Portland, Ore., a distance of 1,116 miles by airline, Grants Pass, Ore., 975 miles; Vacaville, Calif.; Berkeley, Calif.; Battle Mountain, Nev.; San Diego, and other places of distances greater than 400 miles.

The station is equipped with one of the largest type of Brunswick phonographs and a Marshall-Wendell Ampico piano with special reproducing sound panel. The phonograph music is reproduced through a patented Magnavox tone arm, while the piano sounds are picked up by a Magnavox transmitter with a large megaphone on the mouthpiece. The megaphone is also used for voice, instrumental solos and orchestra music.

Find Megaphone Best
This method was used after much experimenting and was found to reproduce without giving jarring notes from the piano. The piano is over twelve feet from the microphone, while singers stand anywhere from twelve to fifteen feet away.

Another interesting fact which was discovered during the experimenting was that draperies were not needed. In fact, it was found better without them. It was thought that there would be echoes and rebounding from vibrations, but not so. The reason was found to be that the studio walls were finished rough and calcimined heavily. In another room with

smooth walls and no calcimine there was all sorts of rebound.

The antenna for the station consists of an eight-wire antenna 90 feet above the ground. Instead of a ground, an eighteen-wire counterpoise, 78 feet long with wires four feet apart, is used.

Has Own Orchestra
Another interesting feature is that KFAC is the only station in Southern California to have its own orchestra. This is known as the "KFAC Orchestra." The orchestra as shown in the picture consists of four pieces; left to right: Edward Moniot, banjo; Marion Jones, piano; Wilbur Funk, Saxophone and Conductor; Stanton D. Smith, saxophone. Other members of the orchestra not shown in the picture are, Eldin Bengé, cornet; Morris Burke, bass horn and Herbert Brooks, violinist. This orchestra has become famous up and down the west coast in a very short space of time and has played at many society affairs, hotel openings, dances and balls since their organization.

The interesting feature of the story is how the orchestra originated. One night the four artists shown in the picture were scheduled to play solos. When they arrived at the station they were introduced to each other and during a three-minute interval were organized into a four-piece orchestra and sat down and played selections for three-quarters of an hour without a mistake, causing compliments and requests for favorite selections to rain in for the remainder of the evening.

Since that evening the orchestra has expanded in size and has been climbing the ladder to fame steadily. They now play once a week, Wednesday evenings between 7 and 8 o'clock, Pacific standard time, playing requested selections, and have never played but what they have been showered with compliments from enthusiastic listeners. They have also received practically all of their engagements through their efforts via Radio.

Radiophone Craze, Old in U. S., Storms Rio Janeiro

RIO JANEIRO.—The Radiophone craze, while now becoming an old story in the United States and other countries, has just hit Rio Janeiro.

A powerful broadcasting station has been erected on the summit of Mount Corcovado, overlooking the city, and besides the Government buildings, many commercial and private houses are being equipped with receiving sets with which to "listen in" on daily programs of concerts, news reports and lectures.

Other cities in the vicinity also are picking up the reports, which have been heard as far as Sao Paulo. This is believed to be the first big broadcasting station to begin operation in South America.

SELECTIVE RECEIVER

(Continued from page 4)

pick up practically any station in the United States within the range of wave lengths that my instruments are capable of receiving and with the addition of honeycomb loading coils of greater range I anticipate more surprising possibilities with this very simple circuit hook-up.

As it is now, by throwing a switch I can insert honeycomb coils as loading inductances and receive code stations operating on 25,000 meters. On several evenings recently I tried this experiment and heard some of the prettiest code imaginable from foreign press stations. I have also had Arlington time on the same arrangement of coils with lower wave lengths.

The above outlines my summer experience with this circuit and I am now moving back to my city residence where further experiments will be conducted. I may later have some more interesting information to tell, inasmuch as receiving conditions in the city are of course different from those experienced in the country due to the many interference sources that one has in town.

Just a few words in respect to aeriels. An experienced Radio man with whom I am acquainted, and who is employed in the Radio department of the Hatfield Electric Company of Indianapolis, advised me that on account of his residence location he was unable to receive with satisfaction results out of town using an outside aerial because of power line and similar interferences. I told him of the results I had been securing with my inside attic "S" aerial and he proceeded to install a similar aerial. The remarkable result was that he is now getting practically everything out of town within the range of his set.

In other words, I am about convinced that an inside attic "S" shaped aerial properly installed and insulated will give better all around results than a long one-wire outside aerial. In fact, I myself made comparisons by erecting an outside aerial in the country and tried both of them during the summer but I could not get the results with the single wire outside that the inside "S" shaped aerial brings me.

As a matter of passing interest, recently I tuned out our local stations all evening and together with a licensed operator listened in on more than thirty-five code stations, both amateur and government, on land and sea. We had several stations in eight of the nine districts covering the country. The missing district was number seven which we failed to pick up although we did listen in on a code message being transmitted from a station in the Philippine Islands to a naval boat. We also heard numerous "logging" conversations in code between land stations and ships.

Twins, with Set in Auto, Tour City and Hear Music

SAN ANTONIO, TEX.—Thomas Conroy and Edward Conroy, 15-year-old twin brothers, have equipped an automobile with Radio receiving outfit and each night are seen touring the streets of San Antonio listening to Stations WJAE, WCAR and AS6. They have a single-tube feedback set. They also hear Houston (WEAY) 150 miles away and Fort Worth, Tex., (WBAP) a distance of 309 miles.

RURAL BANKS HEAR CITY MARKET NEWS

CLEVELAND UNION TRUST SUPPLIES SERVICE

Radio Brings Farmer at Crossroads Close to Centers of Business

CLEVELAND, O.—Near a certain crossroads in a southern Ohio county is a farmer who raises a big corn crop year after year. In a little room in The Union Trust Company, Cleveland, is a man who spends almost four hours a day talking into a Radio transmitter. Neither man knows the other. They are miles apart and yet—

When and at what price the down state farmer sells his corn may depend upon what that man in the little room in The Union Trust Company, Cleveland, speaks into his Radio transmitter. For The Union Trust Company is now broadcasting quotations on farm and dairy products, grains, flour, feed, live stock and industrial and Liberty Bonds and the like. The company operates its own station licensed as WJAX.

Banks Use Lobby Bulletins
Banks throughout a radius of five hundred miles from Cleveland are installing Radio receiving sets in order to keep themselves and their customers fully posted at all times upon prices on farm produce as well as the latest movements in the financial world. These banks are supplied with lobby and window bulletins so that quotations received by Radio may be given to their customers quickly and conveniently.

As a result of this plan, whenever the farmer at the crossroads drives to the nearby town he stops into his bank and gets the very latest quotations on corn or wheat or live stock—his own particular products. He can get these prices daily or almost hourly, as quotations are broadcast four times a day.

Rural free delivery and the telephone have brought about a close contact between the farmer and the nearby town, but Radio is the final step which links the farmer to the city and enables him to do business in the most modern and up-to-date manner. No longer can the business man in the city brag about his advantages over the folks down on the farm, for Radio now makes it possible for the farmer to buy and sell on the same basis as the man in the city, taking advantage and profit of the same fluctuations up and down.

Keeps Banks Posted
Outlying banks also can profit greatly by the broadcasting of bond quotations and financial news, as by this method they are able to keep posted with the very latest events and may receive pertinent and valuable information hours and even days earlier than they could otherwise obtain it.

The use of Radio for this purpose is a distinct innovation in the banking field and is attracting a great deal of attention. Heretofore Radio has been considered by many people as a kind of a toy. It has been used largely for entertainment. (Continued on page 14)

BIG NATIONAL SHOW WILL BE AT CHICAGO

MANUFACTURERS' EXHIBITS
ONLY IS PLAN

National Radio Chamber of Commerce
May Convene First Time at
Exposition

CHICAGO.—The first big, thoroughly organized Radio exposition ever held in the United States will take place in the Coliseum at Chicago from October 14 to 28, inclusive, and will be known as the Annual Chicago Radio Show. Heretofore most Radio shows have been hit-or-miss propositions, aimed to reap a rich harvest at the gate through the universal public interest in Radio telephony.

The Chicago Radio Show has been organized along entirely different lines. In the first place it will be exclusively a manufacturer's show, the first affair of that kind ever held. In connection with this phase of the project the convention committee of the newly formed National Radio Chamber of Commerce has had a special meeting in New York to discuss plans for holding the first national convention in connection with the Chicago Show. Most of the large manufacturers will be represented at the show and it would be the logical time for the holding of the convention. The big auditorium in the Coliseum Annex has been tendered to the Radio Chamber of Commerce for a meeting place.

Supported by Association of Commerce

Back of the movement to get the convention to Chicago stands the Chicago Association of Commerce, its president, E. E. Gore, being of the opinion that Radio will soon be one of the greatest industries in America and he believes Chicago should be the center of the manufacture of Radio apparatus.

Most of the exhibit space in the Coliseum has, of course, already been sold to the biggest manufacturers. A great deal of the remaining space has been reserved, subject to the approval of the management in regard to exhibits, etc. Every application for space is subjected to the most careful scrutiny. Restrictions similar to those imposed on exhibitors at the New York and Chicago automobile shows under the direction of the Automobile Chamber of Commerce have been imposed. Complete decorative and color schemes have been worked out and more money is being spent in making the Chicago Radio Show a presentable exhibition than has been spent on any other three Radio shows combined.

Make Rigid Restrictions

The restrictions are for the benefit of the exhibitor, as well as the spectator, and are aimed to afford the greatest opportunities for the exhibitor to get new business with a minimum of confusion.

One surprising feature of the preliminary arrangements for the show is the large number of communications from Radio dealers all over the middle west. Many of them are insisting that the railroads should make special rates. Others seek information regarding hotel accommodations and it is certain that hundreds of dealers will see the show before placing all of their winter orders.

Indications also are that all attendance records for the Coliseum, home of the biggest trade shows held anywhere in America, will be broken. There will be no "papering" and the management has announced that the number of passes will be held to the "irreducible minimum." Arrangements for the show have now reached such a stage that it can be said without fear of contradiction that the Chicago Radio Show will be the largest and finest Radio exposition ever held anywhere.

**Ten Stations Licensed for
Public Service Broadcasts**

CHICAGO.—Ten stations were licensed for public service broadcasting during the week of September 4 to 9. They are:

- WLAO, Anthracite Radio Shop, Scranton, Pa.;
- WLAM, Morrow Radio Co., Springfield, Ohio;
- WMAB, Radio Supply Co., Oklahoma City, Okla.;
- KFCC, Auto Supply Co., Wallace, Idaho;
- WMAJ, Drivers' Telegram Co., Kansas City, Mo.;
- KFBQ, Savage Electric Co., Prescott, Ariz.;
- WLAL, Tulsa Radio Co., Tulsa, Okla.;
- KFCP, Nielsen Radio Supply Co., Phoenix, Ariz.;
- WLAG, Cutting & Washington Radio Corporation, Minneapolis, Minn.;
- WKAZ, Landaus Music and Jewelry Co., Wilkes-Barre, Pa.

Now Have "Aircraft Radiomen"

CHICAGO.—A new type of Radio expert has just been designated. "Aircraft Radiomen" are now being developed by the Naval Bureau of Aeronautics at Pensacola, Florida, and the Army Air Service at Rantoul, Illinois. During the past year about 60 Radio operators for aviation work have been trained by the Naval Air Service at Pensacola, and assigned to active flying duty where they are doing excellent work as aerial Radio operators.

**INVENTS SMALL SIZE
DETECTORLESS SET**

NEW YORK.—E. B. Myers, inventor of the triode tube bearing his name, has applied for patents covering a new six-tube Radio frequency circuit without a detector tube. Tests made during a severe atmospheric storm were entirely successful. Even the announcer's breathing was heard. The set is entirely enclosed in a small box approximately the size of a cigar box. It has but one control knob to be operated, this being on a variable condenser shunted across the small loop aerial for the purpose of tuning. There are no rheostats or other controls.

Book Reviews

Radio for the Amateur. By A. H. Packard 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.

Experimental Wireless Stations. By F. E. Edelman. This book assumes that the reader has some knowledge of fundamental electricity and mathematics and is a readily understandable text for beginners in the art of Radio communication who desire to start with the elements. Price, \$3.00.

Elements of Radio Telephony. By William C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

The Thermionic Vacuum Tube and Its Applications. By H. J. Van der Bigg, M. A., Ph.D. This book supplies the first comprehensive and reasonably concise treatment of principles of operation and the more important phenomena exhibited by the passage of electrons through high vacua. Price, \$5.

Radio Telephony for Amateurs. By Stuart Bellantine, consulting engineer and formerly expert Radio aid, United States Navy. A book of 300 pages neatly bound and fully illustrated. A treatise on the Radiophone suitable for the beginner or amateur who desires to study the science from beginning to end. Price \$1.50.

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**ATLANTA GETS NEW
500-WATT STATION**

Success of Broadcasting in South
Brings Change in News-
paper's Plant

ATLANTA, GA. — Radio broadcasting has proved such a success in the south that the Atlanta Constitution has discarded its 100-watt set and installed a 500-watt outfit, the equal of any in the United States. The new station, whose call is WGM, gave its first concerts September 1.

The new station uses four 250-watt General Electric vacuum tubes, two of which are employed as oscillators and two as modulators. In addition to these powerful tubes, there is one 50-watt tube which acts as a voice amplifier. Another amplifier is concealed in the studio. Two thousand volts are used on the plates of the 250-watt tubes and 800 volts on the plate of the 50-watt amplifier tube.

Two Motor Generators Supply Current
High and low voltages are obtained by two massive motor generators. One delivers 2 1/4 kilowatts at 2,000 volts, while the other delivers one kilowatt at 12 volts for lighting the filaments of the tubes in the set.

All of the connections of the set are of copper tubing. The circuit is a modified form of the "Stanley British circuit," which has proved unusually effective. The aerial is of the cage type, and is 70 feet above the roof of the five-story Constitution building and 84 feet in length.

WGM will give nightly programs between 6 and 7 o'clock and between 9 and 10 o'clock. The Sunday hours are 3:30 to 4:30 and 9 to 10 o'clock. Music features these programs. The station has its own orchestra, and offers the best available amateur and professional talent. Lectures, sermons and other features are offered.

Phantom-Circuit

BUILD YOUR OWN. This marvel of mystery with no aerial, no loop, no ground brings in music instead of static showers. We consistently have concerts on Michigan from stations 100 miles distant, audible 150 feet from horn. The simplicity of this set will surprise you. No Radio frequency. Complete instructions including photo of circuit sent prepaid for 50c.

VESCO RADIO SHOP, Box 704, Vacaville, Calif.

**All Parts for the
ARMSTRONG
Super - Regenerative
CIRCUIT**

Prices Reasonable : Send for Circular

Kramer Radio Company
4713 Sheridan Rd., Chicago, Ill.

**"ALL-AMERICAN"
Amplifying Transformers**

Two years of successful use all over the world guarantees permanent satisfaction. Radio and Audio Frequency. SEND FOR CIRCULARS
RAULAND MANUFACTURING CO.
35 South Dearborn Street Chicago



Carter "TU-WAY" Radio Plugs

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

Baldwin Headsets

We have for immediate delivery a limited number of Baldwin headsets

Type F \$16.00
Type G \$16.00

Transportation paid in U.S. Cash with order or C.O.D.

Ashtabula Radio Sales Co.
ASHTABULA, OHIO

TRADE THE
"Q-R" Vernier Adjuster

MARK
PRICE \$1.50 Type 100



Pat. Pend'g

With this simple attachment you will eliminate capacity effect from the hands and the close micrometer adjustment enables you to tune in signals which you were unable to hear before.

Manufacturers Jobbers Dealers
Write for Our Unusually Liberal Discounts

Robinson Specialty Company
22 WALNUT STREET, KEYPORT, N. J.

THIS AD and 10c

—will bring you Cram's new Radio map of all broadcasting stations, regular price 35c.

It will also put you on our list to receive free our new catalog of standard Radio equipment.

Chicago Radio Apparatus Co., Inc.
"Dependable Radio Equipment"
415 SO. DEARBORN, CHICAGO

INTERNATIONAL AND ANNUAL

CHICAGO RADIO SHOW

at the
COLISEUM CHICAGO ILLINOIS

Saturday, Oct. 14 TO Saturday, Oct. 21

← THE PUBLIC WILL MEET THE MANUFACTURER WILL MEET THE PUBLIC →

In the Largest Street-Floor Exposition Building in the United States

Officially Indorsed by
National Radio Chamber of Commerce

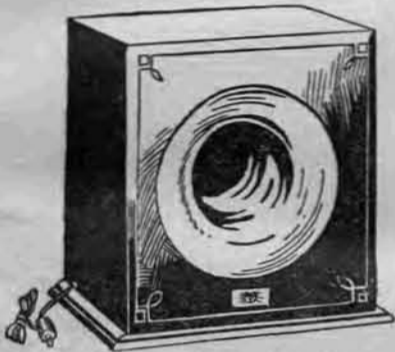
Business Office
549 McCORMICK BUILDING
Phone Wabash 1844

The Radiophonist's Mart

EVERY enthusiastic amateur, after having spent some time listening to the broadcasting of music with head phones, lets his thoughts wander toward loud speaking devices which enable the music to be audible throughout the room and permit other members of the family to listen in.

Most loud speakers possess a limited amount of distortion in reproduction. Retaining the original quality of the music is a rather difficult problem and a number of precautions must be taken in selecting the apparatus utilized.

The Planet loud speaker, manufactured by the Planet Radio Corp., of Chicago, Ill., possess some improvements over the usual types, inasmuch as it avoids the tin and brass effect so often found in the metallic horn amplifiers. The growling, scratching and grating noises are almost entirely eliminated. The emitter, or horn, is a casting of Murphy bell alloy, a secret composition metal claimed to have peculiar properties for sound reproduction. The construction called ram's horn is similar to that of the musical instrument known as the French Horn. The tones are clear, loud and distinct, with none of the echoes or secondary vibrations known as sound interference.



Clear Tone Marks Loud Speaker

The loud speaker can be attached to any receiving set with two or more stages of amplification. The device comes in a richly finished mahogany case and presents an attractive appearance with the horn in polished gold finish, enhancing the appearance of any receiving set whether at home, in the office, or in club rooms.

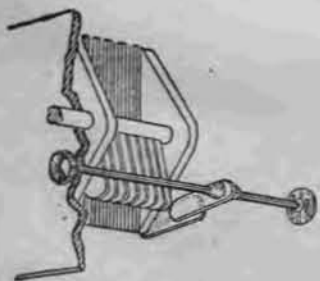
ALTHOUGH the individual cell construction in plate batteries has been featured before, the new type illustrated has an interesting feature in the addition of a tap switch included in the battery cover. This unit, manufactured by the Hipwell Mfg. Company of Pittsburgh, Pa., is an exact duplicate of the usual battery unit, but the cardboard cover has two binding posts at the base for fixed connections.

By means of the tap switch the potential between these two terminals can be varied in stages of 1½ volts to the maximum of 22½ volts. The binding posts of the cells project through the cover and the usual thumb screws are furnished so that fixed connections for any particular tap can be made if desired. The individual cells are replaceable.

The battery is neat in appearance and makes a convenient, compact unit for any Radio receiving set because the tap switch avoids an extra control on the panel, and at the same time permits the close regulation of the voltage often found necessary in the plate circuit.

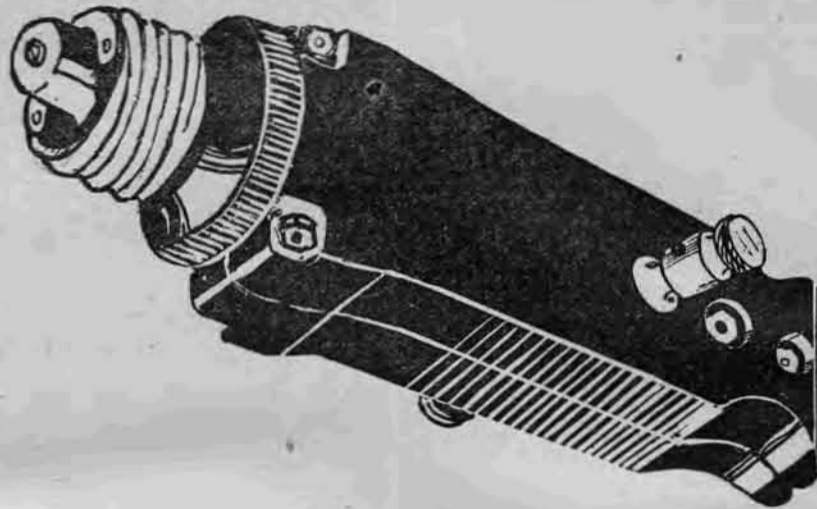
Small Vernier Condenser

A small projecting arm is attached to one of the tie rods of the secondary condenser and it becomes one of the stationary plates. A small rod is passed through the cabinet from the front to the back parallel with the condenser and on this



rod is fastened another similar arm. It can be held in place with two pieces of cork glued on either side. This is adjusted so that the movable plate comes close to the stationary plate. A wire connects the movable plate with the other movable plates of the condenser. A small dial may be used on the front if desired.—J. R. Wilkinson, M. D., Kankakee, Ill.

Socket Aerial Has Mica Dielectric



THE POPULARITY of socket type antenna is indicated by the number of different makes that have been placed on the market. The one shown in the illustration is manufactured under the trade marked name "Antennela" by the Chas. Freshman Company, Inc., of New York City.

The plug is very neat in appearance and is well constructed. The body is made in two longitudinal sections of insulating material, each side carrying a binding post and a condenser. The condensers use Mica dielectric and the plates are copper foil. The average capacity of the condensers is .0003 microfarad. As the plug is designed to withstand the pressure of at least 1,200 volts, the entire instrument is well insured against any break-down when used on the ordinary lighting circuit.

The plug is found to work very efficiently with both vacuum tube and crystal sets. Naturally the efficiency with a crystal set is somewhat limited. The usual screw plug is provided so that the unit may readily be connected to any

lighting socket. No current is consumed as the result of the attachment to the lighting wires, and static effects are greatly reduced.

Hints on Tuning

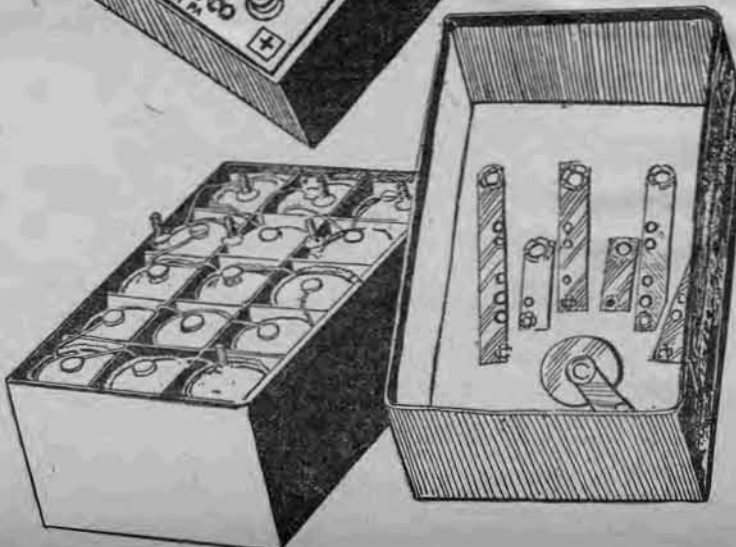
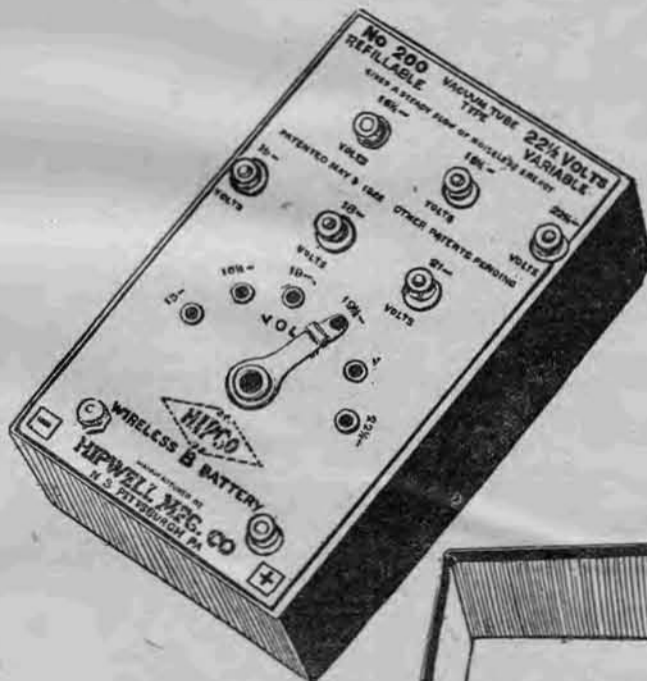
The operation of changing the adjustment of a crystal or mineral detector often results in a slight change in the wave length of the circuit. This is caused by the relatively high internal resistance of the crystal.

In view of this fact, slight readjustments of the tuning coil or of the variable condenser will be found advisable after the detector has been adjusted.—P. J. M.

Use for Old Dry Batteries

Do not throw out your old dry cells. The tar insulating material may be used. Binding posts may be filed down and made into ideal switch points. Fifteen or twenty old batteries may be soldered to a heavy wire and buried four feet in the ground and used for a ground connection.—George A. Muir, New York City.

Tap Switch Provided on B Battery



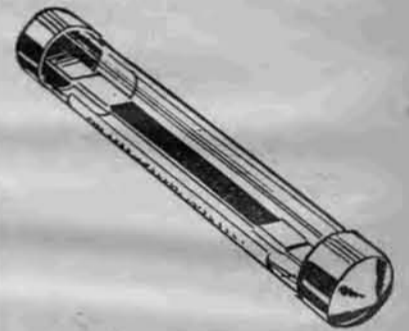
THE GRID leak as used in Radio receiving equipment consists of a non-inductive resistance unit. The function of a grid leak is to drain the grid of the excess negative charge which would gradually accumulate if the grid was perfectly insulated.

An ideal grid leak should embody a non-inductive, non-capacitive resistance of constant value. In order to maintain a constant resistance, the resistance element must be enclosed to prevent foreign objects from injuring or otherwise changing the element.

So far the ordinary grid leak fulfills these conditions. However, it has been found that many of the grid leaks on the market, did not remain constant in resistance, but at the end of several months even though not in use, it was found the value varied as much as 50%. Careful laboratory investigation revealed the fact that the resistance change was caused by molecular displacement of the material composing the resistance unit (usually some form of carbon).

It was found that this action could be prevented by enclosing a specially prepared resistance element in an evacuated container from which all moisture had been thoroughly excluded.

The Electrad Grid Leak, manufactured by the Electrad Corporation of America,



Leak Mounted in Evacuated Tube

New York City, is a resistance unit, ranging in values from .1 to 5 megohms (1 megohm equals 1,000,000 ohms). By obtaining a number of grid leaks of assorted values and combining them in series, parallel or series-parallel combinations, practically any desired value of resistance can be obtained.

To predetermine the value of any combination of resistance the following formula will be of assistance. For resistance in series:

$$R = R_1 + R_2 + R_3$$

For resistance in parallel:

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

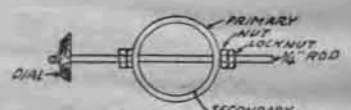
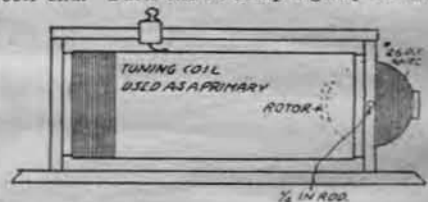
Mounting Jacks in Panels

When mounting jacks in panels, the long sleeve support should be turned so that the contacts will extend beneath the jack. This will prevent the dust falling in between the contact points. It often happens that a small particle of dust will cause an open circuit or at least noise in the receiving circuit.—W. W. Boes, Milwaukee, Wis.

Coupler Made from Tuner

It is not difficult to make a variocoupler from a two-slide tuning coil. The materials necessary to make the change are a ¼-inch threaded rod with nuts to fit, a wooden rotor, a 3-inch dial and ¼ pound of No. 26 D.C.C. wire for winding the rotor.

Wind the rotor with an equal number of turns in the two spaces allowed for the windings. Allow 10 inches of ends for connections. When the rotor is wound mount it on the rod and attach it to the coil as shown in the illustration. The rod rotates in ¼-inch holes bored through the coil end. Turn the nuts up tightly on the



wooden core. Keep one of the slider rods in place.

The rotor is the secondary and the tuning coil is the primary. One slider is used instead of taking off taps as in the usual type of variocoupler. This coupler has given good results on both tube and crystal rectifier.—George A. Coates, Milwaukee, Wis.

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

WKY, Oklahoma City, Okla. 485 also. 500 ml. Oklahoma Radio Shop. (Daily Oklahomaian) Daily, 12 m, weather; 7-7:30 pm, baseball, specials; 8:30-9:30, concert; 9, weather, news. Sun, 3:30-4:30 pm, concert. Central.

State, City, Call
Alabama: Birmingham, WIAG, WSY
Mobile, WEAP
Montgomery, WKAN

State, City, Call
Kentucky: Louisville, WHAS, WKAG,
Paducah, WIAR

State, City, Call
Wooster, WGAU
Youngstown, WAAY, WMO
Zanesville, WPL

Boy Killed by Live Wire; Atlanta Passes Ordinance
ATLANTA, GA.—Radio receiving outfits of either the outdoor aerial or indoor loop type may be installed here only after a license has been issued by the superintendent of electrical affairs, as a result of the passage of an ordinance by the city council Monday.

was electrocuted while stringing an aerial for a homemade outfit. High Tension Wire Causes Death
A bare copper wire which the boy held in his hand came in contact with a high tension wire, and death was almost instantaneous. An 11-year-old companion, who was assisting him, had climbed a tree with the other end of the wire, but as it was insulated he escaped without injury.

State, City, Call
Kansas: Anthony, WBL
Atwood, WEAD
Eldorado, WAH

State, City, Call
North Carolina: Asheville, WFAJ
Charlotte, WBT
Raleigh, WLAC

State, City, Call
Ontario, WJAX
Porto Rico: San Juan, WKAJ

Radio Digest Illustrated

TRADE-MARK

Published by the Radio Digest Publishing Company, Inc.

123 West Madison Street
Telephone State 4844-4845
Chicago, Illinois

E. C. RAYNER, Publisher

New York Office

2125 Broadway

58
PUBLISHED WEEKLYSUBSCRIPTION RATES
Yearly.....\$5.00 | Foreign.....\$6.00
Single Copies, 10 Cents

Vol. II Chicago, Saturday, September 23, 1932 No. 11

Aid to Abnormal Children

Stimulating Interest in the Backward Child

THERE has been a great problem confronting educational experts for years as to how the minds of abnormal children may be developed. It has been very difficult to arouse an interest in the minds of these children. This has been a great obstacle in their education. These experts say that Radio will prove of assistance in the development of the minds of these subnormal subjects. Radio will be a means of stimulating much interest, and, what is more, an interest in a science which demands logical reasoning from beginning to end.

Shut Off Broadcast Transmitters

Interference Results When Not in Actual Operation

BROADCASTING stations should shut off the transmitters when not in actual operation in order to prevent unnecessary interference from the carrier wave. This warning has been sent out by the officials of the bureau of navigation of the department of commerce. Sending stations are also asked not to interfere with the schedules of other stations. Transmitters also must be adjusted so as not to produce unnecessary interference. The bureau has found that some broadcasting stations have interfered over a band extending from 200 to 500 meters. This offense may hereafter be reported as a violation of the law, with the subsequent imposition of a penalty.

Ether Should Be Free to All

Who Owns This Medium That Some Stations Claim?

THE DISPUTE between several broadcasting stations in the East emphasizes the need of governmental control over broadcasts. The person or company who lays claim on the ether is rather "hoggish," for ether pervades all space according to the scientist. No person or company can or should claim this medium as his own. It should be as free as the air we breathe to all who care to use it. All humans must breathe the air and all broadcasting stations worthy of the name should be allowed to broadcast, providing they can entertain the public and give good service.

More Large Stations Required

Great Areas of the Country Have Insufficient Service

WITH the coming year there may be expected the erection of a number of good stations in many great areas of the country where there are no satisfactory broadcasting services at present. There are really very few powerful stations. These for the most part are located in the most populous centers, leaving a large field to cover in the country. Some small stations with only from twenty to thirty watts power in the antenna are scattered about, but they are quite insufficient to supply the service even at close range. Even then only the better receiving sets can pick them up at any great distance. It will be a great day for Radio when every tube set in the country will be able to be within range of a first class station.

Development Similar to Telephone

An Old Handbill Tells of First Telephone Line

SOMETIME during midsummer forty-five years ago the late Alexander Graham Bell gave a demonstration in Boston, Mass., of the wonderful new invention, the telephone. Boston was connected with Lawrence a distance of twenty-seven miles. Music, both vocal and instrumental, were sent over the line and received by an audience at the city hall in Lawrence. Not much does this little reminiscence, which comes from an old handbill, differ from the first trials of the Radiophone.

Fifty years ago news did not travel fast, consequently it took many years for the telephone to get into real action, but the Radiophone just dropped right in on us, taking only a few months to bring it up to the climax which required years with the advent of the telephone.

Naturally they are different instruments. The telephone called for equipment that required great capital to install and get a system in action, while Radio only requires sets, or instruments, which in many instances are built at home.

The telephone, considered a marvel, swept popular fancy over night, then it had a slump. Many predicted that the telephone craze would die out quickly, just as similar predictions are now being made for Radio. But the telephone has never died out. Neither will Radio. It is as much in its infancy as the Bell telephone was in the year 1877.

Condensed

By DIELECTRIC

All of us are more or less proud of our supremacy in matters pertaining to the Realms of Ether; we have an unquestioned right to be. This country is gradually being linked up with the rest of the world by means of the Radio stations built, or in process of building. The Radio Corporation of America found more sensitive spots on the gold nuggets of Sweden than either Great Britain, France or Germany, with the consequent result that many of those gold specimens will find their way to America without impedence in exchange for needed apparatus. The Swedes will enjoy the advantage of new methods for reducing static, along with it.

While gossiping about European countries, it is rather amusing to reflect on the status of Radiophony in Germany. Think of having to secure a license to receive, and to subscribe monthly to a very limited broadcasting service! It is no wonder German amateurs are scarce. But the choicest bit, to my mind, is the proud statement of the Postal Department that establishing 140 receiving stations "marks an epoch-making Kultur advance." Considerable distortion is noticed whenever an American VT detects the word "Kultur."

It is quite possible some of you fans may have heard of Hon. William Jennings Bryan. He transmits frequently and volubly on all wave lengths. In fact no one would dispute his being without a peer in the use of CW for Presidential broadcasting. The great Commoner lately paid a very high compliment to Radio, also extolling its use as an aid to his political party and hoping it would place a Democrat in the White House next time. Is Mr. Bryan planning an elaborate system of government broadcasting in the event he—? Just a moment, please. Some slight repairs are necessary in the sending set.

Passengers on trains and ships have some opportunity for listening in to various programs as they speed along. So there is added to the pleasure of traveling, that of hearing what the ether waves carry. Those fans able to cruise around in aeroplanes will have an excellent chance to hear quite a few stations, as did a party in Europe the other day. There were several Americans flying from Paris to Geneva who heard music broadcast from towns below them as well as a chorus of hunters' horns near Mont Blanc. When a fan gets up in the air he can quickly move from one broadcasting area to another, though of course he has the hum of the motor to contend with.

Theaters have acquired the Radio fever. It's very contagious. For those not owning a receiving set, a ticket to one of these theaters will suffice. New York City soon will have a Radio theater in the Grand Central Palace. Canada already has several. One set of artists for a half-dozen audiences and a single preacher to each section of the country may be the future's economic scheme.

Is it possible that some day we shall see nickel-in-the-slot machines supplying Radio programs to city dwellers? Fancy a group of youngsters getting their supply of gum from one slot machine, then turning to another to tune in a large broadcasting station. Mr. Wrigley should interest himself in this suggestion.

I am wondering if modest celebrities won't count Radiophony one of their greatest blessings. They can broadcast from the seclusion of their homes, or offices, to large crowds without the enervating thought that someone in the audience may have a carefully chosen bouquet of soft fruits ready to present them. A county fair, where soloists and the Mayor of the city near which it was being held remained in the city to address the crowds, presents an example of how it would work. I don't mean that there would have been a raid on the vegetable exhibits, if these principals had been there, but simply to show the convenience of using a microphone.

Can you picture 100,000 people filling the immense municipal stadium, now under construction on Chicago's lake front, to view the Olympic games, and all of Europe and the rest of America getting the results a few seconds after they are run off? That may sound like a faulty detector, but it's pretty certain to prove good tuning. In fact, if I don't burn out in the next few years, I am expecting to hear an orchestra concert given at the stadium along with thousands of other fans. Really the immense possibilities in broadcasting are but just crystallizing.

Such a thing as a church wedding, with all the mourners present excepting the bridegroom, has been known to the social columns of our sporting dailies, though such weddings have more or less failed. But now! Why the bridegroom, if he can't get to the church in time, can step around to the nearest transmitting set and send his answers in by Radio. You won't think this facetious when I add that the foregoing plan was suggested by reading of the strange request received by the operator on the Carmania, when that ship was off the coast of Ireland. Another vessel, having no prayerbook but having a fireman to bury, asked for the ritual to be sent by Radio. The Carmania supplied this service. What is there that Radio won't help? Reno may even lose some of its prestige.

An American fan in Turkey would be like a bootlegger boarding with a Federal agent; the restrictions are many and severe. I'm afraid our appreciation of the blessings we fans have in this country are not of proper amplification. No country equals us in Radio freedom.

RADIO INDI-GEST

Overcome by Ether Waves

Maurice G. St. Germain, of the Paris branch of the Guaranty Trust Company, had been courting Miss Loretta Harvey, New York, three years, but couldn't get up his nerve to propose. Coming into port on the Mauretania he proposed by Radio. She accepted. They're married.

G-WIZ, Some Fight!

Said WJZ to WOR, "I need the ether near and far." "All right for you, but bad for me," said WOR to WJZ.

An Old Adage Up to Date



Laugh by Radio and the world laughs with you.

Why We Need Secret Radio

When the girls get to sending their kisses by Radio, they mustn't be too particular who all tunes in on them.—Kansas City Star.

Poor Old Mary Again

"Mary, Mary, quite contrary,
How fares your Radio?"
"It worked all right, the other night,
But now it just won't go!"

But Don't Turn the Wrong Knob

French scientist claims to have invented a device which will send perfume by Radio. Fellow in Toronto can buy



nickel's worth of sniff water at five-and-ten-cent counter and spray his best girl in Winnipeg.—London, Can., Star.

What Is Home Without a Short Circuit?

Have you heard the latest Radio ballad "Home Is Where the Hook-up Is"?

All Off the Right Program

He wondered why "The Blue Danube Waltz" didn't sound just right. He was using a two-step amplifier.

They Musta Flashed to Her

Margie—And he had Radio eyes!
Sue—What do you mean, Radio eyes?
Margie—Oh, just eyes with a broad cast!

Have 'Em Buy a Portable Set

The only objection some people find in the Radiophone is that it furnishes a reason for staying at home.—South Bend Tribune.

How to be Unpopular with Your Mail Man



After Mr. A. Ham Bug answered a Radio advertisement he received a few circulars by mail.

Or Wearing Under the Vest

In the New York American Mr. Hearst takes up the negative side of the question, "Will the Radio make the newspaper unnecessary?" Radio might be used to light the fire in the kitchen stove, but we doubt if after it is read, it could be available for wrapping up the garbage.

Next Broadcast Will Be Reno

Now that they make love by Radio there's some fast sparking.—Columbus (Ohio) Citizen.

Use of the Radio Receiving Set in the Home

Part III—The Vacuum Tube Detector

By H. M. Towne

There has probably been no development in the art of Radio which has been of such great importance or which has contributed to such rapid progress as the development of the vacuum tube. This device in various modifications has found a rather wide application.

Some of these applications are—to rectify feeble Radio oscillating currents, to amplify very feeble signals, to generate high frequency for Radio transmission, and to convert commercial frequency (60-cycle) alternating current to a direct current supply of voltage which may be used in the transmitting equipment or for charging storage batteries. We will at present discuss the vacuum tube as a detector or rectifier of the feeble oscillations received on the antenna.

Construction of the Tube

The vacuum detector tube, as marketed at the present time consists of three elements or electrodes called filament, grid, and plate. These are mounted and sealed in a glass bulb from which the air is exhausted to a relatively low pressure, and are connected by small wires to studs on the base of the bulb which serve as connecting terminals. The filament is a loop of small tungsten wire, each end of which is connected to a base stud. The grid is a rectangular coil of very fine wire close around the filament loop, and is connected by one wire to a base stud. The plate is an oval or cylindrical form of thin sheet metal spaced uniformly around the grid.

Thus the inner element of the group is the filament and the outer element, the plate, and between these is the fine wire grid. A socket is used for mounting the complete vacuum tube in the same manner that a socket is used for an electric light bulb. The vacuum tube socket has four binding posts for connections which are usually designated "+" and "-" for the filament, "G" for the grid, and "P" for the plate.

Emission of Electrons

In the operation of the vacuum tube, the essential condition is that the filament be heated to incandescence. This causes it to liberate electrons. These electrons are inconceivably small bodies having a mass of 1/1800 of an atom of hydrogen which is the smallest atom of the elements. These small bodies called "electrons" carry a negative charge of electricity. In studying the action in the vacuum tube, we must constantly keep in mind the thought that the electrons emitted from the filament are negative charges of electricity. Together with this we must remember one of the laws of electrostatics which is that like electric charges repel each other and unlike electric charges attract each other.

The motion of electrons under the action of applied voltage is the basis for the modern conception of current flow in a conductor, and whenever we have electrons moving from one point to another, there must be an electric current flowing between these points.

Filament Action

Let us now consider the filament alone, assuming no grid or plate electrodes, but with the filament heated to incandescence by current from a storage battery. The high temperature of the tungsten filament causes these electrons to be emitted from the filament wire. The number of electrons thus emitted increases with the filament temperature, and the electrons are liberated in all directions around the filament.

When a negative charge is withdrawn from a particle, it leaves the particle with a positive charge so that when the myriad electrons leave the filament the latter is left positively charged. Since unlike charges attract, the filament being left positively charged will attract the negative electrons and so an equilibrium is established; that is, the same number of electrons are drawn back to the filament as are emitted. This state of affairs exists in most of our ordinary electric lamp bulbs, although never perceptible.

What Plate Does

Let us next consider the plate element of the vacuum tube in addition to the filament. Assume the positive pole of a second battery is connected to the plate and the negative pole to one of the filament terminals. The battery so connected results in a fixed opposite polarity between the plate and filament; that is, the plate is positively charged with respect to the filament, or, what is the same, the filament has a negative charge with respect to the plate.

The terms "positive" and "negative" are relative just the same as the words "more" and "less." Something cannot be more without that to which it is compared, being less relatively, and similarly, when a charge is said to be "positive" it simply means that something else is "negative" with respect to that charge.

The plate and filament then have unlike charges and the electrons given off from the heated filament are attracted to the

plate which results in a flow of current between filament and plate. This stream of electrons passing from filament to plate creates a so-called space charge. That is, the large number of negative charges in the space between the filament and plate tends to create a negative charge in the space. This negative charge in the space between filament and plate limits the number of electrons which can go to the plate. The negative space charge tends to neutralize the positive charge on the plate, and also tends to repel electrons just leaving the filament, so that for a given plate voltage the number of electrons which can flow to the plate is limited.

If the space charge can be eliminated or neutralized, the number of electrons which will flow to the plate will increase, and conversely if the space charge is increased, the number of electrons to flow from filament to plate will decrease.

Grid Controls Space Charge

The grid element of the vacuum tube located in the space between filament and plate performs the function of neutralizing or aiding the space charge. When the grid is made positive with respect to the filament it will neutralize the space charge

which is seen. A few short-circuits even of very short duration will consume more energy from the battery than normal operation in the Radio set would consume in many weeks. To test the battery a voltmeter should be used. The voltmeter has high internal resistance and does not permit appreciable current to be consumed.

Simple Single-Circuit Set

Let us now refer to the diagram, Figure 10, which shows a simple vacuum tube detector set. The single-circuit tuner consisting of variable condenser C and variable inductance L permits adjustment to the desired wave length just as previously described with the crystal detector sets. A 5-ohm adjustable resistance is connected in between one side of the storage A battery and one filament terminal. This adjustable resistance is called a filament rheostat. It provides for variation of the current through the filament, which, in turn, governs the filament temperature, and the latter determines the rate of electronic emission.

For the UV-200 detector tube, the rheostat adjustment should be such as to give 5 volts across the filament, which with a 6-volt A battery means 1 volt across the portion of rheostat in the circuit.

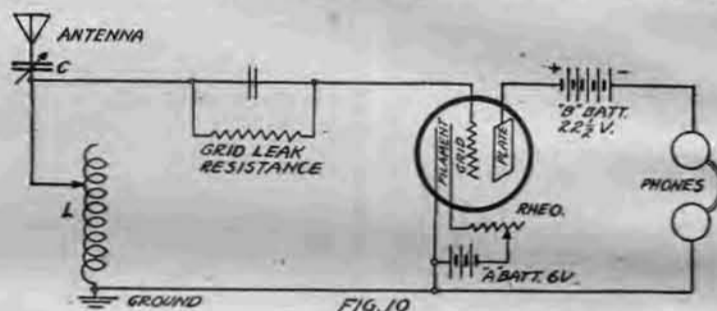


FIG. 10

Similar to Crystal Set

It will be seen that the grid and filament are connected across the inductance L, as in the case of the crystal detector. Oscillations of the antenna-to-ground circuit cause feeble oscillations across the inductor L and these are impressed between the grid and filament.

A small condenser, however, is inserted in the connection from inductor to grid. This is called a "grid condenser." It should have a capacity of from .0002 to .002 microfarad, varying somewhat with the vacuum tube characteristics. This grid condenser greatly augments the rectifying action in a detector tube.

In order to get good rectification, a charge of one sign on the grid should effect a much greater change of plate current than a corresponding charge of the opposite sign on the grid. The grid condenser enables the grid to build up very temporary negative charges caused by electrons which are attracted to the grid when it is positively charged by the incoming oscillation.

Rectifying Action

The grid will on each successive amplitude of oscillation tend to accumulate a negative charge which opposes the flow of electrons from filament to plate, and the result is a reduction in plate current. Thus, instead of the plate current being increased and decreased uniformly above and below its normal value, it is caused to decrease more when the antenna oscillation communicates negative charge to the grid, than it is increased when the oscillation communicates a positive charge to the grid. The result is a decrease in the average plate current and this average follows the shape of the varying amplitudes of the incoming oscillations.

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The fact that the plate current decreases below normal and does not increase above normal means that the change of current is uni-directional. These uni-directional changes in plate current cause pulsations in the telephone receivers corresponding to the voice frequencies which are super-imposed on the carrier wave at the transmitting station.

Grid Leak Function

It is sometimes necessary to shunt the grid condenser with a high resistance of one or two megohms (one megohm = 1,000,000 ohms) as shown in dotted lines, to prevent the grid from building up a permanent negative charge with respect to filament. In most vacuum tubes, however, the insulation resistance between grid and filament within the tube is low enough to allow the negative charge to leak off from the grid. Usually, therefore, the "grid leak" resistance as it is called, is not necessary but in each case may be worthy of trial and results compared.

Grid Controls Large Force

The practical part to remember in the operation of the vacuum tube is that the grid potential, or charge with respect to filament, will control the flow of current from the B battery through the telephone receivers and to the plate, and that a feeble change of grid charge will produce an appreciable change of current in the plate circuit.

It is analogous to a rifle where the trigger corresponds to the grid and the explosives in the cartridge to the B battery. A slight amount of energy on the trigger controls a large amount of energy stored in the explosives. The circuit shown is not used to any great extent because of the advantages of the regenerative or feedback circuit. The single vacuum tube regenerative receiving set will be described in the next section of this series.

(Continued in September 30 Issue)

Removing Enamel from Wire

Many amateurs have troubles while winding coils of various kinds with enamel magnet wire, because of the difficulty experienced in scraping off the enamel without breaking the wire. One way of removing the enamel is to pass the wire over a Bunsen gas flame several times, until the enamel melts and drops off. If it is impossible to do this because of circumstances the same result may be secured by dissolving the enamel in amyl alcohol.—P. J. M.

Amplifying Transformer Leads

Unless the outside lead from the secondary of an amplifying transformer is connected with the grid, there will be inefficient operation with any tube.

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Storage B Battery Made of Test Tubes

Positive and Negative Poles in One Lead Strip

A vacuum tube is useful only as a source of illumination if a B battery is not employed. Naturally with the extended use of the vacuum tube there is a great demand for B batteries. Most of the B batteries that have been used are the common flash-light or garden variety

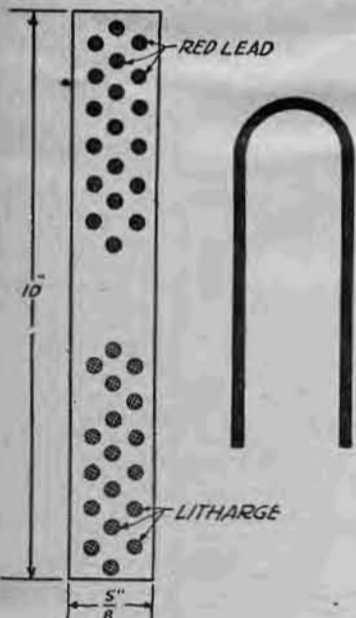
WORKSHOP KINKS? EARN A DOLLAR—

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

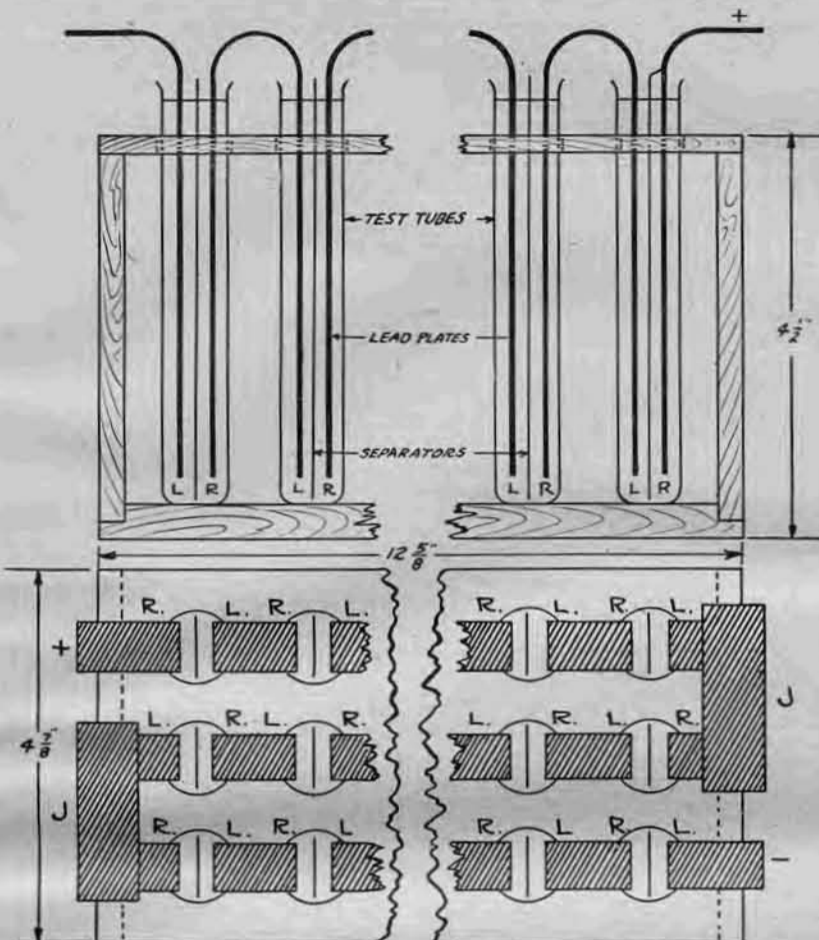
RADIO KINKS DEPARTMENT,
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123 West Madison St., Chicago, Ill.

of dry cell. These have much room for improvement.

In the first place, the voltage of the dry cell B battery does not remain constant. It may fall off considerably, especially when it is nearly discharged. Another of its disadvantages is that a faulty cell in its make-up is capable of producing a variety of loud and unpleasant crackling, frying sounds in the phones. Still another disadvantage is that you are obliged to buy a new battery before you wear out the old one. In the plate circuit of a vacuum tube set a comparatively high voltage is required, but practically no current (only a few one-thousandths of an ampere) is consumed. For this reason



TEST TUBES HELD IN A RACK



Test Tube Rack

Constructional details of the test tube rack are shown in the sketch. The rack consists of a wooden base twelve and five-eighths inches long, four and seven-eighths inches wide, and one-half inch thick; a wooden top the same length and width as the base, and one-quarter of an inch thick; and two wooden end pieces, each four inches long, four and seven-eighths inches wide, and one-quarter of an inch thick. It is assembled as shown.

The top of the test tube rack contains twenty-four holes, each seven-eighths of an inch in diameter. The holes are arranged in three rows, and each row contains eight holes, making a total of twenty-four. A sketch of the top of the test tube rack, with the central portion cut out to save space, is shown in diagram 2. This sketch illustrates the arrangement of the holes. Each hole contains a test tube. In order to secure a firm support for the tubes, it is advisable to scoop out a small portion of the base directly beneath each hole in the top, in order that the rounded ends of the test tubes may be held in place.

Making the Lead Plates

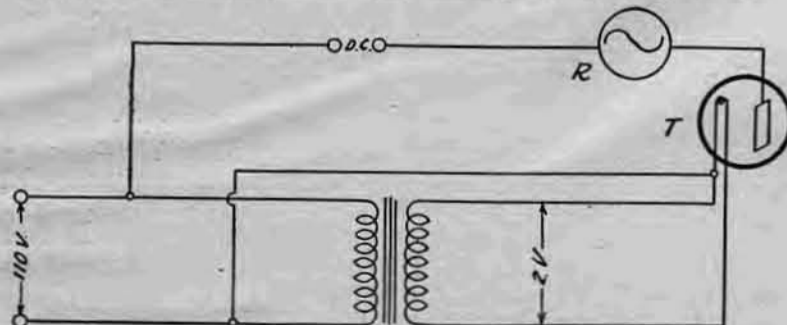
The storage battery plates consist of strips of lead ten inches long, five-eighths of an inch wide, and one-sixteenth of an inch thick. A smooth space about two inches long is left at the center, but from there to each end the plate contains groups of small holes. You can have these holes punched at a machine shop, or drill them by hand with a twist drill, or even punch them with a hammer and

with slightly diluted sulphuric acid until they are of about the same consistency as putty. Extreme care must always be exercised when handling sulphuric acid, as it is not only poisonous, but also extremely corrosive, and will quickly eat away almost any material it may happen to touch. And always remember that when you are diluting sulphuric acid you must slowly add the acid to the water, never under any condition add the water to the acid.

Paste Packed into Holes

The red lead paste must be packed down into the holes at one end of each plate, and the litharge paste into the holes at the other end. When pasting the plates it is advisable to place them on a smooth level surface, such as a sheet of glass, and force the paste tightly into the holes by means of a small, smooth, flat stick.

The greatest difficulty in making a storage battery of this kind is to prevent the paste from falling out of the holes. To overcome this difficulty some amateurs recommend charging the battery as soon as the plates have been pasted; while others prefer to let the plates dry for a few days before charging. Personally, we prefer the latter method, although some of the paste will probably fall out of the plates no matter what you do. We would suggest pasting the plates, bending them into the shape of a hair pin, so that they will fit into the test tubes as shown in diagram 1, and standing them aside to dry for at least three days. They will then be ready for use.



Method of Assembly

is a large nail. The machine shop method is the easiest and most satisfactory.

When the holes have been punched in all the plates, the plates must be "pasted." This consists of filling the holes at one end of each plate with red lead, and those at the other end with litharge.

Red lead is a salmon-red powder that can be purchased for ten or fifteen cents a pound at most paint shops. Litharge (lead monoxide, PbO) is a yellowish powder, and it also can be purchased for ten or fifteen cents a pound at most paint shops. Before being used each of these powders must be made into the form of a paste. This can be done by mixing them

Neighborhood Club Has Set for Many Listeners

In some neighborhoods only one Radiophone is to be found and it is usually kept busy during concert hours. This happened in one section in Akron, O. The owner of the outfit was kept busy entertaining his nearby friends. When gathered to hear a concert one evening they struck upon the idea of forming a Radio club. They found a roomy attic and the club of about twenty members furnished it with spare pieces of furniture from their homes.

The club room is open every evening from 6 p. m. until the meeting is closed. They have all the Radio magazines and papers on hand and a few of the popular games. In the scarcity of ether music, which sometimes occurs, the games afford amusement.

There is a small monthly charge for dues. The fund collected keeps the Radio outfit in trim and pays for operating expenses.

chemicals removed from its surface by soaking in hot water.

The ends of the plates with the red lead in them are marked R and the ends with the litharge in them are marked L. The red lead plates are the positive and the litharge plates the negative.

Plate Connections

In the arrangement and connections of the plates, R indicates the red lead ends of the plates and L the litharge ends. It will be noticed that each test tube contains one red lead plate and one litharge plate. The first plate in the first test tube and the last plate in the last test tube in each row consists of only half a complete plate. Each row of plates is connected to the preceding row by a lead jumper marked J. When all the plates have been connected together, the connections should be somewhat the shape of the letter Z. A binding post can be mounted at each end of the rows of plates to give variations of voltage. Each cell gives two volts, so the total potential from the twenty-four cells will be 48 volts.

Each test tube is filled to within an inch from the top with a 20 per cent solution of sulphuric acid and distilled water. As this solution evaporates it should be replaced by distilled water only, since the acid does not evaporate. In the course of time a sediment will gather at the bottom of the tubes. This should be removed every once in a while to prevent it from piling up high enough to touch the plates and short circuit them.

How to Charge It

The most satisfactory way of charging this battery from the 110 volt alternating current house supply is by means of a tungar rectifier, as shown in diagram 4. An electrolytic rectifier may be used, but it frequently proves troublesome and ineffective. The secondary winding on the transformer that delivers the 2 volts for the filament circuit of the tungar bulb should be a fairly heavy wire, since a rather large amount of current is consumed.

The battery should be charged until bubbles of gas are liberated freely from the plates. The first few times the battery is charged this may take several hours, but thereafter it should require only ten or fifteen minutes. After several charges the positive plates should turn a chocolate brown color and the negative plates a lead grey. During charging, care must be taken to see that the positive of the battery is connected to the positive of the charging current and the negative of the battery to the negative of the charging current.

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Simple Instructions for the Beginner

By Harry J. Marx

How to Make Laboratory Tests

LABORATORY tests are often considered as work purely for the engineer, far beyond the scope of knowledge of the amateur. Every Radio fan, however, has an interest in testing out new types of Radio apparatus for both receiving and transmitting. Such tests may cover anything from crystals to vacuum tubes. The method of procedure is considered as a mystery, when actually it is based upon the simple fundamental principles that cover all electrical work. It is only in the conclusions that are to be formed from the results of such tests that any detailed analysis and description is required.

A series of such tests will be given on this page from time to time. The actual performance of these tests illustrated with graphic charts wherever possible will be given with an explanation of the conclusions that can be drawn from the results of the tests. This series will cover vacuum tubes, detector and amplifying, transformers, impedance coils, rheostats, tuning apparatus, etc.

The first section of the series covers instructions for setting up a testing bench in the laboratory with details of connections and the testing instruments that are necessary.

Laboratory Location

In selecting the location for laboratory work, it is essential to keep in mind the conditions under which the work must be carried out. A well-ventilated, well-lighted room should be selected. Working in the corner of a dark cellar is not favorable for the carrying out of accurate and reliable tests of any kind. Naturally many amateurs will have certain limitations. The average apartment house is not afflicted with superfluous room space, and usually only a corner is available. Under such circumstances, it is advisable to make the best of the situation.

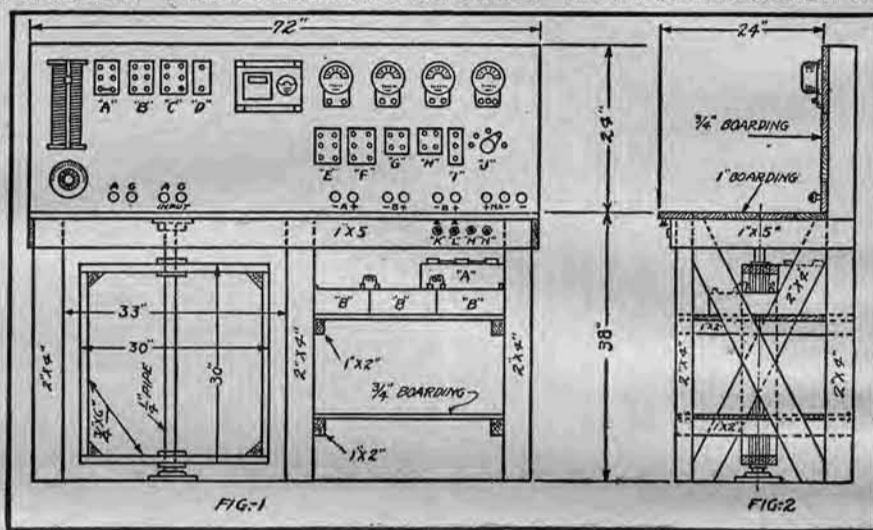
Wall sockets and plugs should be conveniently placed so that the source of lighting current is within close reach at all times. The room should be well lighted by daylight as well as by artificial light. Running water is more or less necessary in every laboratory.

The work bench should be kept separate from the testing bench. Neatness and cleanliness will do much toward making the laboratory an interesting diversion

voltmeter reading 0 to 150 volts, milliammeter with double reading 0 to 2 and 0 to 10 milliamperes, 5 double pole double throw switches, 1 single pole double throw switch, 1 single pole single throw switch, 1 tap switch with 5 contact points, 15 binding posts, 2 two-spring jacks, 2 three-spring jacks, 1 six-volt A battery, 6 22½-volt B battery units.

Aerial, Ground and Loop Connections

The outside aerial and the ground connections are led to the first two binding posts on the left-hand side marked A and G in Figure 1. These are the same as the



two shown on the left-hand side in Figure 3. The purpose of the binding posts is for connection to the usual commercial sets where no further antenna loading coil or condenser is required. Following the circuit in Figure 3 it will be seen that the single-slide tuner used as a loading coil can be thrown in or cut out of the antenna circuit by means of switch A. The advantage of this is to raise the natural wave length of the antenna circuit when desired. From here the connections run to switch B. By means of switch B the input binding post can be

control the potential of the batteries controlled by either switch G or switch H. Switch G closes the circuit of the 22½-volt B battery to the first set of B battery binding posts. Switch H likewise controls the flow of current to the second set of B battery binding posts. Switch I connects the negative terminal of the second series of batteries to either the positive or negative side of the first B battery. Switch J is connected to the circuit set of B batteries and permits control of the voltage range from 22½ to 112½ volts in place of a fixed voltage of 22½.

The last set of three binding posts are for connection to the milliammeter. It will be noticed that three terminals are provided. The two posts on the right con-

A wavemeter will be found essential for numerous tests and can be of the standard commercial type, or where finances limit, can be homemade as described in the September 9th issue of RADIO DIGEST. If homemade, the construction can be incorporated in the back board at about the center of the panel.

Battery Jars Make Dials

Procure some old battery jars from a battery station and with a compass draw circles to any diameter suitable to your needs on the sides or ends. Dip the jars into warm water for a few minutes until they are softened; then cut out the sides or ends with a sharp knife. Cut on the lines made with the compass.

Place the circular-formed disc between two heavy smooth boards until they have hardened. The edges of the disc may be smoothed off with sandpaper, and if the face is smooth, it can be brought to a polish by rubbing it with an oil soaked cloth; then rubbing it with a dry cloth, but if the face is rough it can be brought to a polish by sandpapering with double 0 sandpaper and then using the oil-soaked cloth as stated.

These dials can be marked by making small grooves with a knife along the outer edge, then filled in with white enamel. These dials are very attractive. If one of them happens to warp, it can be placed between two heavy smooth boards until it has straightened out.—F. Cerniglia, Tallulah, La.

Eliminating Body Capacity

When the vacuum tube receiving set is not properly tuned, the effect of touching the finger to some of the parts of the apparatus adds the body capacity to that of the set. If the signals are clear but faint when not touching any part, it is evident that the tube is not oscillating, which is a desirable condition, and better tuning is necessary.

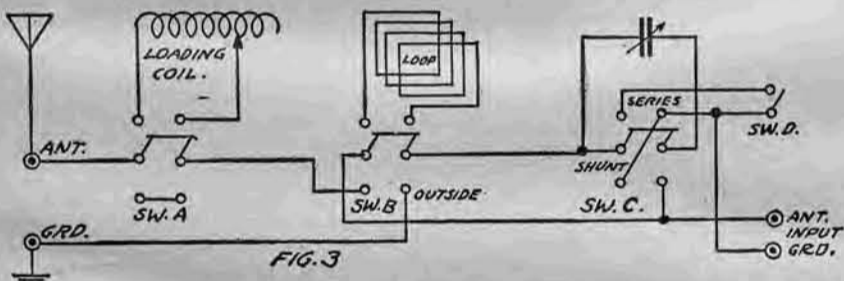
To eliminate the effect of the body, line the box or panel with a very thin copper or lead foil, being careful not to short-circuit any of the connections by keeping the foil clear of all metal parts. This electrostatic screen should then be grounded.

The capacity of the body of the operator materially affects the delicate adjustments of a regenerative set. In some sets, the dials are of metal and are grounded to act as shields.—P. J. M.

Crystal Demand Aids Mines

The widespread extension of the use of the Radio telephone is beginning to affect the mining industry in some quarters of the country to such a degree that the supplying of crystals of certain ores has become a small industry in itself.

These mineral crystals are used as detectors that transform the pulsating electrical vibrations received by the antenna into those that can be converted into sound waves by the telephone receiver. The bright cubical crystals of galena, a natural compound of sulphur and lead, is a favorite detector, and pyrite or chalcopyrite—the first a combination in chemical form of sulphur and iron, and the



from the usual cares of the business world.

Description of Test Bench

The construction of the test bench will require about the following lumber:

40 feet of 2"x4", 12 feet of 1"x5", 10 feet of 1" by 2", about 30 board feet of ¾" boarding, and 12 board feet of 1" boarding.

The method of mounting the loop aerial (see illustration), so that it can be rotated, is left to the ingenuity of the maker. For the loop aerial, 125 feet of No. 20 double cotton covered wire will be needed. There are 12 turns which are placed approximately ¼-inch apart on a 30-inch square, 6 turns on each side of the pivot rod.

Figures 1 and 2 show the construction and main dimensions of the bench. The construction need not follow the illustrations literally but can be varied to suit. The back board on which the instruments are mounted can be made of either hard rubber or bakelite built up in sections or of one piece, if the finances will permit. The surface of the bench should be constructed free of cracks and knot-holes. In the design, all instruments, binding posts and jacks are kept from the surface of the bench, and are mounted either on the back board or underneath the front edge. Two shelves are needed, roomy enough to carry both sets of batteries. If desired, however, the A batteries can be placed on the lower shelf, and the B batteries on the upper shelf.

If the woodwork is good, a coating of black asphaltum varnish, considerably thinned down with turpentine, may be applied. Then the bench will have a pleasing appearance and at the same time the asphaltum will act as an insulator.

Instruments Required

The instruments which should be purchased are:

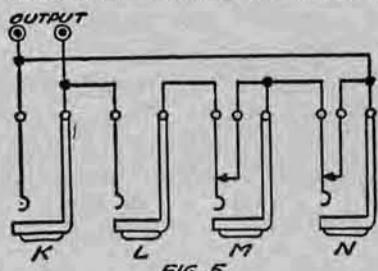
Single-slide tuning coil, 43-plate variable condenser with vernier attachment, battery charger, ammeter reading 0 to 5 amperes, voltmeter reading 0 to 10 volts,

connected to either the outdoor antenna or the loop aerial. Switch E permits the insertion of the variable condenser either in series or shunted across the two leads as desired. If switch C is closed for a series connection, then the condenser can be cut out by closing switch D, thus giving direct connection to either aerial or the condenser.

The suggested location of this apparatus is shown on the left-hand side of the board in Figure 1. The switches are marked with the letters A, B, C, D to identify them with the corresponding symbols in Figure 3.

Measuring Instruments

Figure 4 shows the connections for the remainder of the instruments on the back board of the working bench. Switch E is the A battery switch and permits connections to the battery charger or to the working binding posts marked -A+ on the board. The low reading voltmeter is shunted across the lower terminals of the



switch so that a constant reading is obtained while the battery is in use. In the same manner the ammeter is connected in series so that the current flow can be accurately followed. It may at times be advisable to have flexible leads so that the volt and ammeter readings can be taken after the rheostat connection to the tube.

Switch F controls the reading of the second voltmeter so that it is possible to

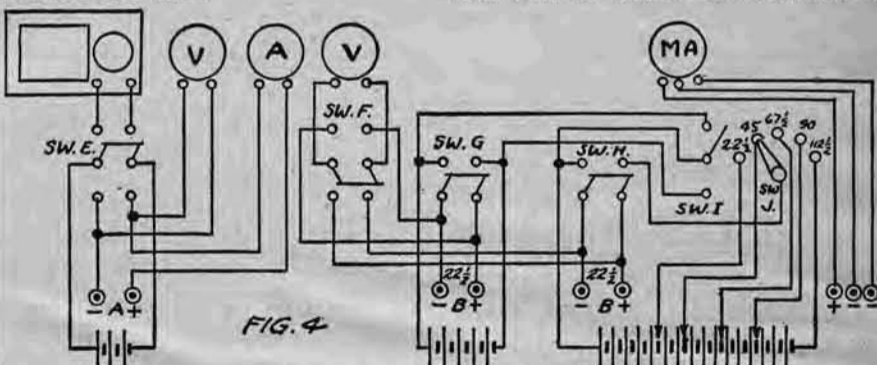
control the high and low scale reading.

Input of Jack Connections

Figure 5 shows the jack connections. The two binding posts are mounted under the front ledge of the bench. The jacks are on the face board. The first jack K gives a direct connection to the two binding posts, but jacks L, M and N are all in series. Jack L must be used first as this automatically closes the circuit. When jack M is plugged in, the contact of the center spring is broken and the circuit is closed through the plug. Jack K then can be used for the loud speaker connection, while jacks L, M and N can be used for inserting one, two or three sets of receivers in series. The two binding posts when in use are connected to the output posts on any set on test. A handy device would be a flexible cord with telephone plugs at both ends so that one end may be plugged into the set under test and the other one in the jack K. Receivers then can be inserted in jacks L, M or N as desired.

Wiring

The wiring should be concealed underneath the bench and in back of the panel. The leads should be kept straight and strapped to the board at regular intervals. When necessary, connections should be soldered and taped.



The battery connections should have flexible leads with spring clips so that batteries can be replaced or removed when necessary. Extra sets of flexible leads should be kept on hand for use with all of the measuring instruments as many circuits will be used where special connections are necessary.

In testing out new types of hook-ups, it is advisable to mount all apparatus on a separate board which can then be set on a testing bench and connected to the proper binding post. This method of mounting on a separate board avoids the necessity of fastening the instruments to the top of the working bench, which will soon spoil the surface of the boarding.

No dimensions have been given for the location and size of the apparatus mounted on the back board. These parts are apt to differ considerably in dimensions for the different type of commercial apparatus that may be purchased. The back panel has more than sufficient room so that additional apparatus can be mounted when found necessary as the work progresses.

other sulphur, iron and copper—are also used.

Eliminating A. C. Wiring Hum

If a regenerative receiver is placed near open or unshielded A. C. wiring in the house, the current flowing in the wire will cause a loud hum in the receivers. This objectionable difficulty may be eliminated by connecting either the plus or minus filament binding post of the vacuum tube socket through a one-microfarad condenser to the ground. Similar results may be obtained by grounding direct. This simple connection will eliminate all of the hum.—P. J. M.

How to Connect Ground Wire

The ground wire for receiving purposes should be connected to the cold water pipe as near the point where it leaves the ground as possible. This will promote efficiency. If the pipe goes several hundred feet around the building before it reaches the ground the antenna wave length may be too great for receiving desired stations.

Receiving Record Contest Standings

THE race continues! Amateurs who are able to BEAT THE RECORDS listed below, or who can claim distance receiving records (100 miles or better) for stations not listed below, but which are given in the broadcasting directory, need only send in their records to be listed along with their names.

One condition exists. Every record aspirant MUST GIVE THE NUMBER OF MILES AIRLINE represented by the record, if his letter is to be considered. Otherwise it will be thrown out.

Records to date are given below. The next complete listing will appear in the October 21 issue.

—Broadcast Editor.

- Station, Miles Record, and By Whom Heard**
- AG1-720-R. C. Bryant, Clarkston, Wash.
 - CFCA-426-E. W. Blanchard, Providence, R. I.
 - CHCB-2,150-J. Kurtz, Brooklyn, N. Y.
 - CHCB-800-L. C. Hurd, Madison, Minn.
 - CHXC-390-A. H. Gray, Mattapan, Mass.
 - CJCA-950-C. Hackney, Fairmount, Ind.
 - CJCG-380-G. W. Hutchinson, Santhey, Sask., Can.
 - CJNC-810-C. Hackney, Fairmount, Ind.
 - CKCE-450-N. Theobald, Attleboro, Mass.
 - DD5-1,265-C. D. Mason, Cleveland, O.
 - DN4-1,150-L. Cushman, San Diego, Cal.
 - KBN-3,650-G. Meek, Shinnston, W. Va.
 - KDAF-560-S. W. Wilkinson, Knoxville, Tenn.
 - KDN-2,200-F. C. Woodford and E. J. Poyser, Canton, O.
 - KDKA-1,364-M. Simmons, Shreveport, La.
 - KDOW-2,700-G. Meek, Shinnston, W. Va.
 - KDPM-500-E. A. Van Wart, Springfield, Mass.
 - KDPT-1,865-C. Hackney, Fairmount, Ind.
 - KDYL-1,275-C. Hackney, Fairmount, Ind.
 - KDYQ-2,250-C. M. Rice, Jr., Worcester, Mass.
 - KDYS-1,000-D. McQuaid, Vacaville, Cal.
 - KDYV-500-M. S. Miller, Sioux City, Ia.
 - KDZB-255-K. Kinney, Berkeley, Calif.
 - KDZH-635-A. West, Junction City, Wash.
 - KDZI-145-A. West, Junction City, Wash.
 - KDZQ-1,115-H. Tetric, Fairmount, Ind.
 - KDZR-260-G. Whisman, Spokane, Wash.
 - KFAC-500-D. McQuaid, Vacaville, Cal.
 - KFAD-850-W. Douglass, Guthrie, Okla.
 - KFAP-1,150-L. Cushman, San Diego, Cal.
 - KFAP-359-M. A. Jeffords, Wenatchee, Wash.
 - KPBB-558-M. A. Jeffords, Wenatchee, Wash.
 - KPBF-1,850-Wm. Douglass, Guthrie, Okla.
 - KFC-3,600-G. Boucher, Harrisville, R. I.
 - KFI-780-Wm. J. Jones, Rigby, Idaho.
 - KFU-760-D. Lombard, Malden, Wash.
 - KFV-600-D. McQuaid, Vacaville, Cal.
 - KFZ-3,500-E. Stonton, Vicksburg, Miss.
 - RGB-250-D. Lombard, Malden, Wash.
 - KGC-1,700-R. Luther, Jefferson, Ia.
 - KGG-605-K. Kinney, Berkeley, Calif.
 - RGN-230-M. A. Jeffords, Wenatchee, Wash.
 - KGW-270-Wm. F. Plaine, Lakeview, Ore.
 - KGY-265-D. Lombard, Malden, Wash.
 - KHE-650-E. A. Rose, Two Harbors, Minn.
 - KHJ-600-Wm. F. Plaine, Lakeview, Ore.
 - KHQ-2,400-C. M. Rice Jr., Worcester, Mass.

- KIZ-780-G. Whisman, Spokane, Wash.
- KJJ-740-R. C. Bryant, Clarkston, Wash.
- KJR-580-Wm. J. Jones, Rigby, Idaho.
- KJS-600-Wm. F. Plaine, Lakeview, Ore.
- KLB-780-H. E. Clarke, Grand Junction, Colo.
- KLP-3,125-W. G. Mann, London, Ont.
- KLZ-1,340-H. S. Rahiser, Pittsburgh, Pa.
- KMC-190-D. Wolfe, San Jose, Cal.
- KNJ-1,150-N. M. Holmes, Chippewa Lake, O.
- KNT-1,950-C. Hackney, Fairmount, Ind.
- KOB-1,550-C. M. Rice Jr., Worcester, Mass.
- KQV-350-K. J. Dunlap, Amsterdam, N. Y.
- KQW-1,900-C. Conrad, Logansport, Ind.
- KSD-1,500-G. Meek, Shinnston, W. Va.
- KUO-3,900-C. M. Rice Jr., Worcester, Mass.
- KUS-300-R. R. Martindale, Sonora, Cal.
- KUY-2,188-Roland Smith, Hilo, Hawaii.
- KVQ-850-R. C. Bryant, Clarkston, Wash.
- KVG-1,800-C. G. Munns, Holsington, Kan.
- KWH-710-Wayne Huber, Albany, Ore.
- KXD-120-J. J. Beales, Jr., San Anselmo, Cal.
- KYE-710-Wm. F. Plaine, Lakeview, Ore.
- KYG-2,300-J. F. Means, Oil City, Pa.
- KYI-500-Wm. F. Plaine, Lakeview, Ore.
- KYJ-1,300-H. Wantuck, Fayetteville, Ark.
- KYW-2,200-J. J. Beales, Jr., San Anselmo, Cal.
- KZC-850-J. J. Beales, Jr., San Anselmo, Cal.
- KZM-1,500-F. E. Cox, Hutchinson, Kan.
- KZN-1,875-C. M. Rice Jr., Worcester, Mass.
- KZY-380-Wm. F. Plaine, Lakeview, Ore.
- KZZ-2,600-A. Galloway, Jr., Grand Rapids, Mich.
- NOP-1,000-W. P. Bear, Fairfax, Mo.
- WAA-905-G. B. Clementson, Lancaster, Wis.
- WAA-1,100-A. H. Klein, Beaver Dam, Wis.
- WAA-150-W. D. Loomis, Jr., Blencoe, Ia.
- WAAH-220-D. R. Bartsch, Galena, Ill.
- WAAJ-1,450-C. E. Johnson, Chetek, Wis.
- WAAK-950-A. H. Gray, Mattapan, Mass.
- WAA-600-E. Amos, Chetopa, Kan.
- WAAO-600-J. Kurtz, Brooklyn, N. Y.
- WAA-1,500-A. C. Rogers, Jacksonville, Fla.
- WAAQ-2,200-W. Douglass, Guthrie, Okla.
- WAA-750-H. B. Higgins, Wellsville, N. Y.
- WAA-150-K. J. Dunlap, Amsterdam, N. Y.
- WAAW-650-G. K. McKee, Cincinnati, O.
- WAA-560-D. R. Bartsch, Galena, Ill.
- WAA-485-H. E. Davis, Omro, O.
- WAAZ-1,150-Warren & Ogg, Ferguson, Ont., Can.
- WAH-175-D. Keigley, Miami, Okla.
- WAJT-102-G. Hooper, Kansas City, Mo.
- WAJX-115-H. S. Rahiser, Pittsburgh, Pa.
- WBAB-290-A. H. Gray, Mattapan, Mass.
- WBAD-1,175-N. Theobald, Attleboro, Mass.
- WBAE-1,000-R. Siegel, Lawrence, Mass.
- WBAF-950-F. S. Cates, Jacksonville, Fla.
- WBAH-1,290-Wm. Douglass, Guthrie, Okla.
- WBAJ-900-W. Douglass, Guthrie, Okla.
- WBAK-750-H. Walrath, Cedar Rapids, Ia.
- WBAM-740-C. Hackney, Fairmount, Ind.
- WBAO-580-E. S. Bee, Brookhaven, Miss.
- WBAP-2,000-J. Kurtz, Brooklyn, N. Y.
- WBAQ-475-C. Revelle, Kansas City, Mo.
- WBAU-680-E. A. Van Wart, Springfield, Mass.
- WBAV-435-D. R. Bartsch, Galena, Ill.
- WBAW-500-E. B. Wagie, Geneseo, Ill.
- WBA-800-C. C. Dancer, Chicago, Ill.
- WBA-715-H. E. Jameson, Milwaukee, Wis.
- WBAZ-1,100-W. Douglass, Guthrie, Okla.
- WBL-1,450-C. H. Vale, Providence, R. I.
- WBM-740-F. F. Simms, Petersburg, Va.
- WBT-450-R. U. Waite, Vineland, N. J.
- WBU-800-W. A. Knight, Hudson, Mass.
- WBY-1,300-J. Kurtz, Brooklyn, N. Y.
- WBZ-1,400-C. Pearce, Hallis, Kan.
- WCAB-325-H. S. Rahiser, Pittsburgh, Pa.
- WCAC-550-N. G. Garlock, Galena, Ill.
- WCAG-1,460-K. McNeil, Ottawa, Ont., Canada.
- WCAJ-2,000-G. Meek, Shinnston, W. Va.
- WCAK-1,100-F. J. McKenny, New Prague, Minn.
- WCAL-475-H. Tetric, Fairmount, Ind.
- WCAP-120-E. B. Wagie, Geneseo, Ill.
- WCAT-590-E. Dahlgren, Rice Lake, Wis.
- WCAU-570-Ray Whetsel, Noblesville, Ind.
- WCAV-800-A. R. Higdon, Henderson, Ky.
- WCAW-125-E. B. Wagie, Geneseo, Ill.
- WCA-700-Mrs. A. C. Wright, Kewanna, Ind.
- WCA-125-D. R. Bartsch, Galena, Ill.
- WCE-220-D. R. Bartsch, Galena, Ill.
- WCJ-1,000-Ernest Wendt, Hewitt, Wis.
- WCK-510-E. G. Waste, Spooner, Wis.
- WCM-1,500-C. M. Rice, Jr., Worcester, Mass.
- WCN-1,330-C. N. Schwab, Grinnell, Ia.
- WCV-1,100-W. Easley, Enid, Okla.
- WCX-780-W. D. Loomis, Jr., Blencoe, Ia.
- WDAB-690-N. Theobald, Attleboro, Mass.
- WDAC-350-F. W. Steffen, Hartley, Ia.
- WDAD-1,470-N. Theobald, Attleboro, Mass.
- WDAE-1,400-J. Kurtz, Brooklyn, N. Y.
- WDAF-1,800-G. Meek, Shinnston, W. Va.
- WDAH-1,200-C. Hackney, Fairmount, Ind.
- WDAJ-780-T. R. Gentry, Dallas, Tex.
- WDAK-1,320-R. Hastings, Atchinson, Kan.
- WDAL-1,500-M. M. Cardwell, Republic, Kan.
- WDAM-350-H. B. Blowman, Fairmont, W. Va.
- WDAN-1,375-W. H. Spencer, Montreal, Can.
- WDAP-1,150-F. S. Cates, Jacksonville, Fla.
- WDAS-1,035-W. G. Isemonger, Middlothian, Ill.
- WDAU-1,800-A. L. Lewis, Stanberry, Mo.
- WDAW-895-C. N. Schwab, Grinnell, Ia.
- WDX-300-S. C. Cushman, St. Paul, Minn.
- WDAY-960-L. H. Krampant, Medina, N. Y.
- WDF-747-Dick Anderson, Norman, Okla.
- WDL-450-F. F. Simms, Petersburg, Va.
- WDM-325-K. J. Dunlap, Amsterdam, N. Y.
- WDT-1,150-R. Hastings, Atchinson, Kan.
- WDY-1,250-H. L. Peterson, Charles City, Ia.
- WEAG-510-M. Owen, Starsville, Ga.
- WEAD-915-M. Gazda, Chicago, Ill.
- WEAH-800-H. S. Juday, Eldorado, O.
- WEAO-2,500-Dobson & Tucker, Oakland, Cal.
- WEAR-160-H. Kunkel, Jr., Jersey City, N. J.
- WEAS-400-W. H. Pettit, Cincinnati, O.
- WEAT-1,175-R. Luther, Jefferson, Ia.
- WEAU-900-J. R. Hale, Houston, Tex.
- WEAV-730-R. J. Hanks, Dallas, Tex.
- WEAY-1,000-W. D. Loomis, Jr., Blencoe, Ia.
- WEAZ-310-H. Tetric, Fairmount, Ind.
- WEH-500-J. K. Stafford, Decatur, Ill.
- WEI-2,000-Wm. Hayes, E. Liverpool, O.
- WEV-175-A. P. Shelton, Memphis, Tenn.
- WEW-510-L. C. Hurd, Madison, Minn.
- WEY-925-W. G. Mann, London, Ont., Canada.
- WFAA-1,070-J. S. Morack, Chicago, Ill.
- WFAD-675-H. Tetric, Fairmount, Ind.
- WFAE-1,970-Wm. Douglass, Guthrie, Okla.
- WFAF-325-S. W. Farmer.
- WFAT-780-L. G. Irons, Ferguson, Ont., Can.
- WFI-1,950-W. Douglass, Guthrie, Okla.
- WFO-600-C. F. Lovely, South Amboy, N. J.
- WGAB-230-R. J. Hanks, Dallas, Tex.
- WGAL-550-F. W. Sullivan, Roxbury, Mass.
- WGAM-765-R. Latta, Clinton, Wis.
- WGAQ-950-H. S. Rahiser, Pittsburgh, Pa.
- WGAU-360-R. U. Waite, Vineland, N. J.
- WGAY-970-N. Theobald, Attleboro, Mass.
- WGF-1,000-E. K. Kitts, Bluefield, W. Va.
- WGH-560-H. S. Rahiser, Pittsburgh, Pa.
- WGI-1,000-H. Walrath, Cedar Rapids, Ia.
- WGL-1,652-M. Simmons, Shreveport, La.
- WGM-675-W. G. Mann, London, Ont., Canada.
- WGR-910-C. N. Schwab, Grinnell, Ia.
- WGY-3,100-J. J. Beales, Jr., San Anselmo, Cal.
- WHA-1,300-F. S. Cates, Jacksonville, Fla.
- WHAF-820-M. Johnson, Atchison, Kan.
- WHAJ-600-A. R. Connet, Providence, R. I.
- WHAM-300-R. U. Waite, Vineland, N. J.
- WHAS-1,060-F. W. Sullivan, Roxbury, Mass.
- WHAZ-910-G. B. Clementson, Lancaster, Wis.
- WHB-1,220-E. A. Howard, Watch Hill, R. I.
- WHD-880-L. C. Hurd, Madison, Minn.
- WHK-1,550-L. W. Gusheon, Pirth, Ida.
- WHQ-725-H. Walrath, Cedar Rapids, Ia.
- WHW-525-K. J. Dunlap, Amsterdam, N. Y.
- WIAH-120-J. & B. Radio Co., Avoca, Ia.
- WIK-260-F. F. Sims, Petersburg, Va.
- WIL-670-J. K. Stafford, Decatur, Ill.
- WJAD-1,350-F. A. Rose, Two Harbors, Minn.
- WJAM-500-F. A. Rose, Two Harbors, Minn.
- WJAX-375-A. J. Barron, Johnson City, Tenn.
- WJH-1,000-R. O. Wise, Villisca, Ia.
- WJK-500-K. J. Dunlap, Amsterdam, N. Y.
- WJN-403-G. Hooper, Kansas City, Mo.
- WJX-1,000-H. L. Peterson, Charles City, Ia.
- WJZ-3,000-J. J. Beales, Jr., San Anselmo, Cal.

- WKAA-1,800-D. and R. Zeit, Cedarville, Mich.
- WKAQ-1,550-W. Douglass, Guthrie, Okla.
- WKC-900-R. Luther, Jefferson, Ia.
- WKL-675-Dr. H. Aldrich, Fairmount, Ind.
- WKN-1,150-R. U. Waite, Vineland, N. J.
- WKY-1,250-R. Zorger, Akron, O.
- WLAJ-865-G. B. Clementson, Lancaster, Wis.
- WLB-1,500-C. H. Vale, Providence, R. I.
- WLK-970-M. Simmons, Shreveport, La.
- WLW-600-Wm. Holland, Brookline, Mass.
- WMB-925-J. M. Lambert, Kankakee, Ill.
- WMH-750-A. H. Gray, Mattapan, Mass.
- WMO-325-K. J. Dunlap, Amsterdam, N. Y.
- WOC-1,300-F. J. Madford, Jr., St. Petersburg, Fla.
- WOD-585-Dick Anderson, Norman, Okla.
- WOE-460-E. B. Wagie, Geneseo, Ill.
- WOH-1,050-F. S. Cates, Jacksonville, Fla.
- WOI-1,241-M. Simmons, Shreveport, La.
- WOK-800-E. G. Waste, Spooner, Wis.
- WOO-800-C. R. Hocker, Penbrook, Pa.
- WOQ-1,100-G. W. Perkins, Thomson, N. Y.
- WOR-1,100-J. Hammond, Minneapolis, Minn.
- WOS-1,200-J. Kurtz, Brooklyn, N. Y.
- WOU-1,950-G. Meek, Shinnston, W. Va.
- WOZ-1,050-F. S. Cates, Jacksonville, Fla.
- WPA-900-J. R. Chrissinger, Downers Grove, Ill.
- WPE-900-L. H. Krampant, Medina, N. Y.
- WPI-230-R. U. Waite, Vineland, N. J.
- WPL-690-R. Luther, Jefferson, Ia.
- WPO-750-Wm. J. Leo, Jacksonville, Fla.
- WPK-775-A. H. Gray, Mattapan, Mass.
- WRL-310-W. E. Thomas, Altoona, Pa.
- WRR-1,000-Lee Augustus, Ypsilanti, Mich.
- WRW-1,250-K. E. Gabbert, Clay Center, Kan.
- WSB-1,700-H. E. Cutting, Bozeman, Mont.
- WSL-240-R. U. Waite, Vineland, N. J.
- WSN-450-L. H. Krampant, Medina, N. Y.
- WSX-600-H. Tetric, Fairmount, Ind.
- WSY-960-E. A. Van Wart, Springfield, Mass.
- WWI-1,200-F. S. Cates, Jacksonville, Fla.
- WWJ-2,200-F. W. Hill, Cristobal, C. Z.
- WWL-507-Mrs. A. C. Wright, Kewanna, Ind.
- WUW-320-H. B. Blowman, Fairmont, W. Va.
- WWZ-215-H. S. Rahiser, Pittsburgh, Pa.
- 2XA-150-J. Kurtz, Brooklyn, N. Y.
- 2XAI-950-C. W. Dow, Port Byron, Ill.
- 2XB-350-H. B. Blowman, Fairmount, W. Va.
- 2XI-350-H. S. Rahiser, Pittsburgh, Pa.
- 2XJ-1,900-C. G. Munns, Holsington, Kan.
- 2XY-525-A. J. Barron, Johnson City, Tenn.
- 3XW-780-F. J. Hinds, Berwyn, Ill.
- 4CD-880-E. Dahlgren, Rice Lake, Wis.
- 9ARU-100-W. H. Pettit, Cincinnati, O.
- 9YA-270-E. Dahlgren, Rice Lake, Wis.

RURAL BANKS HEAR

(Continued from page 5)

Its use for the broadcasting of market quotations is at least a recognition of its immense practical value to the industrial, commercial and financial world. The Union Trust Company is not broadcasting an entertainment in any sense of the word. It is sending to bankers, business men and homes tangible, financial information which will be of value to people in a strictly business way.

Has Modern Transmitter

The Union Trust Company broadcasting station is said to be one of the largest and most up-to-date in this section of the country. The transmitting room has been made soundproof by felt inlays. The mechanical room contains the entire broadcasting apparatus and also receiving apparatus. A 5-kilowatt motor generator furnishes the power. Four 250-watt tubes are used in this station and in conjunction with them a two-stage voice amplifier. The hours of the daily broadcasting by WJAX are 9 A.M., 10 A.M., 2 P.M., and 3 P.M., Eastern standard time.

Recently a test was conducted to ascertain the efficiency of the new station and to find out the area covered by the broadcasts. Letters were received from various points far distant from Cleveland, among them being Little Rock, Ark., Baltimore, Md., Newport, R. I., and Marshfield, Wis., saying that the music broadcast at this test was heard clearly and distinctly.

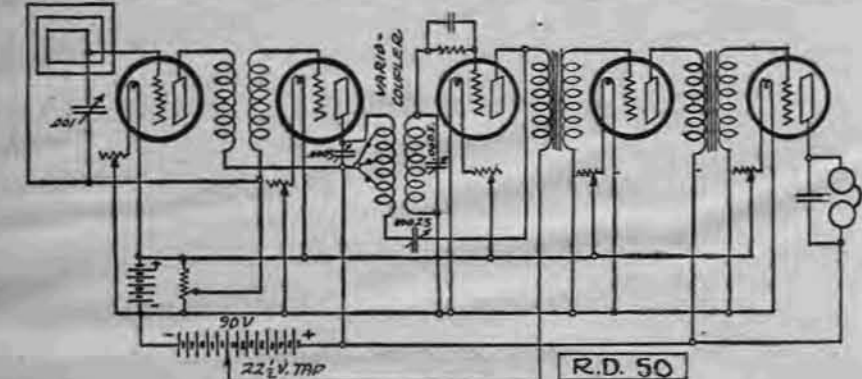
Strengthening Tube Signals

Radio enthusiasts having receiving sets employing only a single vacuum tube can strengthen the signals, especially if they are Radiophone signals, by taking the magnet poles from an old telephone receiver and placing them in different positions in front of the tube. Signals, ordinarily received very weakly, may be heard very clearly using this arrangement.—P. J. M.

Fixed Condenser on Phones

Very often the fixed condenser across the phones will have to be removed if one or more loud speakers or a Magnavox is attached in addition to the phones. It is well, therefore, to have the phone condenser connected with a switch.

HOOK-UP R.D.-50



This hook-up diagram is primarily designed for use with a loop aerial, having, as it does, two stages of Radio frequency, detector, and two stages of Audio frequency. It will be noticed that a variocoupler is used for the coupling between the last stage of Radio frequency and the detector, but that the variometers are omitted.

The hook-up, however, is regenerative because a .00025 mfd. variable condenser is inserted between the plate and primary circuit. If desired, a double throw switch can be inserted so that the usual outdoor aerial and ground can be connected to the primary of the variocoupler omitting the two stages of Radio frequency. The grid potential is controlled by means of a potentiometer across the A or filament bat-

tery. Rheostat control is employed on the filaments of all the tubes. Ninety volts are used on the plate circuits of the amplifier tubes, but the detector plate circuit is connected to a 22 1/2-volt tap. Four variable condensers are used on the hook-up, one 43-plate to control the wave length across the loop circuit, two 23-plate variables for controlling the primary and secondary of the variocoupler, and the fourth variable condenser (mentioned before) in the plate circuit.

Although not indicated here, it will be found advantageous to shunt .5 mfd. fixed condensers across the A and B batteries. This circuit, due to its numerous controls, is a little more difficult to operate and is only suggested to the more advanced amateur.

Questions and Answers

Mill Noises

(746)WEC

Have installed a Westinghouse RC set in the mill at this place. When the mill is running we get such a cracking noise (which I presume is static from the belts) that we are unable to do much. Have tried several different locations for the aerial. The last one we ran at right angles across the street from the mill. The office where we have the set is only a few feet from the mill.

Can you give me any information as to how to eliminate this?

A.—Try completely enclosing all sides of the set in a metal lined cabinet, using tinfoil or copper screen wire for lining.

Super-Regenerative Set

(754) REP

1. Will the super-regenerative hook-up on page 11, July 22 issue, be superior to a straight regenerative circuit with two stages both of Radio and audio frequency amplification?

2. There are getting to be so many broadcasting (and other) stations that we must work for selectivity also. Is the super-regenerative selective?

3. Can variocoupler and variometers be used in place of honeycomb coils except of course where they are used as transformers?

A.—1. Armstrong says so.

2. Very selective.

3. Yes, a variocoupler may be used, but rather than a variometer to tune the plate circuit, I would recommend a tickler.

A.—1. 1,000 miles or more probably, depending on station listened for. The long wave stations will come in at greater distances.

2. About 20 miles. Maybe 50 sometimes.

3. Galena is best of the two.

4. About three feet apart.

5. Resistance means little in phones. It is the number of turns per unit of space that really means quality.

6. Depends on distance away. Some energy will be lost when close and parallel.

7. Should not slant. It is best horizontal to ground.

8. Not much difference. Doubt any noticeable effect of change.

9. Increases selectivity of tuning. Variable condenser. Fixed condenser is good across phones as by pass for high frequency.

Stations and Their Calls

(755)LAD

I read your paper every week and would like to see these questions answered in it.

1. What is the range and who operates 3XW in Pennsylvania?

2. What is the range and who operates FOF of Washington, D. C., heard July 19?

3. Where is HKFD?

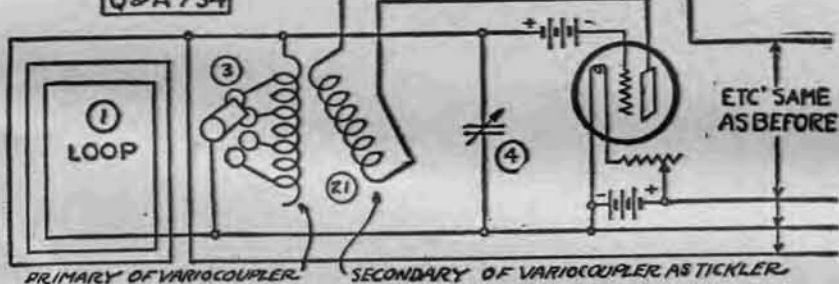
4. Is there a station at Key West, Fla.? If so, what is its call?

5. Is there a station in Kansas City, Mo., whose range is one hundred (100) miles and broadcasts on Thursday nights?

6. Who is, and also the range of WCAD.

A.—L. H. A. Beale, Jr., Parkersburg, Pa.

Q&A 754



This can be the variocoupler's secondary. If this doesn't tickle, double its number of secondary turns. See diagram showing part of circuit in questions (modified from S-17, page 11, July 22 issue).

Radio and Audio Frequency

(745)BS

The terms "Radio frequency" and "audio frequency" are rather confused in my mind. I would be very grateful if you would explain them to me.

1. What are the relative merits of each? Which is the more desirable and which is more practical? Are they obtained by the same method?

2. I have a loose coupler, tuning coil with a vacuum detector and accessories. My aerial is 100 feet long with a 50 foot lead in; it is approximately 35 feet high. Over what distance do you think I should be able to receive?

3. How much farther could I reach if I added a two step amplifier?

I have read your paper since the first issue, and consider it an authority on Radio.

A.—1. Radio frequency is frequency of the transmitting signal in its original form and is not heard in a phone set. Audio frequency is the frequency of Radio frequency after passing through the detector and a head set or audio frequency transformer. The impedance effect of either of the latter bunch hundreds of Radio frequency cycles into one audio frequency cycle. The audio frequency is audible, as it is below 10,000 cycles per second and therefore causes a sound that is in the possible range of hearing of the average human being. Both systems are desirable and practical. Radio frequency amplification is necessary for long distance work.

2. About 50 miles.

3. About 200 miles.

Good Questions

(748)EM

As a reader of your admirable paper I would like to ask you a few questions.

1. About how far should I be able to receive Radio telegraph signals with a three thousand five hundred (3,500) meter loose coupler, a pair of three thousand (3,000) ohm phones (Murdock 56) and a crystal detector with a two (2) wire, hundred (100) foot aerial?

2. How far can I hear phone signals?

3. Which mineral is better for detector, galena or silicon?

4. How far apart should aerial wires be?

5. What is the advantage of three thousand (3,000) ohm phones over two thousand (2,000) ohm phones?

6. Will a telephone line interfere with an aerial if it is nearly parallel to it?

7. At what angle should an aerial slant, or should it slant?

8. About how far should I hear Radio telegraph signals with a variometer and variocoupler instead of the loose coupler?

9. What help would a variable condenser be? A fixed condenser?

Range at least 700 miles.

2. NOF is the call. It is the Naval Radiophone station at Anacostia, D. C. (near Washington), range is unknown.

3. HKFD? If you heard it right it is some station licensed by the Republic of Columbia, South America. It may have been a ship flying their flag.

4. Yes, a naval station, NAR.

5. Yes, WHB, Sweeney Auto & Tractor School, 8-10 p. m. (Central) Thursday nights. Range, 1,000 miles.

6. St. Lawrence University, Canton, Ohio. Range unknown.

Wood Panels

(366)RT

I bought my first RADIO DIGEST and like it fine. I intend to get it regular from now on. I am building my own receiving set and trying to make as good a one as I can for the small amount of money I have to invest in it. It will have about the same grade of parts and the same design as the Remler Type Q three-coil set with the detector.

I am going to use a vernier condenser with the .001 mfd. variable condenser just the same as is used with the .005 variable condenser. Also a vernier rheostat.

Could I use shellacked redwood for the panel or would that leak across between the instruments? If redwood would not do advise what other wood or cheap material I could use. My panel will be about 15 by 20 inches.

My aerial will be 50 feet high and 225 feet long. Would it be better to put an insulator in my wire so as to make the aerial shorter? I live in the country away from any power lines. There will be a tree about 10 or 15 feet below the aerial and about 50 feet from the lead in.

A.—Wood panels always permit leakage. Use fibre, bakelite, formica or hard rubber. Use insulators in order to make your aerial 160 feet long, including the lead-in. As long as wires don't touch the trees you're all right.

Patent Infringement

(490)CLK

Your splendid "RADIO DIGEST" as well as most other Radio magazines tell how to make all kinds of Radio sets. Now since the craze for receiving sets is at its height and thousands disappointed at having to wait indefinitely for the factory catch-up, many of us amateurs have been busy making our own and friends' sets. As a rule, after one builds a really efficient set it is not long until he wants to try his hand at some different design. He wants to try them all and as a rule he, in time, has several outfits on hand usually. Especially in the summer when the demand for Radio is so great it is found that a good set is not only salable, but in great demand, and if it is made well as to looks and efficiency, it will even bring a good price.

Now will you kindly tell us if we are at liberty to make and sell such sets as are described in each issue for your magazines.

You publish the information freely but

I have never yet seen any warning accompanying these instructions as to where any such design happened to be protected by patents.

Will you kindly say if one would be permitted to build and sell the "single inductance" set using one rotor, variable condenser with switch and two stage audions, purchasing all the parts but winding the inductance and building the cabinet and assembling it himself.

A.—You can build and use your own sets but if you sell same you must watch patent infringements. You cannot manu-

facture for resale any patented article or circuit without permission of the patentee.

Resistance

(478)JNR

Please tell me the resistance of one Eversharp lead, grade HB, one and one-quarter inches long (1 1/4").

A.—Resistances will vary due to the amount and kind of graphite and the molding pressure. A Wheatstone bridge will tell you what the resistance is in any case.

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Radio

Illustrated



Art has its fling with Radio. One of the figures in the group at the fountain just south of the Art Institute, Chicago, listening in on the concert given by KYW.



Chilo, the chimpanzee of the Milwaukee zoo, has his share of the Radiophone. Animals frequently show signs of being much interested as they listen in on a concert or a speech.

The illustration shows a high-speed ink recorder. It records trans-oceanic messages at 200 words a minute. Samuel Miller is recording a message from Nauen, Germany.



Tom Thumb, the baby elephant, is shown at the receiving set, supposed to be listening to a message from his mother. This small animal weighs 276 pounds. © INT.

