

Radio Digest

EVERY WEEK

Illustrated

TEN CENTS

TRADE-MARK

Vol. II

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CHICAGO, ILL., SATURDAY, JULY 15, 1922

No. 1

RADIO TREATS CANCER

FRENCH PLANES FLY AND LAND BY RADIO

AUTOMATIC AVIATION IS IDEAL GOAL SOUGHT

Land Station in Trial Controls Ship in Flight for More Than Hour

(Special to RADIO DIGEST)

PARIS, FRANCE.—In addition to controlling the flight of an aeroplane by Radio, attempts are being made in France to devise mechanism to enable a plane not only to ascend pilotless but also to land without any hand on the controls.

Devices in course of perfection show wonderful ingenuity. In one case, a machine without a pilot, its engine having been started, runs across the aerodrome, causing to revolve at a rapidly increasing pace a small two-bladed fan or screw between the wings. The fan as soon as it turns a certain number of revolutions actuates mechanism which places the control surface of the machine in the right position for ascent, its manoeuvres while aloft being controlled by Radio.

Lands Automatically.

When the time comes for landing, a signal has the effect of unrolling beneath the aeroplane a length of wire with a weight at the end. This weight, touching ground while the machine is at some little height, switches off the engine and causes the rear surfaces of the plane to set themselves in such a position that the landing wheels of the machine makes a smooth contact with the ground.

French Radio control of aeroplanes has achieved already a notable triumph. A large machine was taken up by its pilot, who left the controls and allowed the machine to be manoeuvred for more than an hour by Radio operators in a land station far below. At a given signal the pilot resumed control and landed.

WINNIPEG POLICE TO HAVE RECEIVING SETS

Law Enforcers of Manitoba Province May Be Equipped

WINNIPEG, CANADA.—Plans are under consideration to equip the Winnipeg police force with Radiophone receiving apparatus, and if this method of sending instructions to members of the force proves satisfactory, it may be inaugurated by the Manitoba police force.

PAGE GOLF PLAYERS AT TEE BY AIRPHONE

NEW YORK, JUNE 22.—To get in touch quickly with golfers on the links, the Winged Foot Golf Club is considering the installation of a Radio system on the new 36-hole layout which is being built at Mamaroneck. It is planned to have a Radio sending system at the clubhouse and aerials and receiving stations at each tee, so that members can be paged.



WANT AD SENT BY RADIO ETHER WAVES FILL HEAD

Oregon Newspaper Receives Unique Advertisement

PORTLAND, OREGON.—A unique point in Radio service was made in The Oregonian tower recently when an emergency call in lieu of telephone was sent in from station CLS, the Vancouver army post.

"We want to put a want ad in The Oregonian," the army operator said through the air during a testing period. A stenographer from the advertising department was sent to the tower room and took the message as if she were at the telephone.

Captain K. B. Wise, adjutant of the 59th infantry regiment, advertised for a second-hand English saddle, to use in polo practice at the army post. The complete advertisement was received by Radio and was sent to the composing room from the tower.

Picks Up Harmless Lunatic with Very Modern Symptoms

LAKEVIEW, ORE.—Sheriff Woodcock recently picked up a man near Summer Lake to give him a ride to Lakeview. The man gave his name as Henry John Scullion and after riding a few miles he called the sheriff's attention to the Radio music coming from the engine of the car. Later he told the sheriff that he could hear Radio music and conversation at almost any time. He also explained how the pictures of the big men in the movies were taken. He claimed that they were puffed up with gas, and stated that he underwent the same experience while crossing the desert, the picture men following him until an opportune time for snapping him. The poor fellow was brought to Lakeview, and on examination was declared insane and later taken to Salem for confinement in the state hospital.

TRIODE TUBE KNIFE CUTS OUT GROWTH

Dr. T. Howard Plank, Chicago Surgeon, Shows Wonderful Application

Machine Like Transmitter

Continuous High Frequency Alternating Current Cuts and Cauterizes Fast

Making many moments of pleasure in the homes of millions of persons is not the only use for Radio. Who would have dreamed it would also find its application in the cure of cancer, the dread disease of mankind? But such is the case. The same Radio frequency current, generated in the same fashion as for broadcasting, has been applied to the surgeon's scalpel and successfully used in curing the disease. Dr. T. Howard Plank, noted surgeon of Chicago, and possessor of the only Radio scalpel manufactured so far, exhibited the apparatus and held a cancer clinic recently before hundreds of members of the American Institute of Homeopathy.

The machine was built last November by A. J. Forsee, chief of government X-ray research and president of the High Tension Transformer and Equipment Company of New York. It was exhibited in May at the American Medical Association convention at St. Louis, Mo. Dr. Plank has used the apparatus experimentally since its conception and only now has announced his successful use of it.

Looks Like CW Transmitter

Upon opening the cabinet housing the machine, one sees the identical apparatus used in producing signals in continuous wave telegraphy. There are two large De Forest Oscillions, the alternating current transformer for stepping voltage up for the plates and down for the filaments, balancing condensers. Radio

(Continued on page 2)

AIRPHONE IN GERMAN TRAINS AND HOTELS

BERLIN, GERMANY.—Radiophones will be installed on a number of important German express trains, and receiving instruments will be placed in hotels and embassies, according to an announcement made recently. Tests were made recently under the observation of engineers, military attaches and the diplomatic representatives of the United States and Sweden.

TREAT CANCER

(Continued from page 1)

frequency chokes, grid condensers and leak, an oscillation transformer, and a radiation or antenna ammeter. Two binding posts on the outside of the cabinet correspond to the aerial and ground connections of the Radio transmitter.

Instead, however, of sending the continuous Radio frequency alternating current into the aerial and ground, one binding post is connected to a platinum tipped scalpel with insulating handle, and the other to a flexible metallic ground plate upon which the patient is placed.

Cuts Fast and Clean

In cutting tissues the Radio scalpel cuts faster and cleaner than the plain surgeon's scalpel, and in addition the new device cauterizes without burning an infinitesimally thin wall of tissue as it cuts, so that no blood flows. "It seems that the Radio current does the cutting," said Dr. Plank, "for I can notice no resistance to the scalpel as I draw it along the flesh." Dr. Plank showed that a dull Radio scalpel would also cut, although not as rapidly as one drawn to a fine edge.

The tissue can quickly and easily be cut into slices one thirty-second of an inch in thickness, a feat requiring the highest manner of skill with the ordinary scalpel. The Radio scalpel cuts through fat tissues the same as other flesh, but does not cut bone. Its cutting properties remind one of the electric or oxy-acetylene torch.

Wounds Heal Rapidly

When asked if the wounds of the new scalpel healed as rapidly as those of the usual scalpel, Dr. Plank replied that he believed they healed even more rapidly, due to the instant cauterization and consequent relief from complicating infections. He cited a recent case of breast cancer in which a long and deep incision had healed in four days. The wall cauterized is so thin that it does not act as a detriment but rather a help to the healing. No carbonization or burning of the flesh by the new Radio scalpel is noticed. An interesting development of Dr. Plank's experiments is that the higher the frequency of the applied current, the faster and deeper are the cutting properties of the scalpel, and vice versa.

Interrupted Spark Burns

The doctor showed a high frequency interrupted alternating current apparatus which he had experimented with, and which consisted of a high frequency step up transformer, Leyden jars, oscillation transformer and spark gap. The apparatus was like that found in practically every transmitting station before the three element vacuum tube became popular because of its greater efficiency.

Dr. Plank showed that the high frequency spark scalpel carbonized and burned tissues with ease, but would not under any circumstances cut them. The difference between the two methods is purely in the nature of the generated current. The new and successful method uses a continuous high frequency alternating current, while the older makes use of an interrupted and damped high frequency current.

Canadian Province of Manitoba to Add Radio to Forest Patrol

Norway House and Victoria Beach Sites of Two New Stations—Will Communicate with Airplanes Patrolling Eastern Forests—Use Radiophone Instead of Code to Simplify

WINNIPEG, CANADA—Plans have been drawn up for the construction of two new Radio stations to be located at Norway House and Victoria Beach, Manitoba, according to Major B. D. Hobbs, superintendent of the Manitoba Aerial Forest Patrol. These stations are to communicate with the airplanes patrolling the eastern Manitoba forests in order that information regarding forest fires may be swiftly obtained and relayed to the District Inspector of Forestry at Winnipeg.

At present there is only one air station in Canada equipped with Radio, but the results obtained have proved so satisfactory that the Air Board contemplate installing Radio on every large air station in the near future. In order to reduce operating expenses, the air station at High River, Alberta, has abandoned the spark and C. W. telegraphy in favor of the Radiophone so that the patrolling aircraft need not carry operators and one-man machines may be used.

RADIO SONG FROM MID-OCEAN

First Song Transmitted by Radiogram
Composed by Rudolf Friml aboard S.S. Majestic
Published from Saffego by Blue Hills

© INT.

Composer Rudolf Friml sailed from New York recently on the S.S. Majestic, together with Florenz Ziegfeld, Jr. While in mid-ocean Mr. Friml wrote a song, dedicating it to Mary Eaton, who will sing it in the Follies. Most of us can't sing, let alone write, songs in mid-ocean, but in addition Mr. Friml Radiogramed it to S. F. Kingston, Ziegfeld's general manager. The first Radiogramed song in transcribed form is here shown

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Looking Ahead

- Radio Frequency Amplification. A continuation of Benjamin F. Micsner's series, and a timely article.
- Crystal Detector Receiving Sets. The next article by Peter J. M. Clute will interest a host of fans possessing the simpler sets.
- Panel Units for Your Receiving Sets. Two additional panels of the standard type. The best way for an amateur to build up his set is by standard panels.
- 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 will be back in its place next week.

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CHICAGO SHOW AWARDS MANY CONTEST PRIZES

High School Youths Carry Off Major Honors at Exposition

CHICAGO—A large silver loving cup, four gold medals, three silver medals, and \$150 in cash prizes were awarded to winning contestants in the various competitions held during the Chicago Radio Exposition which ended here July 1. The awards were as follows:

Eugene Craig, attending Miller grammar school, Evanston, Ill., was awarded a prize of \$25 and gold medal for the best crystal detector receiving set, wave length range from 175 to 600 meters, made by any boy attending grammar school.

Frank Smalek, Tilden high school, Chicago, received a prize of \$25 and gold medal for the best crystal detector receiving set, wave length range, 175 to 600 meters, constructed by a boy in the first or second year of high school.

John Pringle, Tilden high school, Chicago, was awarded first prize of \$50 and gold medal for making the best regenerative detector and audio frequency amplifier receiving set, wave length range 175 to 600 meters. Second prize in this contest, \$30 and silver medal, went to Fred Walcott, Evanston high school, Evanston, Ill., and third prize, \$20 and silver medal, to S. F. Martin, Crane Technical high school, Chicago.

Washburne Continuation school won the gold medal awarded for the best receiving set made by any exhibitor during the exposition.

For having the best arranged and most interesting booth, Lane Technical high school, Chicago, was awarded a large silver loving cup, while Crane Technical high school, Chicago, won a silver medal for having the second best exhibit.

NEWTON, MASS.—A new Radio receiving set has been installed at Norumbega Park, a popular summer resort on the Charles River at Auburndale, and reached by trolley lines as well as canoeists from a radius of fifteen miles.

Frenchman Brings Out New Miniature Receiving Tube

(Special to RADIO DIGEST)

TORONTO, CANADA.—A new vacuum tube has been invented by the master mechanic of the Eiffel Tower Radio station, Paris, France, which can be operated on one volt of electric current, and all that is necessary to supply this is a simple flashlight battery. This new detector and amplifier tube has already found its way to the Canadian market and is being sold at considerably less than the present tubes. The same inventor has perfected a crystal detector receiving set that is capable of receiving messages from a distance of up to 500 miles.

When this set was first exhibited in Paris, France, a squad of ten gendarmes was called into action to keep the spectators in order, and sufficient orders for the new set were given to keep the factory busy for two years. This set, like the vacuum tube, is making its way to the Canadian market.

To Erect Five Radio Beacons

WASHINGTON.—Radio beacons that send out warning signals to ships in times of fog and heavy weather, will be installed at Boston, Nantucket, Cape Charles, Columbia river, Puget Sound, the department of commerce has announced. When these installations are completed, there will be ten lighthouse stations broadcasting Radio signals from which any ship equipped with the Radio direction finder can determine its exact position. If funds permit, Radio beacons will also be installed at Delaware Bay, Los Angeles, and Blunts Reef. Radio beacons are now in operation at Ambrose, Fire Island and Sea Girt near New York harbor, and on the lightships off Cape Hatteras and San Francisco. Many foreign vessels are now installing Radio direction finders that will enable them to take advantage of the Radio warnings, and these as well as American ships are interested in improved service.

Radio Programs Now Keep Lighthouse Tender Happy

(Special to RADIO DIGEST)

CLEVELAND, O.—William L. Gordon, a lighthouse keeper on an isolated island in Lake Erie, has forwarded the following letter to the chief of the lighthouse service, Washington, D. C., telling how he keeps in touch with the outside world through a home-made Radio set. Mr. Gordon in his letter says:

"I thought you might be interested to know that I have a small home-made Radio set from which I receive, through WWJ, Radio broadcasting station of the Detroit News, the latest world news, the time, reports of sporting events, etc., musical concerts, and a talk every morning by the household editor, giving recipes for each day's dinner, also talks on the care of flowers and the home. From WCX, of the Detroit Free Press station, we hear concerts, speeches, and the news. On Sunday mornings and evenings we hear the services of the St. Paul's Cathedral of Detroit, through the broadcasting station of WWI. As we do not get ashore very often we enjoy all this very much."

Airphone to Aid Mine Rescue

PITTSBURGH, PA.—The Pittsburgh experiment station of the United States Bureau of Mines, Forbes street, is to be one of two central stations to be equipped with Radiophones to speed up mine rescue and safety work, it was announced recently. A western station will be in Salt Lake City.

High-power broadcasting towers here will receive news of mine accidents or accidents in the petroleum industry and broadcast instructions to specially equipped mine rescue and safety cars maintained at 20 stations in the country.

Ed Wynn, well-known comedian, is at work on a musical comedy with a Radio atmosphere and entitled "Listening In," to be produced next fall. He contemplates broadcasting part of it.

PLAN NEW BEACON COASTAL STATIONS

BUREAU OF STANDARDS HOLDS CONFERENCE

Manufacturers Given Chance to Furnish Direction Finders—Foreign Ships Equipped

(Special to RADIO DIGEST)

WASHINGTON, D. C.—A conference was held here recently between representatives of companies manufacturing Radio direction finders and officials of the Bureau of Standards, regarding the production, cost, installation, calibration, and maintenance of Radio direction finders on shipboard.

It was announced that the Department of Commerce has decided to install additional Radio beacon stations as follows: Boston, Nantucket, Cape Charles, Columbia River, entrance to Puget Sound and, if funds are still available, Delaware Bay, Los Angeles, and Blunt's Reef, California. These are in addition to the two new Radio beacons at Diamond Shoal (off Cape Hatteras) and San Francisco Light Vessel. Three other Radio beacons have been in operation in the vicinity of New York Harbor for over a year, at Ambrose, Fire Island, and Sea Girt.

Foreign Ships Use Radio Compass.

A considerable number of foreign ships have been equipped with Radio direction finders and are calling for Radio beacon service as they approach American shores. American shipping companies are also awakening to the importance of using the direction finder on shipboard, in order to determine their locations in time of fog and in order to aid in various ways in time of distress at sea.

As a result of the conference, arrangements will be made through the Light-house Service between the manufacturers of Radio direction finders and the operators of steamships for the trial and demonstration of Radio direction finding equipment produced by the several manufacturers under conditions of practice. It is anticipated that with the installation of the additional Radio beacon stations and the activity of the manufacturers in the production of direction finders for use on shipboard, this method will be adopted very generally as an aid to navigation.

Golf, Piano Aid Fast Code Work

Canadian Expert Advises All Code Operators to Increase Speed by Playing

(Special to RADIO DIGEST)

HALIFAX, N. S.—Can you transmit thirty words a minute? Can you copy weak signals through interference and static? Take up golf and piano, is the advice given by Nova Scotia operators to novices wishing to improve their code speed.

Any man who can drive 200 yards with out slicing or pulling can easily learn to transmit Morse signals at high speed, says Mr. W. T. Johnstone, of the Dominion Radio service. Mr. Johnstone points out that the secret of high speed transmission lies in the perfect coordination of mind and body, and in the accurate control of the muscles in the forearm and hand. Golf develops this self-control to a remarkable degree, he states, while piano playing strengthens the arms and hands. Several operators are studying the piano in order to cure themselves of a habit of slurring the more difficult letters of the alphabet, such as V and H. Piano practice not only cures this slurring but develops in the operator a swinging, rhythmical style of transmission that is easily copied at the receiving station.

RIGHT-OF-WAY GIVEN IOWAN POLICE CHIEF

DAVENPORT, IA.—It will make no difference if the transmitting station at the Palmer School of Chiropractic, WOC, is engaged in an important business transaction should the police of this city require the station to broadcast a crime warning. The chief of police believes it will be a big help.

AIRPHONE TIPS OFF MOONSHINE STILLERS

LOUISVILLE, KY.—Revenue officers seeking distillers of the far-famed and hard-hitting "white lightnin'" in the mountains of Kentucky say that many raids made in the last few months have proven un-successful due to the adoption of Radiophone as a means of communication among the moonshiners.

NEW CLUB FORMED BY NATIONAL FANS

PITTSBURGH SCENE OF RECENT ORGANIZATION

Club's Fundamental Purpose to Fit Up Hospitals—Non-commercial in Purpose

(Special to RADIO DIGEST)

PITTSBURGH, PA.—This city is the scene of the organization of the National Radio Club. The work of enrolling members has started, and articles of incorporation have been filed.

While one of this club's fundamental purposes is to promote and finance the installation of Radio equipment in hospitals, it will also use its influence to keep the broadcasting art on its present high plane; enlarge musical and educational Radio programs; keep all members informed regarding developments, improvements and news of interest regarding Radio; answer, without charge, all technical questions asked by members; receive and file articles written by members for reference; lend the moral support and influence of the club to those agencies endeavoring to eliminate the confusion of signals; and promote fraternity and good fellowship among members.

The organization committee includes H. B. Coe, New York; W. Payne, Philadelphia; F. R. McCray, Los Angeles; J. Palm, Cincinnati; R. G. Craig, R. Mansmann, and T. G. Albertson, Pittsburgh. The Club has been assured co-operation from manufacturers but will maintain a strictly neutral attitude in all matters of equipment. Its officers and directors will be selected from Radio enthusiasts not engaged in making or selling Radio apparatus.

FISHERMEN AGITATING FOR RADIO EQUIPMENT

Schooner Puritan Wreck Cited as Object Lesson

(Special to RADIO DIGEST)

HALIFAX, N. S.—Following the wreck of the fishing schooner Puritan, the American challenger for the International Fishermen's trophy, Nova Scotia fishermen are requesting owners to equip their vessels with Radio. They point out the fact that the Puritan was able to obtain bearings from the Radio-compass stations at Chebucto Head and Canso, as Radio-equipped vessels frequently navigate through dense fog in the vicinity of Sable Island, where the Puritan went aground, with the help of the Radio-compass stations. They are also quoting the loss of the steamer Arbecco, recently wrecked near Cape Race, Newfoundland, in a dense fog. This ship, they claim, could have rounded the cape in perfect security had she been able to communicate with the Cape Race compass station.

The fishermen have also petitioned the Dominion government to supply an aerial patrol, the airplanes to look for schools of herring and mackerel and to inform the fishing fleets by Radio of the position of these schools.

Stunt Flyer Airphones Audience During Flight

(Special to RADIO DIGEST)

BIRMINGHAM, ALA.—With the inauguration of the Birmingham Aero Club here on the Fourth of July exercises were held at Roberts Field in which Glenn E. Messer, nationally known "stunt flyer," communicated by Radio with the crowd assembled on the field all during his exhibition. He gave notice during his flight of the next stunt to be performed and also told of his exact altitude at different periods of his exhibition.

QUEEN OF THE "HOW TO MAKE"



© P. & A. Miss Hope Hampton, film star, trying out her home-made set on the piano, using the wires as an aerial. (Insert) Shows her soldering the tuning coil © INT.

5ZA WINS HOOVER'S CUP

Falconi Awarded Trophy as Best Amateur

HARTFORD, CONN.—Announcement was made recently by the American Radio Relay League that the silver loving cup donated by Herbert Hoover, Secretary of Commerce, has been awarded to Louis Falconi, of Roswell, N. M. Falconi's station, 5ZA, was described in the May 20 issue of RADIO DIGEST. The trophy was to go to the amateur wireless operator who constructed and operated the most efficient amateur station in the United States in 1921.

PHANTOM NEW YORK SHOW

Grand Palace Manager Denies Knowledge of Exposition

NEW YORK.—The management of the Grand Central Palace was much surprised recently to learn that there was to be a permanent Radio exposition, a dance hall and theater on one entire floor of their building and that 30 per cent of the space had already been optioned by Radio equipment manufacturers. Somebody is either "spoofing" the management or else there is another "get-rich-quick" scheme afloat, for the president says that there is no Radio exposition scheduled except for one to be held there in December of this year.

THE ANTENNA BROTHERS

Spir L. and Lew P.

A Modern Fish Story



Little Tricks Aid Panel Making

Wood Lid Knobs and Cardboard Make Dials

There is nothing to compare with black formica or bakelite fronts for the panels on Radio sets. Either one of these materials will finish up smooth and shiny, and when nickeled mountings are used there is nothing more attractive. These mate-

WORKSHOP KINKS? EARN A DOLLAR—

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

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

rials are the best electrically and they present a workmanlike job. However, the cost is very high. If these materials are to be used the most sensible thing to do is to adopt the unit system of construction.

It is not always necessary to spend a large sum of money, as this can be done for a reasonable price. Sometimes a good piece of hardwood may be used instead of bakelite or formica. Make sure that the wood is thoroughly dry.

The wooden handles for pot lids which may be purchased from any hardware dealer can be used for knobs on the switches or as coupling handles. These can be bought for a penny each. The machine screws for use on the panels can be bought cheaply in gross lots. There will be required some screws 1/2 inch long, some 2 inches long and some brass washers. The size of the screws is not important, as the only thing necessary is to have nuts to fit the threads.

The switch contact points may be made of machine screws run through the panel, allowing their heads to stand out on the front and using a pair of nuts on the back to hold the screw in place and for clamping the wire, the same as for a binding post.

The pot lid knobs are attached with



FIG. 1

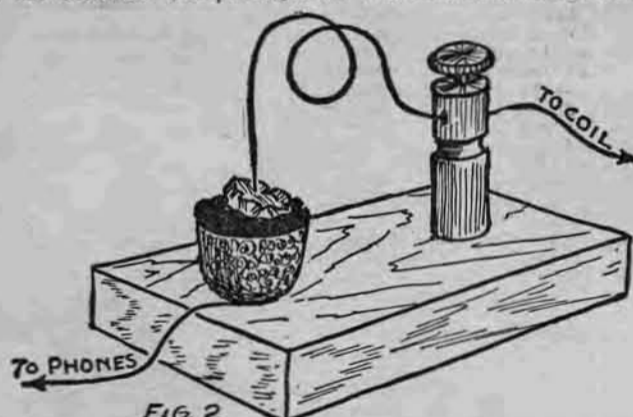


FIG. 2

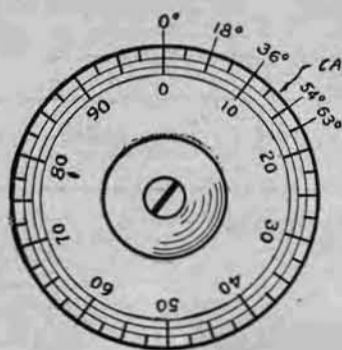
the two-inch machine screws. The hole in the knob is made a snug fit for the screw body. On either side of the knob enlarge this hole with a larger drill point or bit so that the nut will fit in it. Pass the screw through the hole, put on the nut, and screw it up tightly with a screwdriver while holding the nut with pliers until the nut and screw head are embedded firmly into the knob. The illustration shows this part of the work clearly.

The switch blades are made of brass strips having a good, stiff spring to it. If it is of soft brass it will soon lose its spring and there will not be a good contact. If brass seems to be too expensive, or cannot be readily obtained, open up an empty tin can and cut your blades from this material. The dials can be cut from a piece of cardboard so as to make a suitable disk. Roll this along the edge of a rule, marking it off into sixteenths of an inch until the whole circumference has divisions. Lengthen each tenth mark, also each fifth mark, making the tenth marks longer than the fifths. Number the tens from zero up all the way around.

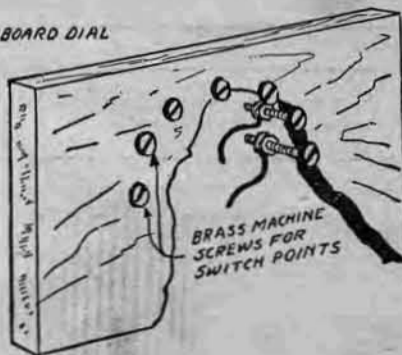
Preventing Tube Shrinkage

Cardboard tubes, used for tuning coils or couplers, are apt to shrink after the wire is in place, leaving the turns very

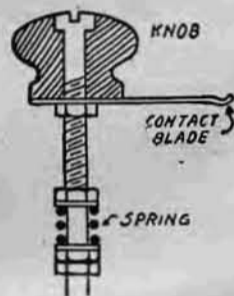
PANEL HAS POT LID KNOBS



CARDBOARD DIAL



BRASS MACHINE SCREWS FOR SWITCH POINTS



KNOB

CONTACT BLADE

SPRING



CONNECTING TWO WIRES



BINDING POST

loose, unless some precautionary measure is taken.

One method is to roll and dip the tube, on which it is desired to wind the coil, in a shallow dish containing boiling paraffin. Proper precautions should be taken to leave the tube in the dish long enough to have the paraffin soak through the cardboard. When taken out of the dish and allowed to drain off and cool, the tube will harden and no trouble will be experienced from shrinkage.

A similar operation may be repeated when the wire is wound on the tube, to hold it in position.—P. J. C.

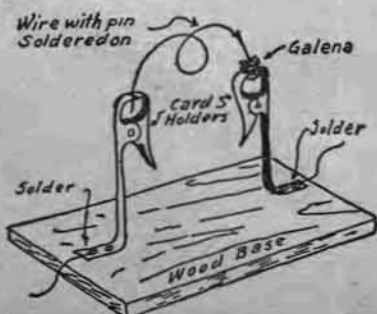
Making a Crystal Cup

The amateur who is making his own crystal detector and needs a cup for the crystal will find that a thimble cut off as shown in Figure 1 and with a screw placed through the bottom will be all that is required. With the screw in the bottom

the cup may be attached to the base or mounting board by turning it into the wood, as shown in Figure 2. For those who admire good looking sets, the thimble cup can be made very attractive.—Albert E. Jones, East Milton, Mass.

Card Clips Make Detector

The illustration shows how two card holders may be used to hold the crystal and the cat whisker. A block of wood is procured and the clips attached as shown.



The cat whisker as well as the crystal is held in the claw of the paper clip.—Bert Shillinglaw.

Finding Aerial Wave Length

Here is a simple method for roughly estimating the wave-length of an aerial: Add the length of the lead in to the aerial wire length. If more than one wire is in the aerial, add one-third of length again. To this add the length of the ground wire. Divide total by two, and add the result to the total of the addition.

Example: Find wave length of an aerial of three wires, 65 feet long, with lead-in 12 feet and ground 20 feet. 65+22+12+20=119. Divided by 2, equals 59. Add 119 to 59, equals 178, which is the approximate wave length of this antenna system.—Phillip Meyers, Chicago, Ill.

Aerial from Ford Magneto

Here is an amateur kink which may interest some home Radio builder. I have constructed a good aerial, or rather a ribbon, by unwinding the bobbins of a discarded magneto taken from a Ford car. These ribbons were polished and soldered together to obtain the proper length.—F. W. Steffen.

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

★ **Radio Bugs!** ★
Try This on Your Cat's Whisker
To the tune of Yankee Doodle
Price \$10

Gregg's Listen In set, is a marvel, you bet. Through which the waves come abuzzin'. Attach to the phone You now use alone, And the program is heard by a dozen. Yes, a dozen hear the news, A dozen hear it dandy. Everyone should have Gregg's Set, Because it is so handy. The family should get Gregg's Listen In set. Does for all, even uncle and cousin. No more all alone. Does one use the phone, The set sends it out to a dozen.

Write for Catalogue
Gregg Company
Room 505, 35 South Dearborn Street
CHICAGO

Phone Receivers Make Good Condenser Test

It often becomes necessary to test the condensers of a Radio set to see if they are in working order. This is a very simple matter but one which is quite likely to give the uninitiated no end of trouble.

Connect one terminal of the condenser to be tested to one lead from a small dry cell battery and one lead from a telephone receiver. Then touch the other terminal of the condenser with the free battery lead and then with the free lead from the phones. If the condenser is in order a click will be registered in the receivers every time the phone lead is applied to the condenser terminal following the application of the battery lead. If no click is heard the condenser is not functioning properly. It may be the result of the short circuiting due to the dielectric substance having broken down, or in case of a variable type, the plates touching. Broken terminal connection may also cause trouble.—Fred Martin, Indianapolis, Ind.

Hanging Receivers on Hook

Telephone receivers will retain their sensitivity longer if a hook is provided near the set so that they may be hung up when not in use instead of being knocked around or dropped on the floor. Constant jars will reduce the effectiveness of the permanent magnets in the receivers.—Wm. Hunt, Denver, Col.

Distributors FOR DeForest Radio Sets All Types IMMEDIATE SHIPMENT Head Sets Vario-Coupler Variometers and all necessary parts for constructing your own set. Write for Complete Price List Special Discounts to Dealers

THOS. E. WILSON & Co.
42 South Wabash Avenue
Dept. R. D. Chicago

BRACH VACUUM LIGHTNING ARRESTER

Every lightning flash fills the air with static, which has in it potential dangers to every radio and home, unless they are protected by the BRACH Vacuum Lightning Arrester.

This unflinching sentinel is on guard day and night—it works automatically, does not have to be switched and cannot become grounded.

Railroads, fire alarm systems and the U. S. Army depend upon the BRACH Arrester—successfully used for 16 years.

Sold by Dealers Everywhere
L.S. BRACH MFG. CO.
NEWARK, N. J.

Stations Make Programs Carefully

Station KGB

By A. M. Ottenheimer

A RADIO broadcasting program is quite necessarily much like a daily newspaper: It serves so many and such multifarious classes—and must please them all. An entertainment for Radio listeners, since it goes to so many ends, hence must come from as many sources. The daily Radio schedules go into churches, schools, hospitals, homes, offices, stores and countless other places and the wants and the desires of each must be catered to and considered.

It has been the scrupulous adherence to this principle, perhaps, that has brought so much success to KGB, the Tacoma Ledger Radio broadcasting station at Tacoma, Washington. In the three months of its existence, countless professional and scores of talented amateur performers have served its listeners, who are now beginning to run into the thousands. Careful attention is given to each individual program, each is assiduously studied and worked out.

Not Heard in Portland

Strange as it may seem, KGB has never been heard in Portland, through some freak of atmospheric and geographical conditions, nor have any of the Portland stations been picked up in Tacoma, as far as it has been possible to ascertain.



Mme. Irene Pavloska, Famous Soprano

Recently Mme. Irene Pavloska, famed soprano of the Chicago Grand Opera Company, sang a group of numbers for KGB. Fulfilling a concert engagement in Tacoma, she graciously consented to sing for the Radio fans previous to her other appearance.

The justly noted Aeolian Quartet of the Kolb and Dill company also appeared a short time ago in a short concert, and Miss Frances Jacoby, violin virtuoso with the same company, was also featured.

Each week one or more vaudeville acts from the Pantages circuit appear at the Ledger station. They are obtained by the courtesy of the local manager of the theater, who has been quick to grasp the advertising values of these Radio appearances. Among the better known of these Pantages artists who have served the Ledger's listeners has been Little Angie Cappell, dear to the hearts of many a veteran of the late war as "The Little Wop." Miss Cappell appeared over for an extended period during the war as an entertainer and vocalist and established an enviable record.

Japanese Songstress Broadcasts

Then there was also, not so long ago, petite Tanaka Kuma, Japanese songstress, a soprano of talent. Her numbers at KGB illustrate her versatility, as she first sang "The Last Rose of Summer" in English and "O Sole Mio" in Italian.

Such well known acts as the "Royal Revue," an organization of "big-time" artists, have also appeared. Composed of seven artists, among them the well-known Deslys Sisters and Erwin Rossa, sensational violinist, an extended program was presented by the entire company.

Individual artists of the city are often given prominence. Among them has been Jan Russell, a young violinist of unusual promise, whose ability has caused quite a stir in musical circles. The young man, barely 17, and his sister, Anne, only 15, presented a complete program one evening, much to the edification of their appreciative auditors. Child prodigies, with which Tacoma abounds, are frequent broadcasting stars.

Tacoma is fast becoming a Radio town. Radio has taken the city by storm and as yet there is no sign of a slackening in the interest or enthusiasm. The number of listeners is growing daily and KGB is alive to its responsibilities to these hundreds and is endeavoring to fulfill them in most creditable manner in its power.



Angie Cappell, "The Little Wop"

Station WLW

By Harry Pence

WITHOUT importing celebrities of national reputation for outstanding "drawing cards," the Crosley Manufacturing Company—operating broadcasting station WLW, of Cincinnati, Ohio—has given the Radio public a series of entertainments that have been far above the ordinary in artistic merit, as well as much more interesting to audiences than the more ambitious programs offered by some of the more widely known stations.

From the first the owners of WLW, knowing the musical resources of Cincinnati, realized that it would seldom be necessary to go far for performers of the very highest excellence, and though some difficulty was experienced in overcoming the prejudice of some of the more temperamental musicians, the Crosley Company succeeded in enabling Radio fans within the range of its station to listen to many of the master performers on the teaching staffs of the Cincinnati musical institutions and their more proficient pupils.

Station Serves in Other Ways.

Nor has entertainment alone been the object of station WLW. When the Community Chest campaign threatened to falter a bit the team leaders of the drive were invited to send their speakers to WLW and put their messages and appeals into the air.

The heads of the various city departments were all invited some time ago to address the public by Radio, giving any message concerning the workings of their departments which they felt might be of public interest. A number of them responded and told the public how the affairs of the city could be the better administered when the endeavors of officials were understood and a co-operation effected, if only to the extent of mutual confidence.

The brief discussion of the commissioner of health was an entertaining and instructive talk, productive of much benefit in that it gave his hearers a clearer idea than they had previously had of the constructive work of his department and the ends which he hoped to achieve for the general welfare.

Convention Speakers Also Broadcast.

Few opportunities in this line have been overlooked by station WLW. As national trade, industrial and professional associations met here in national convention their leading speakers have been invited

to speak for the Radio fans as well, and most of them have been quick to realize the value of the opportunity and eager to avail themselves of it.

A few days ago, while the American Federation of Labor was in session, Samuel Gompers, President of the Federation, made his first speech over the Radiophone at WLW. His talk on labor's appeal to America reached thousands who, in the natural course of events, would never have come into contact with him, but who thus had an opportunity to hear this distinguished man at his best.

On the same evening that Mr. Gompers delivered his Radio address a very talented young Cincinnati writer of children's stories, Robert F. Schulkers, author of "Seketary Hawkins" and "Mile-a-Minut Milo," read a new story to his juvenile audience and told them how he planned and wrote his yarns. The effort brought so many complimentary letters to the company that a "Milo" story has been made a feature of the regular program.

Human Interest Programs Appeal.

The fact that the WLW programs have been of that particular human interest kind that appeal strongly to the section over which its waves radiate has been due in a large measure to the fact that Mr. Crosley has called to his aid Robert F. Stayman, a talented and very practical newspaper man, whose experiences as a reporter and an editor have trained him



Tanaka Kuma, Japanese Songstress

to a quick appreciation of the opportunities that exist all around and a prompt action that has, time and again, enabled him to obtain the services of prominent personages in order to give the public an opportunity to hear them at the time when interest in them and their work was at its height.

"Static" seldom mars a WLW program, even in sultry weather—but then it is not the present purpose to discuss technical affairs. One who desired to do so could find much to interest him at station at Northside, Cincinnati, but for the present the effort is made to show why the WLW station is popular. If the particular policy of good program making obtains that desired result, there is an obvious explanation.

At no stage in the development of a very successful enterprise has station WLW faltered in its policy of giving Radio fans their regular evening's entertainment maintained at the highest standard.



Jan Russell, Clever Young Violinist

Considerable difficulty has also been experienced by Tacoma listeners in catching KGY, the station at St. Martin's College at Lacey, Washington, for some unexplained reason.

The Ledger station presents two programs daily. The afternoon program on week-days runs from 4 until 5 (Pacific time) and the evening schedule from 7 until 9. On Sundays the afternoon broadcast is lengthened by an hour, running from 3 until 5 and the evening broadcasting hours are from 7:30 to 9:30.

The paper has a Radio editor on its staff who devotes all of his time to the preparation of the programs and the best possible presentation thereof. In the short time of the station's operation, this work has been brought down to little short of a science and KGB pardonably prides itself on its carefully prepared, studied programs.

Arrange Stellar Programs

Some famous personages have graced some of the Ledger station's broadcasts.



Professors Gracinto Gomo, singer; Romeo Gomo, pianist, and William Morgan Knox, violinist, of the staff of the Cincinnati College of Music, all accomplished performers, broadcasting a concert in the studio of Station WLW, Cincinnati.

DUTCH AIRPHONE SYSTEM TO GROW

PLAN TO INSTALL PHONE FOR FARMER'S USE

Transmitter of Efficient Design Is Used —Range from Amsterdam to Liverpool

(Special to RADIO DIGEST)

AMSTERDAM.—The Government of the Netherlands is now broadcasting weather reports by Radio telegraph twice daily, but is planning the installation of Radiophone service in order that farmers who do not know code can listen in.

Every fifteen minutes the Amsterdam Stock Exchange sends out bulletins by means of wireless telephony, giving the ruling quotations of the exchange. When the exchange is closed, a press bureau makes use of the broadcasting system for the distribution of domestic and foreign news, as well as foreign exchange and stock quotations in code.

Orchestral music and speeches are broadcasted Sundays from 2 to 5 p. m. by the Netherlands Radio Industry at the Hague. With a radius of about 600 miles, this Company's entertainment is said to have become very popular in the British Isles.

Develop Efficient Transmitter

Experiments with only .25 amperes in the aerial and 160 watts input have carried broadcasts of both music and speeches as far as Liverpool and Edinburgh successfully. The transmission of matter with this small amount of energy is said to be the result of an invention of an electrical engineer named Idzerda, president of the industry, who has applied for U. S. patents. The Company is conducting part of its correspondence with its customers by Radio.

The Marconi Wireless Telegraph Company's recent tests of combined Radio and wire communication between members of the English Anglo-Batavian Society speaking from the Marconi House in London, and members of the Netherland-England Society at Amsterdam, speaking from the Stock Brokers Society, may result in the establishment of a combination wire and Radio system connecting the two countries.

Department Store Buyers to Test Radio Apparatus

Examination Outline Suggested to Insure Quality of Sets

WASHINGTON.—Ever-increasing public interest in Radio has added to the troubles of department store buyers and others handling such equipment. Because of the rather technical problems involved, actual and prospective salesmen of "ether wave" receiving devices say they are up against it in their efforts to satisfy the trade. Finding no information available to use in selecting good or rejecting bad apparatus and fearing the loss of established good will, appeals have been directed to the Bureau of Standards of the Department of Commerce to devise standard testing methods.

Performance test methods for immediate use by a commercial testing laboratory were recently agreed upon in an outline by representatives of the Bureau of Standards, the Electrical Testing Laboratories of New York, and the National Retail Dry Goods Association. Suggestions regarding improvements on these methods, or new methods for testing the equipment submitted by the National Retail Dry Goods Association will be subject to approval of the Bureau of Standards.

The tests outlined include examination as to the materials and workmanship of construction, the mechanical and electrical design, simplicity of adjustment, ruggedness, sensitivity, sharpness of tuning, wave length range, and faithfulness of reproduction in Radio telephone reception.

Boys' Camp Plan Canoe Radio

NORTHPORT, ME.—A large party of boys from Camp Navajo, a salt water camp for boys on the shore of Penobscot Bay, will start shortly on a 200-mile canoe trip along the inland waters and up some of the rivers flowing into Penobscot Bay. They will keep in touch with the camp by Radio and will have canoes equipped for this purpose. Those of the boys who are not versed in the art of receiving are now being taught how to set up and use the apparatus.

Gives Movie's Place to Radio

PORT ARTHUR, CAN.—At a session of the convention of the National Council of Women, held here recently, one of the members suggested that Radio would oust movies from their popular place in another six months.

Book Reviews

Radio Questions and Answers. By Arthur R. Nilson. This book is intended especially for students and operators who are about to take the government examination for a Radio operator's license. It gives the actual questions and shows how they should be answered. Price, \$1.00.

The Thermionic Vacuum Tube and Its Applications. By H. J. van der Bijl, 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, \$5.00.

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

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.

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.

Radio Enters the Home. Written by experts. It tells how to enjoy popular Radio broadcasting, and it gives complete descriptions of apparatus and installation instructions. Published by the Radio Corporation of America. Price, 35 cents.

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

Radio License Fee Law Considered by Chicago

CHICAGO.—An ordinance requiring the issuance of permits before the installation of a Radio set of any character and in general treating such installations in the same manner that electrical wiring installations are treated has been introduced into the City Council in Chicago.

An inspection fee of \$3 for receiving stations only and \$5 for combined transmitting and receiving stations will be charged. Re-inspections will be charged for at \$1.50 per hour, with no charge less than \$1.50. Installation requirements are made for receiving stations only, and for combined transmitting and receiving stations. When it is necessary to do any wiring to take power from street mains, the ordinance provides that the work can be done by licensed electricians only. Estimates of a yearly revenue of \$100,000 have been placed on the license features of the proposed ordinance. Penalties of from \$5 to \$100 for each violation of it are provided, and each day's use is constituted a separate violation.

Canadian Hotel Installs Set

A receiving station has been established in the Grand Central Hotel, St. Catharines, Ontario, which claims to be the first hotel in Canada to supply Radio music to their guests in place of the old-fashioned orchestra.



CARTER TU-WAY PLUG takes TWO head sets at same time; takes ALL types of cord tip terminals. Price \$1.50 each. If Your Jobber Is Unable to Supply, Write Us

Headquarters for
Radio Supplies and Equipment
Radio Department
COMMONWEALTH EDISON ELECTRIC SHOPS
72 West Adams Street
Chicago, Ill.

RADIO TO AID IN FIGHT AGAINST BOOTLEGGERS

New York Police to Install Air-phone on Boats

NEW YORK.—The police department of New York have installed Radio outfits to keep in touch with police boats used to prevent smuggling and bootlegging. Communication is also maintained with other police stations. The police department also keeps a constant watch in order that they may be in a position to render any assistance possible in response to calls for help or medical aid.

"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

ARMSTRONG'S New Super-Regenerative RECEIVER

How to construct and operate it

RADIO MAILING LIST

6540 Radio Retail Dealers, per M. . . \$7.50
681 Radio Jobbers, for list 7.50
524 Radio Manufacturers, for list . . . 7.50
and any other list you want.
Trade Circular Addressing Co.
166 W. Adams Street Chicago, Ill.
Phone FRANKLIN 1182

"To Build Right, Consult First"
MANUFACTURERS who want the best obtainable consulting advice on their Radio engineering problems must go to the man who knows for their information.

TO BUILD right—consult first. No obligations are incurred in sending in your problem. An estimate on its solution cost will be tendered first.
ADDRESS your correspondence to Box 109, Radio Digest Illustrated, Chicago. THE MAN WHO KNOWS

Photos, Diagrams and Graphs from Two Different Sets Constructed by the Author
By KENNETH HARKNESS

Booklet Ready for Delivery. Price 40c

PUBLISHED BY

The Radio Guild, Inc. 236 W. 34th St., New York City, N. Y.

CROSLLEY RADIO APPARATUS BETTER—COSTS LESS

Crosley Harko Senior



The HARKO SENIOR was developed to supply the demand for a low-priced, efficient receiving outfit, having a range of from 150 to over 600 meters, thus bringing in on the average amateur antenna—amateur stations, radio telephones and commercial stations, operating up to and including 600 meters. Ships and stations on the Atlantic Coast are easily copied in Cincinnati. Radio telephone concerts and voice, from Newark, New Jersey and other New Jersey phones in addition to Pittsburgh, Detroit, Chicago and other phones, are regularly copied in Cincinnati, except under adverse conditions. It is just the thing for receiving radio telephone concerts. This instrument is a combination tuner and audion detector. It consists of a tapped inductance, a CROSLLEY VARIABLE CONDENSER, CROSLLEY Model "A" Rheostat, CROSLLEY V T SOCKET, CROSLLEY GRID CONDENSER and Leak. The hook-up is special—of our own design. The HARKO SENIOR is sold complete as described without tube, "B" Battery, "A" Battery or phone, as is usual with such apparatus.

PRICE \$20.00
The HARKO SENIOR can be used in connection with the two-step amplifier described elsewhere.

Crosley Two Step Amplifier



To meet the demand for a moderately priced, efficient Two-Step Amplifier we have developed the one illustrated above. This consists of CROSLLEY Rheostat, Sockets and Transformers, mounted on panel of formica or other similar dielectric composition, complete with binding posts which are marked.

The CROSLLEY TWO-STEP AMPLIFIER is designed to work well with practically any audion detector hook-up, the phone posts on the detector being connected to in-put binding posts on the amplifier panel. The phones are then attached to the phone posts on the amplifier and the positive and negative posts connected with the "A" battery. Two leads with clips come out of the rear of the cabinet to be connected with the "B" Battery. The CROSLLEY TWO-STEP AMPLIFIER cabinet is designed to match up uniformly with either the CROSLLEY Detector Unit, the Crosley Crystal Receiver No. 1 or the HARKO SENIOR. The size of the cabinet of the Two-Step Amplifier is 11 1/2 inches wide, 6 inches high, 4 3/8 inches deep.

Price of the CROSLLEY TWO-STEP AMPLIFIER without tubes, "A" or "B" Batteries, or phones, complete as shown in the illustration, is \$25.00

The CROSLLEY VARIABLE CONDENSER is unquestionably one of the most radical improvements in Radio apparatus introduced during the past few years. It has a great many advantages over the old type of interlocking plate air condensers. Hence, its popularity. In marketing these condensers we make no apologies on account of the low price. Instead we state emphatically that they are better than other types of variable condensers that have been heretofore offered for use in Radio work, notwithstanding their low price. The CROSLLEY VARIABLE CONDENSER depends upon a thin sheet of mica as insulation between the plates. As there is no friction from the opening and closing of the plates, the mica will last as long as the condenser. Moreover, the mica will stand up under much higher voltage than the average air condenser, without puncturing, breaking or showering. Therefore, the CROSLLEY VARIABLE CONDENSER can be used safely for C. W. Work or modulated C. W. work. Anyone who has experimented with Radio telephone will readily recognize the advantage of this feature. Each CROSLLEY VARIABLE CONDENSER is carefully tested to withstand one thousand volts before shipment. Try this on an air condenser if you never want to use it again. Another decided advantage of the CROSLLEY VARIABLE CONDENSER is the fact that there is no danger of short circuiting. The slightest bending of one of the plates will make other condensers absolutely worthless.

PRICES: Model A, \$1.25; Model B, \$1.75; Model C, \$2.25
For Knob and Dial, 40c extra

IN addition to the above, we now are producing, in large numbers, the Crosley Crystal Receiver No. 1 and the Crosley Detector Unit, the two combined forming the Harko Senior. Our Radio Frequency Tuned Amplifier, costing \$15.00, is producing wonderful results. We also are producing transformers, variometers, vario-couplers, loud-speaking devices, sockets, cabinets, rheostats, tap switches, taps, binding posts, and many other articles used in radio outfits. SEND FOR OUR CATALOG

CROSLLEY MANUFACTURING COMPANY
CINCINNATI, OHIO

The Radiophonist's Mart

THE EXPERIMENTAL stage in Radio has passed and the discerning public is now demanding equipment capable of more accurate reproduction of voice and music, and the elimination of all distortion and undesirable noises. To obtain these results it is necessary that the condenser, one of the vital parts of the receiving set, have wider range, greater selectivity and permanent adjustment. Through long and exhaustive study of these problems coupled with countless experiments, a new type of vernier condenser that produces the perfect results desired has been developed.

The microdenser, as it is known, is built with but two surfaces, the peculiar shaping of which makes possible greater capacity in a very small space. The accuracy with which the microdenser can be adjusted enables the operator to tune out undesirable noises and signals heretofore impossible to eliminate. Due to greater range and finer adjustment it is possible to use this instrument for various circuits and purposes, making it especially valuable to the experimenter.

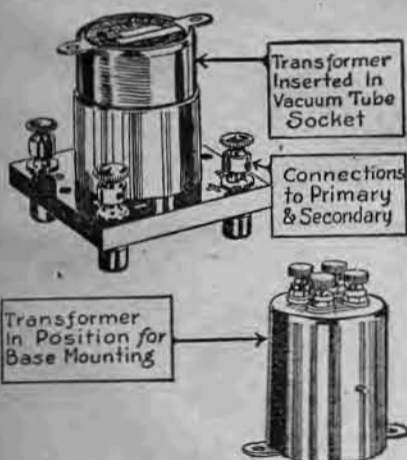
The rated capacity of the new design vernier variable condenser is .001 microfarad. Due to its ingenious method of adjustment it functions as efficiently on all circuits requiring any capacity up to its normal rating. When used in a vertical position the base may be filled with oil thereby increasing its capacity several times.

For course adjustment, a lever extending between the dial and cam case operating through an arc of ninety degrees is provided. This lever explores the entire range of the microdenser very quickly from maximum to minimum. The finer or vernier adjustment for tuning is made by turning the knob in the center through an arc of 180 degrees. This adjustment is possible at any position of the cam lever.

The microdenser is suitable for either table or panel mounting. For panel mounting a 1/4 inch hole is all that is required. It is but 2 1/4 inches in diameter and extends 3/4 inches back from the panel. The dial is 2 1/4 inches in diameter, coated with black satin finish with raised silver markings.

THROUGH exhaustive research over a period of many months, culminating in the perfection of the Erla Radio frequency transformer, many of the difficulties encountered until now in Radio frequency amplification have been overcome. Results obtained with this transformer and domestic vacuum tubes have proved equal and in some instances superior to the best that Europe has been able to produce, using vacuum tubes of special design.

Success was assured by the vital discovery that the efficiency of Radio frequency amplification is directly dependent upon the accuracy with which the transformer is tuned to the incoming oscillation. Through accurate tuning of the transformer, the effect of tube capacitance has been neutralized. Also by reducing the capacitance effect of the transformer itself, a considerable step-up ratio has been provided, reducing the number of stages required.

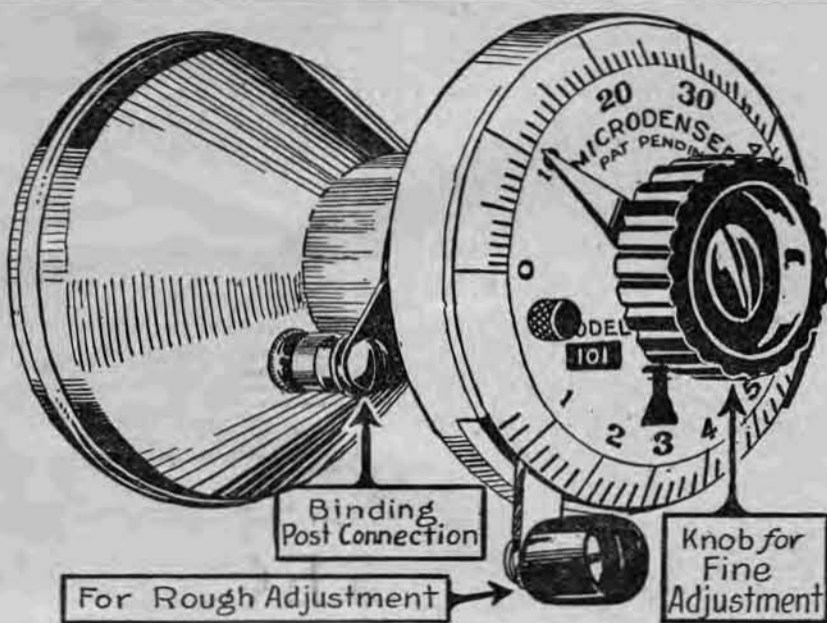


Erla Radio Frequency Transformer

The efficiency of this transformer is such as to require a stage less of amplification than is needed with average transformers. Likewise, there is a marked improvement in clearness and definition of signals, with a minimum of interference.

These Radio frequency transformers employ no iron in their magnetic circuit, avoiding the inevitable transformer losses where iron is present. At the same time, due to the special construction, a wide band of wave lengths is covered from 150 to 600 meters. From one extreme of wave length to the other, the efficiency of the transformer varies but slightly, though maximum results are obtained on a wave length of 360 meters, for which it was especially designed, to meet the general demand resulting from the em-

Microdenser Has Vernier Adjustment



ployment of this particular wave length in broadcasting.

In multi-stage amplifiers, a different transformer is used in each stage. Account is taken not only of the incoming oscillation, but also of the load that is reflected back to the grid circuit of the succeeding stage from the plate circuit, as a result of the tube's gridplate capacity. Thus, by correlating each transformer to the load in the plate circuit of the succeeding stage, super amplification is obtained.

Another advantage of the Erla transformer is that it does not exhibit the regenerative properties that are common to many Radio frequency amplifiers as a result of inherent capacitance coupling between stages. By housing the transformer in a shell of heavy brass, the coupling capacitances between stages are minimized and regenerative effects are avoided.

The design of the transformer is such that it can be easily mounted either on a table or panel, or set into any standard vacuum tube socket with diagonal springs. The latter feature will recommend itself because of the extreme flexibility of hook-up that it makes possible, as well as because of the neatness of arrangement that results.

For amplifying, using the Erla transformer, any standard make of amplifier tube may be used. An amplifying tube may also be satisfactorily employed as detector, by applying full voltage to the plate circuit of the tube. Best results, however, are obtained with a Radiotron-200 detector tube, or its equivalent, using a reduced current of 18-22 volts. Trying various voltages will quickly determine the best voltage to use.

The development and perfection of Radio frequency amplification marks the greatest advance in the science of Radio that has taken place since the invention of the three-electrode vacuum tube. Signals that are too weak to be detected by

ordinary means are readily heard with Radio frequency, the addition of even a single stage resulting in an astonishing improvement. Not only is there a tremendous increase in the distance over which signals are heard, but the reception of voice and music is uncommonly clear and free from distortion, with a marked absence of tube and battery noises. In addition, selectivity is greatly increased, a variation in wave length of only twenty-five meters between sending stations being sufficient to bring in the one station to the complete exclusion of the other, with efficient tuning.

A final and highly important advantage of Radio frequency amplification is that it makes the use of the compact and convenient loop aerial entirely practical, except for extreme long range reception. For local reception, one stage of Radio frequency and a loop will be found entirely satisfactory, under normal conditions. Besides its convenience, the combination of Radio frequency and loop has advantage of greater selectivity, due to directional properties of the latter. Also it eliminates interference resulting from static disturbances to a remarkable degree.

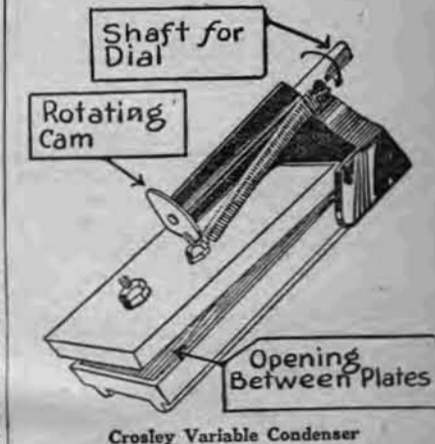
The reason for the superior results obtained with Radio frequency amplification is that it enables the detector tube to do its work more efficiently. As is well known, a detector tube will fail to respond to less than a given signal voltage. Through the correct combination of amplifying tubes and Radio frequency transformers, feeble signal voltages are brought up until they are able to operate the detector tube in a satisfactory manner.

Nor does it make any difference how weak the incoming signal is to start. Proper Radio amplification will bring it up to sufficient strength to make the detector operate, after which audio amplification may be brought to play.

Unlike audio amplification, Radio fre-

quency is not limited in its application by disturbing tube and battery noises. This is because these noises are usually at a relatively slow rate and are not effectively transmitted through an amplifier designed for Radio frequency currents. Thus it is possible to use many stages of Radio frequency amplification, whereas audio frequency is usually limited to two or three stages at most.

THE CROSLLEY variable condenser is one of the improvements in Radio apparatus introduced during the past few years. It has a number of advantages over the type of interlocking plate air condensers. It depends upon a thin sheet of mica for insulation between the plates. As there is no friction from the opening and closing of the plates, the mica will last as long as the condenser. Moreover, the mica will stand up under much higher voltage than the average air condenser,



Crosley Variable Condenser

without puncturing, breaking or showering. Therefore the condenser can be used safely for C. W. work or modulated C. W. work. Anyone who has experimented with Radiophony will readily recognize the advantage of this feature.

Each condenser is carefully tested to withstand one thousand volts. Another decided advantage of the condenser is the fact that there is no danger of short circuiting through bending of plates.

EVERY RADIO fan dreads the time when his "A" battery requires recharging. This means a nice job of hauling what seems to be a ton weight to a battery station with, perhaps, the alluring prospect of spilling some of the electrolyte on the family carpet or, better still, over a brand-new suit. All the soap and water in the world will not replace the material that the acid has left its mark on.

What then is more enticing than the prospect of charging your own batteries direct from the electric light circuit? It can occasionally be done without special apparatus, but it requires a knowledge of electrical circuits and storage battery charging that the amateur lacks. An attempt at recharging without the apparatus usually results in blown fuses and a ruined battery.

One of the battery chargers on the market, manufactured by the France Mfg. Company, is illustrated on this page. This rectifier and charging unit can be used on both "A" and "B" storage batteries. There are no parts to wear out and it requires little attention. The fact that it is portable makes it a handy accessory for the Radio amateur. It is exceedingly flexible as to voltage and current range. The actual current drawn from the house lighting circuit amounts to very little, therefore making recharging an inexpensive operation. Batteries can be set up and recharged over night.

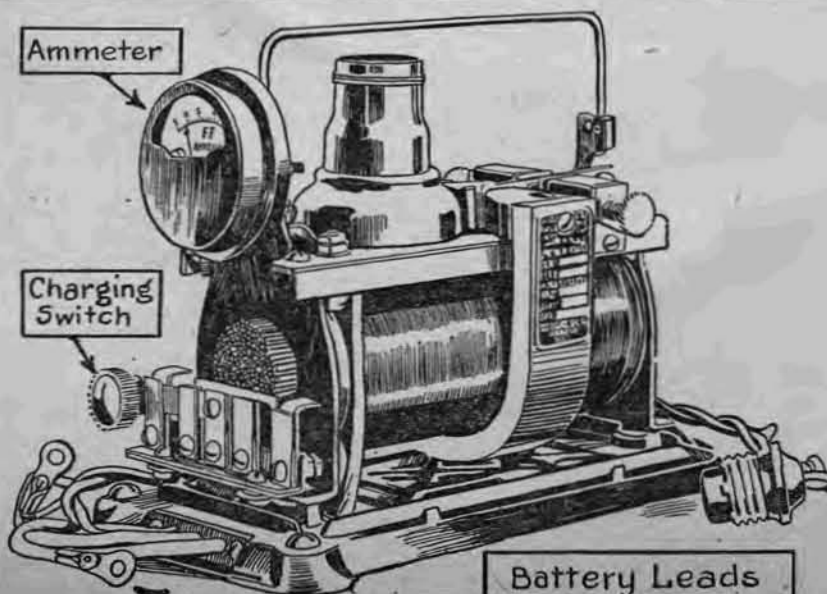
The operation of the P-F magnetic rectifier does not depend in any way upon the condition or state of charge in the battery, hence in many cases a badly sulphated or dead battery may be brought back to usefulness if there is any chance whatever.

To charge a 6-volt storage "A" battery, the switch is thrown to the right and then the positive charging wire with red clip is connected to the positive terminal of the battery. The other clip is connected to the negative terminal of the battery.

To charge a storage "B" battery, which may consist of any number of cells up to fifty, equivalent to 100 volts, the switch is thrown to the left side and the positive charging wire with red clip is connected to the positive terminal of the battery. The other clip is connected to the negative terminal of battery.

The ammeter on the rectifier reads directly in amperes, and will therefore only show a slight movement when charging a "B" battery, due to the small current flowing, but the glow of the lamp will indicate that the battery is being charged.

F-F Charger Stops Battery Worries



Battery Leads

Radio Digest Illustrated

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In a new scientific field where many writers are contributing articles there will arise some controversy over the expressions of opinions and statements made from time to time. Some of these controversies may be taken into the courts for settlement. The priority of inventions may be claimed as well as the merits of some part entering into the construction of the radio apparatus. The Radio Digest is an outlet for these expressions and the publisher disclaims any responsibility for opinions or statements made in connection with radio apparatus. The news will be printed as it comes to us.

Vol. II Chicago, Saturday, July 15, 1922 No. 1

Radio and the Women

Many Openings for Women Are Found in New Art
THE GOVERNMENT now renders peace time service for women who want to delve into the mysteries of Radio. For those who wish to take up Radio as a profession there is a chance to learn the meaning of the dots and dashes used in the International Morse Code free of charge. Information in detail will be supplied by writing to the nearest Army headquarters. Lessons will be sent by mail, simple lessons, so that a student of average education may understand and grasp the principles. Government instructors will correct the lessons.

Women Radio operators will be in evidence in the near future despite some present prejudices against their services. It is claimed that ships never engage women as Radio operators, because in the case of accident, the Radio operator and the captain leaves the ship last. This would interfere with the unalterable code of "women and children first," yet women telephone operators have proven their bravery in the face of disaster by staying at their posts for days at a stretch.

Radio is open to women in many land stations. It is certain that when women prove themselves proficient in this new field they are bound to be in demand.

Lightning Not Attracted by Aerials

Small Wire in Aerial Has Little Effect

IT MAY BE of interest to the many Radio fans that the fire department of the city of New York has never had a fire on record that was caused from lightning following an aerial, whether it was protected by arresters or not. If this is the case, why should the drastic regulation rules proposed by the Underwriters be considered at all.

Lightning is nothing more than a discharge of high potential of electricity between two objects. This may happen between two clouds or between a cloud and the earth. It is assumed that the earth has a charge of electricity at all times, and we may call this charge the positive. The hot, dry air makes a good insulator between the clouds and the earth, but if the clouds hang low a charge of electricity is induced in them by their closeness to the earth and this charge is the opposite to the earth's charge. If a wind springs up other clouds will swiftly pass the charged cloud and an opposite charge is induced in them and then a flash occurs. The air between the clouds is broken down and the disruption causes a downpour of rain. If the cloud comes near the earth the same effect is produced and the flash of lightning will be between the cloud and the earth. This latter case is the one that is of greatest interest to the Radio man.

The lightning discharge may be many million volts. It sounds dangerous, and is dangerous if you are in its path, but the lightning is not going out of its way to meet you. The flash follows the lines of least resistance and takes the shortest possible path to earth.

Suppose the cloud is hanging over your aerial and it is the closest point toward the earth. If your system is properly grounded it may drain the cloud of enough energy to make it ineffective. Suppose the charge in the cloud is too heavy for your aerial to drain it, or too slow to make it ineffective, then the flash occurs and aerial or no aerial the flash will reach the earth, but not through the small wire by any means. The insignificant No. 14 wire used in most aerials will not change the path of a bolt of lightning in the least.

Lightning arresters are used to protect the instruments from extra heavy current surges caused by excessive static and from high potential currents induced from lightning discharges taking place at a distance, but these arresters offer no protection from a direct bolt of lightning. They will no more protect the system from lightning than the mistaken idea that an aerial offers to attract such a bolt, and that is none. Put up an aerial and use it, also use a lightning arrester for the sake of the law and forget about the danger talked about by the Underwriters.

Ye Ed Asks 'imself

Question.—What is the general plan of Radio reception?

*Answer.—*When the Radio message is sent a signal is energized in the ether with electrical energy having vibrations from five to four million cycles per second. In the receiving set these signals respond to a set which is tuned in electrical resonance for the type of signal which is sent out. In some receiving sets this signal is reduced in frequency before it is amplified; in other words, the frequency is changed from Radio frequency to a frequency which is capable of reception by means of the human ear. In other receiving sets this Radio frequency is detected by means of the detector lamp and is then amplified to the required amount before it is reduced to a frequency suitable for reception by the human ear.

In ordinary crystal receiving sets it is always customary to reduce this Radio frequency to human ear frequency, and then amplify such a system in the regular manner.

Question.—Considerable discussion is being raised in regard to the efficiency of crystal detector sets. This discussion arises particularly as to the range in miles of such a set. What is the mileage of the ordinary crystal set?

*Answer.—*A large number of manufacturers have produced sets covering wave lengths of two hundred to four hundred fifty meters. They have been careful in the production of these sets not to lead the purchasers to believe that the range in mileage of these sets was extraordinary. In producing the set they have simply stated that it would receive certain signals and have been also careful to specify the wave length in meters. This use of the term wave length meters has caused considerable confusion in the mind of the ordinary purchasers as to the efficiency of the set. He has immediately jumped to the conclusion that the specification of wave length range in meters represented in miles the total range value of the receiver. Unscrupulous dealers noting this effect have added to the present confusion by leading the prospective customer to believe that his interpretation of the wave length as total reception of mileage was correct, and it is on this account principally that a good many purchasers of crystal detector sets have become thoroughly dissatisfied with Radio receiving apparatus.

It has also been found that under good conditions reception has been obtained with an ordinary crystal set from two hundred to two hundred fifty miles. This is exceptional, however, for short wave length reception. Use has also been made of this fact to endeavor to sell the customer another set claiming that the set has gone defective. Endeavoring to make such a sale the dealer has been forced to specify the mileage reception of the instrument and because of his reluctance to actually inform the customer the actual mileage either through ignorance or otherwise he has in general specified a range of 50 miles.

In general it may be said that music by means of present broadcasting systems can only be heard with the ordinary crystal set during summer months at a distance of from five to a maximum of ten miles; this range can only be obtained by means of an antenna system at least one hundred fifty long, mounted in a satisfactory manner at least fifty feet from the ground. A crystal receiving set should not be depended on to respond to music broadcasts with an indoor aerial.

Question.—There seems to be considerable argument as to the necessity of using a highly efficient telephone which is located in series with an ordinary amplifying set. Advise whether an ordinary telephone receiving set is suitable for the purpose.

*Answer.—*In a crystal receiving set there can be no question as to the necessity of employing the most efficient type of telephone receivers. These at best will give only ordinary results so that it will be obvious that an inefficient telephone would make the signals very hard of reception. It is, of course, to be understood that a phone consisting of inexpensive parts will not stand the wear and tear as satisfactorily as a set which is made of good material and built for rough treatment. Even in an amplifying set the best type of telephones should also be used.

In general it may be said that the purchase of a high grade telephone receiver is absolutely necessary for good Radio reception, even though an amplifier is used.

Question.—How is the length of an aerial determined?

*Answer.—*Lengths of either an indoor or outdoor aerial are not predetermined. General rules, however, require that it be, at least, seventy-five feet long, one hundred to one hundred twenty-five feet being, if possible, a better length to use. An aerial of this type should be mounted, at least, thirty-five feet above the ground, and provided it is properly insulated should give good results. However, for the reception of long wave lengths, a considerable longer aerial may be of decided advantage, especially in the summer months.

Question.—Is it possible to use a bed spring as a satisfactory antenna?

*Answer.—*Provided a bed spring is located in the same building or close to the location of the transmitting station a bed spring may be used with the proper amount of amplification.

In general it may be said that a bed spring or similar methods are inefficient and entirely impractical for ordinary use.

W. N. Furthman.

RADIO INDI-GEST

The Radio and the Ladies' Aid Society

Robert Stewart Stuliffe.

The Millville gossips used to say that Becky Brown could talk all day; 'twas Tra-la-la and Far-a-diddle, her tongue was balanced in the middle. And though good records others made when Thursday met the Ladies' Aid, Becky's clack them all would drown, she'd start and talk the whole bunch down.

One quiet dame, Miss Hilda Snow, just listened; but the Radio, had come to town, and Hilda's dad, had got the Radio fever bad. It sounded loud the time



to rise, at breakfast gave him warnings wise; at ten it told what eggs were worth, then news from all around the earth.

At noon it gave the dinner call, at five who'd won the day's baseball; at seven a concert, then, a talk on things that fly and those that walk. On Jupiter, the Milky Way, on what had happened through the day, and listening Hilda got to know, about a million things or so.

In Hilda's brain was straightway born a scheme to silence Becky's horn; for seven hours every day, she'd listen to broadcasters' say. She'd hardly stop to sleep or sup, but like a sponge just sopped it up, and then came Thursday afternoon, and with it Becky's endless tune. But something stopped her usual din, for Hilda rose and butted in.

She talked of stars and of the sun, of ball games lost and races won; of history, plants and of the trees, of shoes and hats, of skirts at knees. Things of the past, and those to be; rehearsed them all, from A to Z.

And three straight hours went rushing past, as in a trance she held them fast; and Becky Brown received a rout, she fainted and was carried out.—Worcester, Mass., Telegram.

Boy, Order Our Radio Funnels!

Coils, condensers, rheostats,
Also whiskers from the cats,
Seems the last few months or so,
All we've heard is Radio.

"Thinker" Jones came from afar
To get some spare parts for his ear,
In and out the stores he'd go,
But all he found was Radio.

William Plum, he looked for plugs,
He got so tired he needed drugs,
Into a drug store he did go,
And all he found was Radio.

In an office there is a clerk
Who tells the boss he's killed with work;
Oh! if the boss could see this bo,
His phone hooked on the Radio.

Tightwad Johnson sure did hate
To see the usher pass the plate,
Now to church he does not go,
He just hooks up the Radio.

When you go into the shop
To have the barber cut your mop,
You'll want to "wait" an hour or so
And listen to his Radio.

Each day we see some new device,
A frequency regulator or cable splice,
Prediction has it hooch will flow
Through the agency of Radio.

All for a Nickle

At a wired-Radio demonstration in New York, a connection with a lamp socket operated a fan, lighted a lamp, heated an iron and produced a Radio program all at one and the same time. The only reason a hair



curler and a warming pad for an ache were not provided was that no one in the audience asked for them. It reminds us of the old days in Coney Island when the Barker used to cry "Here y' are! A side o' beef, a loaf o' bread and head o' cabbage for a nickle!"—Chicago Daily News.

An Efficient 500 Meter Loose Coupler

By Adrian Van Muffling

SIMPLE directions are here given for the construction of a loose coupler to receive wave lengths up to 500 meters. Use two tubes of waterproofed cardboard of about $\frac{1}{2}$ inch wall thickness, 4 inches long and of $3\frac{1}{4}$ and $3\frac{1}{2}$ inches outside diameter, respectively. Next have your local patternmaker turn up two wooden disks, A and B, of dimensions as shown in Figure 3. Care should be taken to have the raised shoulder on the inner surface fit snugly in each respective tube without forcing the latter out of shape. Also have him turn up a plain wooden disk, C, to fit into the other end of the inner cardboard tube.

Now lay out on each disk two holes for the brass sliding rods. Draw a line on the disks $\frac{1}{2}$ inch from the center and lay out the centers at a distance of 1 inch in each direction from the bisecting diameter. Care should be taken to have the positions of the holes exactly alike on each disk, or binding may result that will make tuning difficult. It will be found best to nail the disks temporarily with very thin brads and drill the holes in one operation, preferably on a drill press to insure perfect parallelism. The stands D, E and F are also made of wood, $\frac{1}{2}$ inch or $\frac{3}{8}$ inch thick. In D, which forms the end stand and supports the brass rods, two holes 2 inches apart must be drilled to receive the latter. The stands are best fastened to the base board with glue, or they can be screwed from the bottom.

Assembly of Primary

The outer or primary tube is fastened to the stands with four or six screws, which should have flat heads so as not to interfere with the movement of the secondary tube within. To avoid crooked driving of the screws, two holes large enough to admit a long thin screwdriver should be drilled at points exactly opposite the screw holes. All dimensions of parts are found on the detail drawing, Figure 3.

The sliding rods should be of brass rod or tubing, $\frac{1}{4}$ inch in diameter, though a slightly larger size may be used if this is more readily available. It is best to

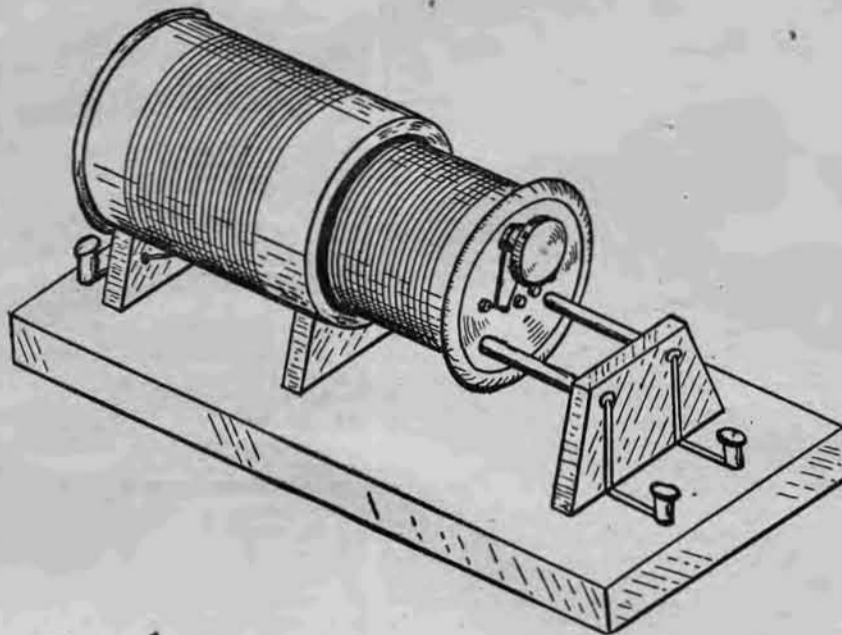
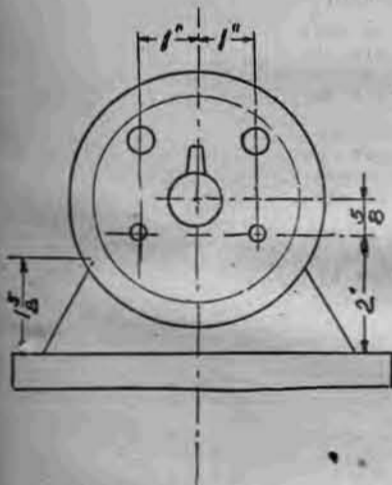


Fig. 1

lows and you will not have any trouble: 1st, drill all required holes in the tube; 2nd, wind the coil as required, leaving loops for attachment of tap wires; 3rd, assemble the switch complete, and fasten or solder a generous length of tap wire to each contact. Also mount the two primary binding posts, connecting one by a lead to the switch post and the other to a wire to be drawn through the hole with

in assembling the secondary, except that the disk C should be inserted after everything else is finished. A novel idea and one that will improve the appearance of your outfit by eliminating all loose wiring consists in fastening the secondary terminal ends to the sliding rods. This is best done by drilling a small hole in each rod and soldering the end of the wire into it. Care must be taken to do



TAP PRIMARY WINDING IN REAR AND BRING TAP WIRES THROUGH THIS HOLE

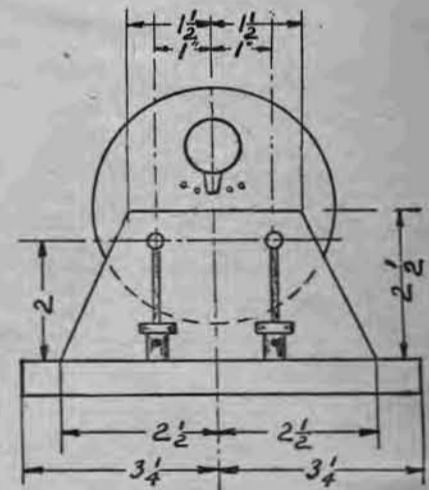
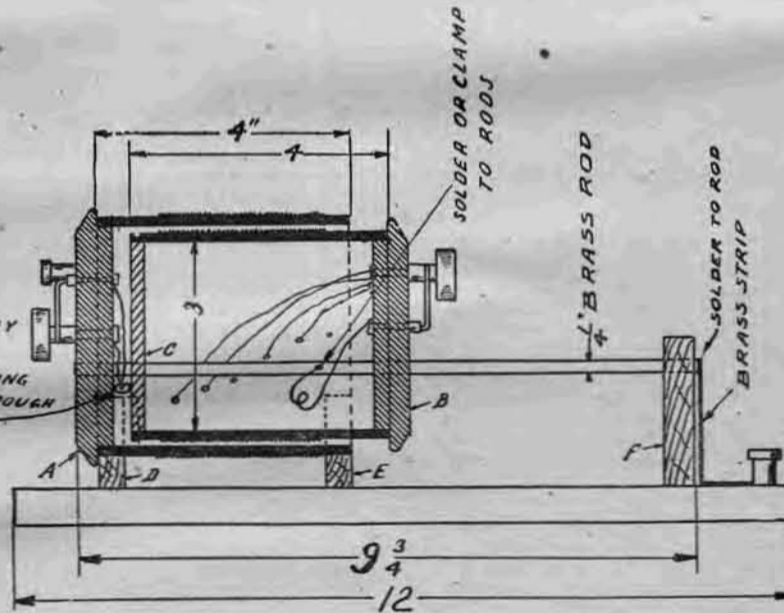


FIG. 3

drill the holes to receive the tubes in A and D slightly oversize (about $\frac{3}{1000}$ inch.) This will make a force fit and will eliminate the necessity of using cement or set screws to keep the outfit in place. It is always unwise to make instruments so that they can not be taken apart if necessary without causing something to break. Many amateurs are apt to do this to their later regret.

The holes in B and A, on the other hand, should be somewhat oversize to allow easy sliding of the inner tube.

Tapping Primary

Usually this type of transformer carries the tap switches on the base board, which makes a rather unsightly job on account of the many wires. With a little care it is possible to put both switches on the spool heads, and thus keep all the wiring concealed.

Tapping the winding is done in the usual manner, that is, at every turn where a tap is required a little loop is made in the wire and the insulation carefully scraped off. The wires are then soldered to the loops.

The primary top switch should be put on the spool A in the position shown. Dimensions for locating it exactly have not been given because they will depend upon the size of switch which you decide to use. The wiring should be tapped on the rear side of the coil, where the wires will not show. All tap wires are then bunched together and brought into the coil through a hole drilled in the tube as closely as possible to the shoulder of the spool.

Order of Assembly

You should be careful to assemble everything in its proper sequence, otherwise you will find it very awkward to attach the wires to the contacts after the tube has been assembled. Do it as fol-

the others. 4th, draw all wires through the hole from within. You will now be able to assemble the coil, using shellac or glue to join the tube to the spool. 5th, solder all wires to the proper loops, not forgetting that the one leading to the binding post should connect with the far end of the winding. Next, fasten the tube to the blocks E and F and fasten to the base.

Putting Secondary Together

The same procedure should be followed

this at a point on the rod where no interference will be caused with the free sliding of the inner tube along the rod. The best place will be found at a point about $\frac{3}{16}$ inch outside of the spot at which a ruler laid across the tube touches the rods. After you have finished assembling the primary tube a little experimenting will show the exact location with no trouble.

Coil Inductance Values

The primary winding will be 3 inches

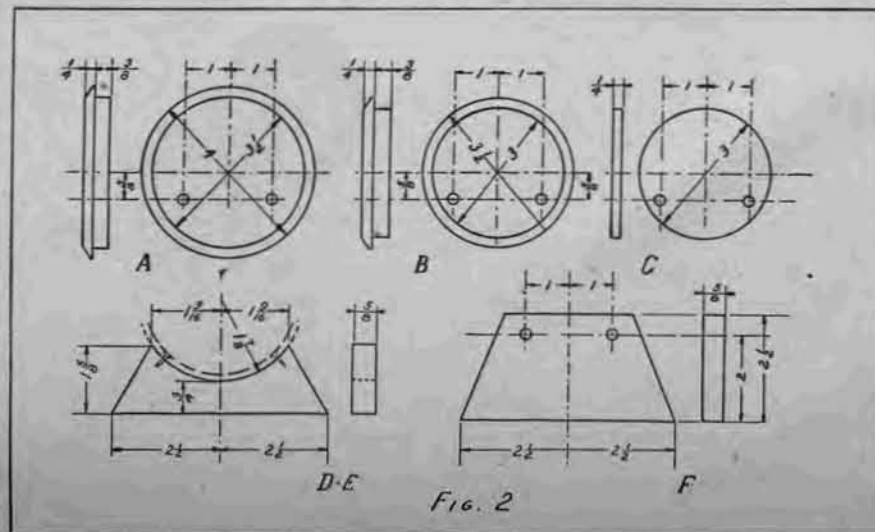


FIG. 2

wide. It should thus begin at a point $\frac{1}{2}$ inch from the edge of the tube. The inductance is calculated for an antenna of the L type 60 feet high with a 20 foot lead to the set. The antenna inductance is 185,500 centimeters. The primary should be wound with 150 turns of No. 26 single silk covered wire, 148 feet of which will be required. This will receive up to wave length of 500 meters.

The coil should be tapped at the 15th, 30th, 45th, 60th, 75th, 90th, 105th, 120th, 135th and 150th winding. Ten contacts will thus be required for the primary tap switch.

The secondary winding consists of 100 turns of No. 30 double silk covered wire, the length of which will reach 95 feet. Seven taps on the secondary switch should be connected respectively to the 14th, 28th, 42nd, 56th, 70th, 84th and 98th turns. This set is designed to be operated with two 43-plate condensers of .001 microfarads each.

The secondary terminals can be mounted upon the base plate as shown in the illustration and connected to the slide rods by means of copper strips, or they can be fastened directly to the rods themselves where they issue from the support D. In either case an exceptionally neat looking outfit will result.

A Summer Battery Suggestion

The storage battery is one unit of the Radio set that cannot be disregarded for any great length of time without suffering a reaction. The necessity of keeping this particular unit in first class operating condition is obvious to any one who has used it as a part of the Radio outfit.

The necessity of replenishing the individual cells with distilled water more frequently than usual during the summer months is due to the fact that evaporation of the water is much more rapid, due to the hot weather. Fans who operate their sets all year around will find it necessary to add distilled water about once a week during the summer instead of once every two or three weeks.

Use nothing but pure distilled water in

your battery. Boiled water is not distilled water, and is the worst kind to use in this connection, because the mineral salts are precipitated and concentrated and it is not long before enough have accumulated in the battery to start an electrolytic action between the plates and the mineral salts. The result is that the framework of the plates is soon eaten away and the battery ruined. Do not attempt to add any acid to the solution, as it is not necessary and will undoubtedly prove detrimental.—Geo. Hanley, San Francisco, Cal.

Straightening Warped Dials

Warped composition dials are not uncommon on Radio outfits. Such dials may be fixed up as good as new if due precaution and care are taken, when attempting to straighten them out. Proceed as follows:

Take the knob from the face of dial and subject the latter to dry heat, taking care not to crack or blister the dial, or melt the surface. After being heated, the dial is clamped tightly between two smooth, flat boards for three hours or more. This operation will give a dial as straight as a new one, and by exercising a little caution, this may be repeated as often as found desirable.—P. J. C.

Care of Vacuum Tubes

When you handle the vacuum tubes of your receiver great care should be exercised that they are not knocked about or that the filaments are broken. A good way to operate these tubes is to keep the glow just a little below the critical point.

Radio Telephony for Amateurs and Beginners

Part VIII—Receivers and Loud Speakers

By Peter J. M. Clute

To Explain—

The following article by Peter J. M. Clute is a continuation of his series. Articles to come are:

- IX. Crystal Detector Receiving Sets.
- X. Vacuum Tube Receiving Sets.
- XI. Amplifiers.
- XII. Useful Information.

THE TELEPHONE receivers are, perhaps, the most important part of a Radio receiving set. They perform the final operation for the reception of Radio signals and enhance or detract from the value of the receiving set, according to the quality of their tone.

The telephone receiver consists essentially of a horseshoe magnet and an armature, upon which is impressed a magnetic field due to the current flowing in the winding around the horseshoe. Referring to Figure 1, the mechanical force exerted across the gap (the pull of the electromagnet upon the armature) is proportional to the square of the induction across the gap. When a magnetizable body, such as iron, is put in a magnetic field, the number of lines of force is increased; the number per square centimeter of area is called the "induction."

If no current is flowing through the receiver winding, there is a constant pull

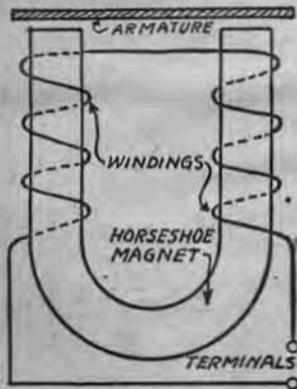


FIG. 1: ESSENTIALS OF A TELEPHONE RECEIVER

due to the permanent horseshoe magnet. When a current is flowing in the winding, the force pulling the diaphragm toward the magnet is proportional to the square of the induction, due to the current flow. It is desirable that the receiver diaphragm shall vibrate always directly proportional to the current flowing in the windings, so as to reproduce in audible form the variations of the current received. The greater the induction of the permanent magnet is made, other conditions being the same, the greater will be the diaphragm displacement for a given current input in the receiver windings. In other words, the diaphragm of the telephone receiver repeats the current variations but in amplified form: Inasmuch as the diaphragm is an elastic body, it has a tendency to vibrate at its natural frequency, the latter being largely dependent upon the elasticity of the material of which it is made. The current input of the re-



Fig. 2

ceiver windings is constant in amplitude but varies in frequency. The greatest movement takes place when the frequency impressed is the same as the natural frequency of the diaphragm.

Telephone Receivers for Radio Work.

Telephone receivers for Radio work should be much more sensitive than ordinary receivers, since Radio signals are often quite faint, especially those from distant stations. These receivers are usually wound with from 1,000 to 1,500 ohms resistance per single receiver. If German silver wire is used in winding the bobbins of Radio receivers, the cost of making the receiver is greatly reduced, since this type of wire has a much higher unit resistance than copper wire of the same size. However, since the sensitiveness of the receiver depends, not directly upon the resistance but on the number of turns of wire on the magneto, it is readily apparent that German silver wound receivers are inferior to those wound with copper wire.

The diaphragms of Radio receivers are thinner than those of ordinary receivers, so that less energy is required to set them in vibration. There is a certain limit,

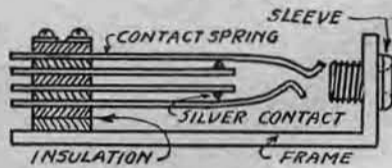


FIG. 3. JACK FOR TELEPHONE PLUG

however, beyond which decreasing the thickness of the diaphragm also decreases the sensitivity of the receivers.

One type of receiver has a long permanent magnet, being more than a complete circle, since the ends overlap. The magnetic circuit has comparatively little reluctance, having a double path between the pole-pieces. The air spaces are thin and the flux from the permanent magnet does not have to pass lengthwise through the armature. These features of the magnetic circuit favor a strong flux and permanency of magnetization.

Thin Armature Main Part.

In the electromagnet, the thin armature is the main part affected by the energizing current, the iron losses being thus reduced to a minimum. The winding is concentrated in a single spool and its effect upon the armature is utilized at both ends and on both sides at each end. The thin mica diaphragm is very light and sensitive to the impulses of the armature. The diaphragm, armature, link and spring together weigh only a fraction of the weight of the common steel diaphragm.

Figure 2 shows a certain type of receiver that is distinguished for its matched tone and pitch, possessing a soft, clear tone, which is a great advantage for long distance reception. The diaphragms in these receivers are 0.006 inch thick, and the caps are of hard rubber and shaped in such a manner that they fit closely and feel quite comfortable to the ears. The bobbins are wound with No. 40 enameled pure copper wire to the correct number of turns, giving an approximate resistance of 3,000 ohms to the set.

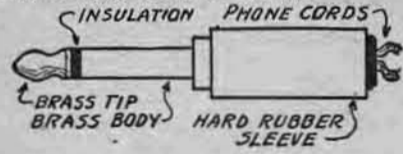


FIG. 4. TWO-CIRCUIT TELEPHONE CORD TIP PLUG

In most types of receivers, special attention has been paid to the pitch as well as to the sensitiveness in the design of the receivers. It has been determined that the human ear is more responsive to higher-pitched notes than to lower ones, and for this reason these receivers are given a high natural period, bringing in weak signals, clearly and strongly.

Jacks and Binding Posts.

Jacks or binding posts for one pair of telephone receivers are provided on all receiving sets. Figure 3 shows a jack in which fits a plug fastened to the receiver cord tips. Figure 4 depicts a two-circuit plug, which can be used with any standard make of jack. As the plug is inserted, it connects the 'phones in series with the circuit automatically.

A new plug has been designed to answer the needs of the amateur who does not use a loud speaker. This multiphone plug enables one to install four or less sets of phones with one plug and one jack. It is constructed so that when two or more receivers are to be connected to a receiving set, they are joined in series, as tests have shown that better results are obtained than if the phones are wired in multiple.

Another commercial multiphone attachment is made up complete with four sets of headphones. This device may be used in connection with any receiving set by simply clamping one of the receivers firmly on the multiphone.

Automatic filament control jacks pro-

vide a convenient and rapid means of shifting the telephones from one stage of amplification to another. They are so connected as to cause the insertion of the

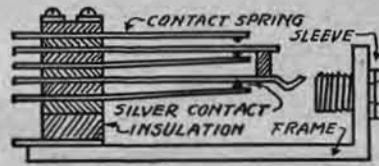


FIG. 5. TELEPHONE JACK FOR DETECTOR AND AMPLIFIER CIRCUITS

telephone plug in any stage to light only those filaments required by that stage of amplification. Removal of the plug immediately extinguishes all filaments and allows their relighting by the mere insertion of the plug without adjustment of the filament rheostats. This feature greatly increases the useful life of the vacuum tube and the drain on the filament battery is reduced to a minimum. The jack, shown in Figure 5, is designed for use between the detector and amplifier and successive stages of amplification, except the last step, when a jack, such as shown in Figure 6, should be used, as two of the springs are not necessary and are omitted in this jack, for the last step,

Loud Speakers.

The loud-speaker, one type of which is shown in Figure 7, is virtually the backbone of successful Radiophone reception. When wearing head receivers, one is apt to hear too many of the disturbances and howls existing in the various circuits, especially if the signals are brought up loud. However, with the loud-speaker in operation, it is generally possible to hear the voice or music loud and clear above the parasitic sounds, and this makes the Radiophone service all the more popular and enjoyable.

As a general rule, a loud-speaker will not work well on simple receiving sets. However, if the signals received in the head-set are exceptionally loud, it may be possible to attach a loud-speaker to the

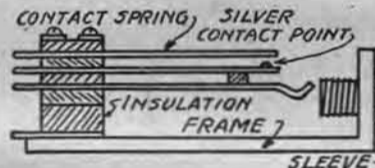


FIG. 6. TELEPHONE JACK FOR LAST STAGE OF AMPLIFICATION

receivers, so that the sound may be made more audible by the acoustic properties of the horn. Ordinarily, a loud-speaker may only be operated by the use of an amplifier. One type of loud-speaking device consists of a special high-resistance receiver mounted in a base over which a horn of scientific design, to give proper acoustics, is mounted.

It is interesting to note how many devices have been introduced for use as loud-speakers in connection with the reception of broadcast programs. Figure 8 depicts one of the new devices, which consists of a simple cast aluminum horn, provided with two arms that terminate in soft rubber caps. The ordinary pair of phones clamps over the two arms, so that the sound must then pass up through and be amplified by the horn. No sheet metal is used, so that the "tinny" sound is left out. The volume is doubled, because the sound from two head phones are blended into one powerful tone.

Phonograph Type Loud-Speaker.

Another device utilizes the tone chamber of the phonograph, as shown in Fig-



Fig. 7

ure 9. It has been found that the tone chamber of any talking machine is quite favorable to the reproduction of Radio music and speech. One of the phones is attached to a novel holder, which rests

upon the turntable of the machine. To connect the attachment it is only necessary to remove the speaker-box from the tone arm and replace it with the attachment. The sound passes from the receiver to the tone arm of the machine, and a loud-speaker is obtained at low expense. It can be used with one or more stages of amplification.

There is no doubt but that broadcast music is at its best when it is heard through some form of loud-speaker. Radio loud-speakers operate on the same principle as the phonograph. Vibrations of the diaphragm result in corresponding sound volume. With Radio, the volume of sound produced by a loud-speaking device depends upon the energy received from the transmitting station.

Loud-speakers cannot be employed directly with simple crystal receiving units, unless the latter are located very near to the broadcasting station. A vacuum tube detector outfit increases this distance



Fig. 8

slightly, but even this method is not adapted for general usage. No matter what sort of receiver is used, where the distance from a transmitting station is more than a few miles and a loud-speaking device is desired, it will be found necessary to have an amplifier for satisfactory results. An amplifier is a combination of tube units which, working together, can build up the original energy of the receiving antenna system, so as to be audible. Generally speaking, amplifiers consist of one or two vacuum tubes with the necessary connecting and control equipment. An amplifier with two tubes is called a two-stage, two-step or double-stage amplifier. There are generally provided jacks for making instantaneous plug connection to the first or second stage, as desired, thus regulating the volume of sound produced.



Fig. 9

The simplest loud-speaking devices make use of a single telephone receiver and a special horn. These horns are provided with soft rubber gaskets, or with clamps, so that the regular receiver may be held in place while the sound travels up through the horn and are amplified so as to be audible at a distance. The fact that these devices may be used without any alteration responds to the popular fancy.

Regenerative Receiver Trick

A common mistake in a home-made regenerative receiving outfit is to reverse the leads to the plate coil. In this condition the coil will not oscillate, so that no regenerative amplification is obtained. Many an amateur will become discouraged and discard their coil just for this little mistake. The thing to do is to change plate coil leads if the circuit does not regenerate.—Walter A. Knight, Hudson, Mass.

Simple Instructions for the Beginner

By Harry J. Marx

Radio Measuring Instruments

THE ACCURATE electrical control of transmitting sets by means of indicating electrical instruments is firmly established among experienced operators. To secure perfect radiation the operator of a transmitting station uses exceedingly accurate instruments as guides. The novice operators of vacuum tube receiving sets seem to be laboring under a misapprehension in that they deny the necessity of instrument control. The use of instrument control is desirable not only as a means of a more certain adjustment but because with certain instruments, damage to the tubes can be prevented and the life of the tubes so greatly prolonged that the saving in the cost of tube renewals will soon pay for the cost of the instrument.

He may, in an effort to be careful of his tubes, guess at a lower filament voltage than is proper. This will result in poor reduced phone reception and promptly the operator places the blame on the broadcasting station or upon an otherwise perfectly good receiving set. The more common practice is to overheat the filament and force the tubes in an effort to secure better results, which reduces the life of the tube without a compensating increase in reception. As small an increase as 5 per cent in filament current above the rated value as determined by the tube manufacturer will, if maintained, reduce the life of the tube to one-fourth its normal life.

Methods of Filament Control.

There are two methods of filament control, the voltmeter control and the ammeter control. With the voltmeter the voltage across the filament is maintained at a certain value. With the ammeter the amperage thru the filament is maintained at a certain value. The United States navy, in co-operation with the manufacturers of tubes, after extended experimental investigations, have determined that the voltage life of tubes with voltmeter control is three times as long as with ammeter control, hence the voltmeter control is preferable.

There is quite an obvious reason for this difference in life. As the filament burns it is constantly disintegrating, due to the high temperature, and as it wastes away, it becomes thinner and the electrical resistance increases. Now if we continue to force the same current as measured by an ammeter through the filament, Figure 4, the temperature constantly increases as time goes on due to the corresponding increase in resistance. This higher temperature hastens the disintegration and soon results in the burned out tube. If, however, the voltage is maintained constant with a voltmeter across the filament, Figure 6, the current through the filament decreases as the resistance increases, and this prevents the filament temperature reaching dangerously high values and so prolongs the life of the tube.

ment consists in essentials, of the following parts:

1. A permanent magnet having pole pieces on the inside of the two extremities as shown in the illustration and having a cylindrical core inserted between the pole pieces permitting a gap of minimum size sufficient to permit the coil to rotate.
2. A coil, the moving element, wound in accordance with the requirements of the instruments and mounted in jewel bearings so as to rotate freely in the gap between the pole pieces and core.
3. Two springs rigidly attached to the movable coil above and below, producing a torque in a counter clockwise direction and also serving to carry the current from the external circuit through the coil.
4. A pointer rigidly mounted on the movable coil as shown in the illustration.
5. If necessary an external resistance as in the case of the voltmeter shown to the left of the instrument in the illustration.



Figure 2



Figure 3

How Meters Indicate or Measure.

The springs produce a torque which tends to keep the pointer on the zero of the instrument, this torque being in a counter clockwise direction.

The permanent magnet produces a magnetic field between the pole pieces through the core. When current flows in the circuit through the coil, another magnetic field is established surrounding the coil in proportion to the magnitude of the current. The two magnetic fields are so constructed that they react and produce a torque in a clockwise direction. This torque tends to deflect the pointer towards the right, and when counter balanced by the counter clockwise torque of the springs, and correctly calibrated, will on a proper scale, indicate volts or amperes.

Figure 3 illustrates a direct current filament ammeter of the type designed for use on Radio receiving or transmitting sets.

Figure 2 shows a filament voltmeter of identical type which has been found so essential for filament control.

Using the Instruments.

The various uses of electrical measuring instruments for use on vacuum tubes and receiving sets are illustrated in the accompanying hook-up diagrams. An ammeter may be used for filament control as illustrated in Figure 4 or the preferred method, namely, voltmeter control, is clearly illustrated in Figure 6. Note that the voltmeter is connected directly across the filament between the filament rheostat and the tube. Figure 5 shows how the milliammeter is inserted in the plate circuit.

A very simple hook-up by means of which it is possible to become more familiar with the vacuum tube and to learn the essential characteristics, is shown in Figure 7. This consists of an ammeter and a voltmeter in the filament circuit, and a milliammeter connected in the plate

circuit. By varying the voltage on the filament, the magnitude of the current flowing through the filament may be read directly on the ammeter and by means of Ohm's law, the resistance of the filament may be computed. By varying the "B" battery voltage for various filament voltages, the nature and magnitude of the plate current may be studied.

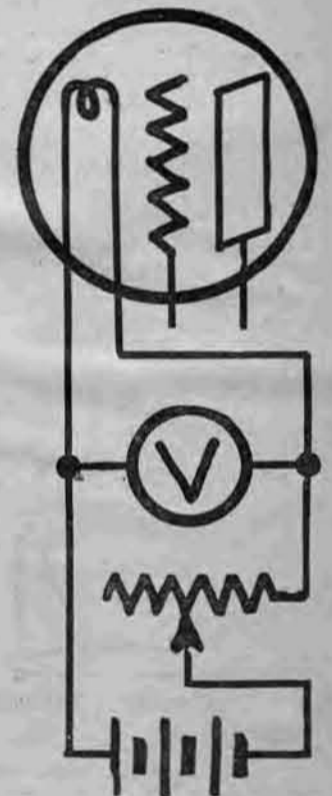


Figure 6

The Complete Receiving Set.

A complete set consisting of a detector unit and one stage of amplification is shown in Figure 8, equipped with all meters which are practical for use in a receiving circuit. It is not essential that two filament voltmeters be used as shown in the diagram, but in a manner similar to that illustrated for using the plate voltmeter on either the detector or amplifying plate, the filament voltmeter may, by means of a switch, be used to indicate either the filament voltage of the detector tube or the amplifying tube.

Radio fans who wish to progress with the development of the science of the Radio telephony reception will be amply repaid for their efforts if they utilize every possible scientific method of in-

(Continued on page 15)

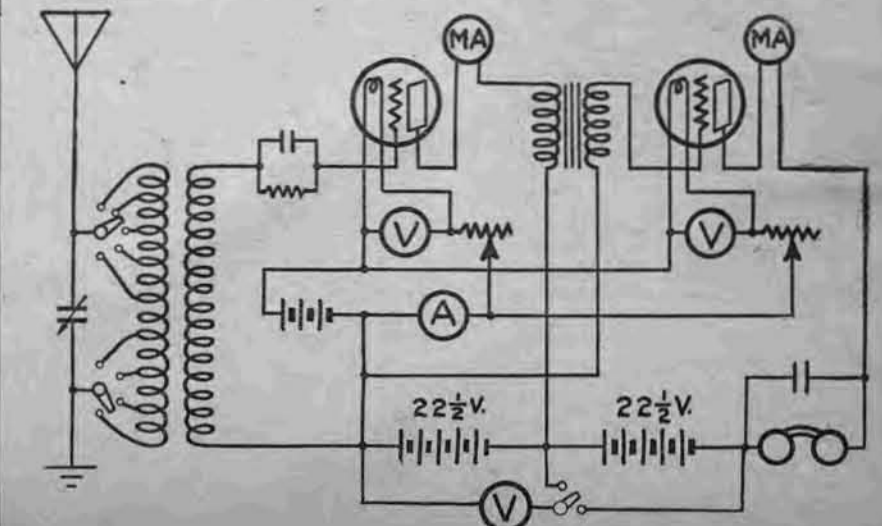


Figure 8

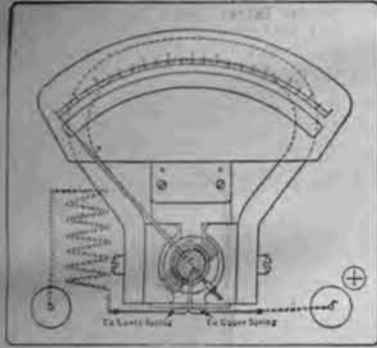


Figure 1

Brilliance Not Easily Gauged.

When electric lighting was in its infancy, the line voltage was adjusted by observing the brilliancy of the incandescent lamp located in the power station, but now that commercial electrical measuring instruments are available, step into a modern central station power plant and note the elaborate switchboards with instruments crowded side by side. Today we would deem it absurd to use lamp brilliancy to gauge the line voltage. This is exactly the manner in which most Radio receiving sets using vacuum tubes are adjusted today. The filament rheostats are adjusted until the filaments appear to have the proper brilliancy. Because of the fact that the filament is hidden behind the plate and the tube is usually mounted behind the panel, vision control of vacuum tubes is even more difficult and accurate than in the case of electric light circuits.

Most people know that the lamps supplying us with light are rated at about 115 volts and also what will happen if such lamps were connected across 220 volts. They would burn out. If the line voltage is not maintained close to 115 volts and drops to say 100 volts, the brilliancy produced will not be satisfactory. Similarly you may burn out your tubes or you may fail to get the most efficient results if you do not use measuring instruments.

Tube Works Best at Certain Values.

The vacuum tube is a delicate and sensitive device and it operates most effectively at definite values of plate voltage and filament temperature. Without the use of indicating electrical measuring instruments the operator can only guess at the adjustment of these important values.

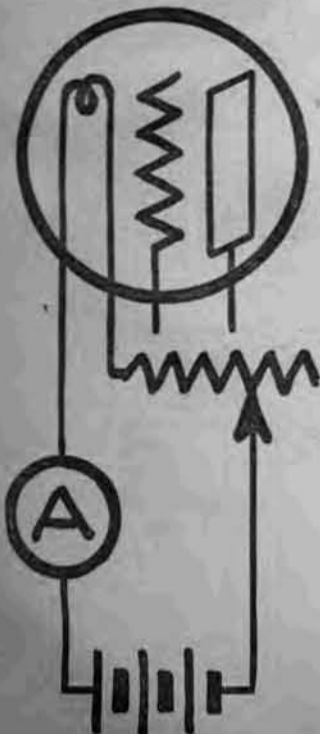


Figure 4

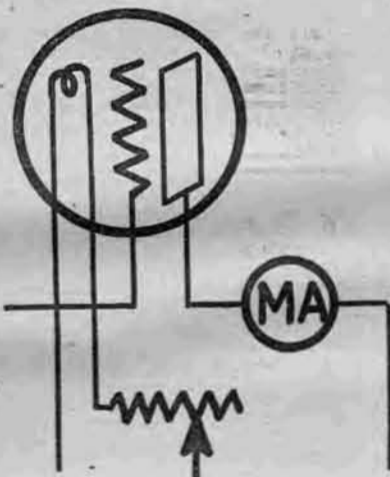


Figure 5

Location of Critical Points.

Aside from the great saving in tube life, by the use of proper voltmeters and ammeters, an increase in the ease and accuracy of adjustment also results. The characteristic curves of various vacuum tubes differ even if of the same type and manufactured by the same company, but for any one of these tubes, the critical values may be obtained by experiment once and for all, and at subsequent use it is usually merely necessary to adjust the filament to this best value and then to proceed with the tuning adjustments which are thus independent of tube adjustments. An additional very important function of the filament voltmeter is that it shows by its indication the condition of the "A" battery. When no instruments are used, the only indication that the battery requires recharging is when it will no longer operate the tubes. This is not only very injurious to the battery, but it may be found dead at a time when most desired for use.

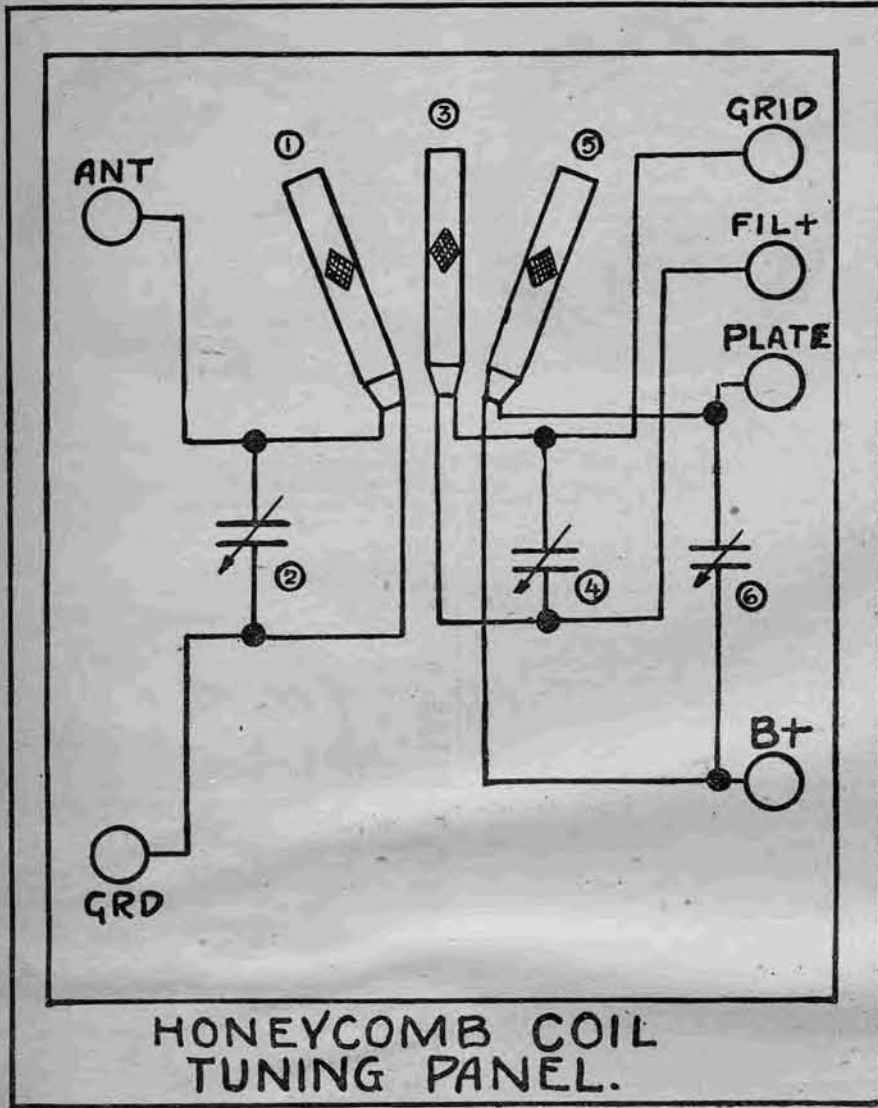
The plate voltmeter, while not as important on a receiving set as the filament voltmeter, is of great convenience and assists materially in obtaining the best results from the set. A glance at the plate voltmeter will show whether or not the "B" battery is run down or properly connected, and thus eliminate the necessity of having to examine all the connections on the set to locate the trouble.

Construction of Meters.

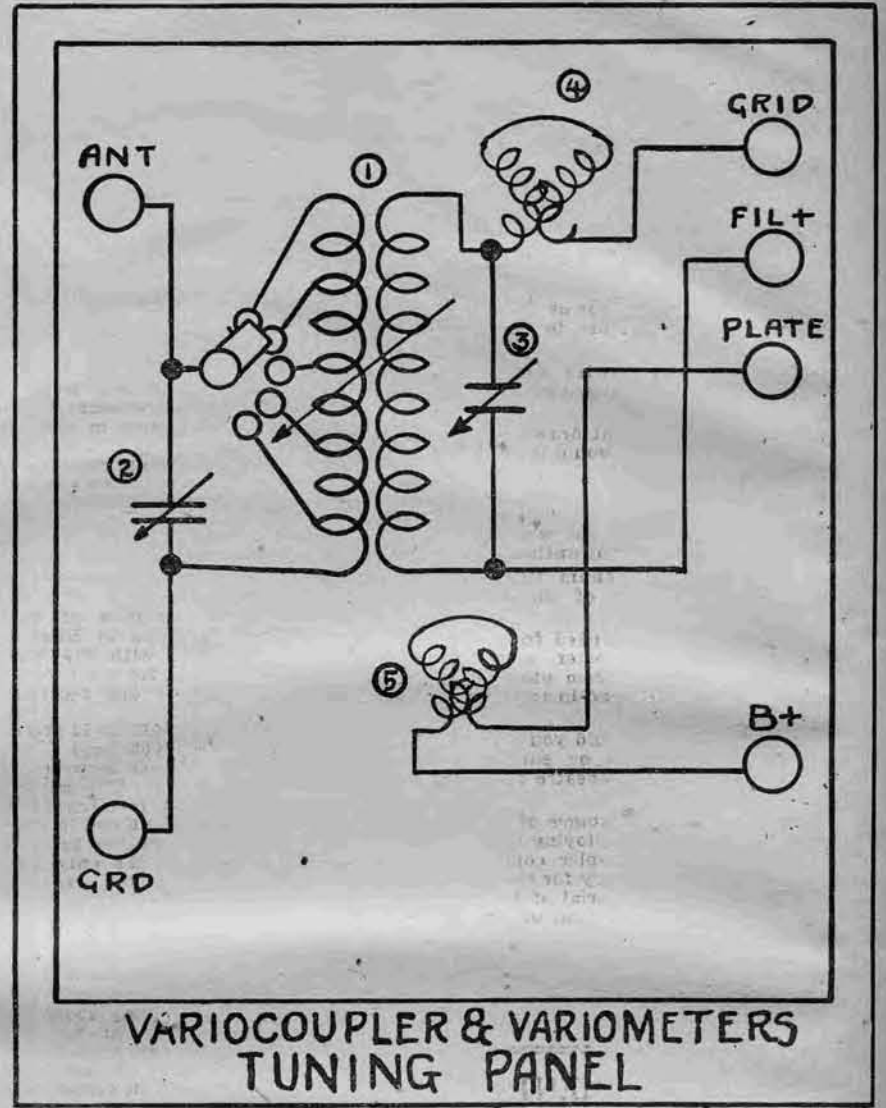
Figure 1 illustrates the internal construction of a permanent magnet movable coil instrument such as is used in direct current voltmeters, millivoltmeters, ammeters and milliammeters. The move-

Panel Units for Your Receiving Sets

By Harry J. Marx



HONEYCOMB COIL TUNING PANEL.



VARIOCOUPLER & VARIOMETERS TUNING PANEL

PARTS REQUIRED FOR HONEYCOMB COIL TUNING PANEL

- 1 Panel, 8"x10"x¼"
- 6 Binding Posts
- No. 1—Primary honeycomb coil
- No. 2—Primary variable condenser .001 Mfd.
- No. 3—Secondary honeycomb coil
- No. 4—Secondary variable condenser .0005 Mfd.
- No. 5—Tickler honeycomb coil
- No. 6—Plate circuit variable condenser .00025 Mfd.

The two binding posts on the left hand side are for the aerial and ground connections. The honeycomb coils are set in a three coil mounting, permitting a variable adjustment. The primary condenser, number 2, permits finer adjustment for wave length in the primary circuit. In the same way, the variable condenser, number 4, controls the finer adjustment of proper wave length in the secondary circuit. The variable condenser, number 6, adds to the sensitivity of the regenerative feature in this hook up. The two binding posts in the upper right hand corner are for connection to the vacuum tube detector unit, directly to the grid and positive side of the filament battery. The two binding posts below marked "Plate" and "B+" are for the regenerative connection and connect the tickler coil in series between the plate and the "B" battery.

PARTS FOR VARIOCOUPLER AND VARIOMETER TUNING PANEL

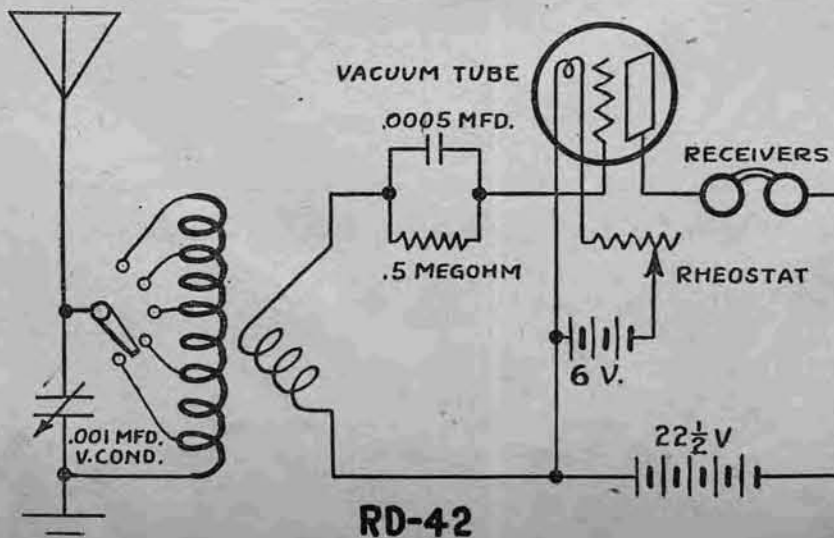
- 1 Panel, 8"x10"x¼"
- 6 Binding Posts
- No. 1—Variocoupler with tapped primary
- No. 2—Primary variable condenser .001 Mfd.
- No. 3—Secondary variable condenser .0005 Mfd.
- No. 4—Grid variometer
- No. 5—Plate variometer

The two binding posts on the left hand side are for the aerial and ground connection. The tapped switch on the primary of the variocoupler, adjusts the inductance of the primary coil for wave length control. The primary variable condenser, number 2, controls the finer adjustment of the primary circuit. The secondary circuit is roughly adjusted and rotation of the secondary coil and the finer adjustment is taken care of by the secondary variable condenser, number 3. The grid variometer, number 4, controls the flow of the current to the grid of the vacuum tube, while the plate variometer, number 5, controls the plate current flow. The two binding posts in the upper right hand corner are for connection to the vacuum tube detector unit directly to the grid and the positive side of the filament battery. The two binding posts below marked "Plate" and "B+" are for the regenerative connection and connect the plate variometer in series between the plate and the "B" battery.

HOOK-UP RD-42

In reply to a number of requests for more hook-up diagrams, RADIO DIGEST will insert at least one every week on this page, giving as many details as possible of the instruments required and explaining any special features. The diagram R. D.-42 answers a number of requests to the Question and Answer Department for a circuit using a variocoupler, variable condenser and the usual detector vacuum tube with its rheostat, battery, grid leak and grid condenser.

The variable condenser in the primary is of the 43-plate type with capacity of .001 microfarad, and is shunted across the primary coil to permit accurate tuning. The grid condenser has a capacity of .0005 microfarad and the grid leak, a resistance of .5 megohm. These can be varied and other values substituted as desired. The vacuum tube is the typical detector or soft tube type. The plate circuit requires a 22½ volt "B" battery with the usual notation that the positive terminal should



RD-42

be on the plate side of the circuit. The rheostat is of the usual type controlling the voltage from the 6 volt "A" battery to the filament of the vacuum tube.

This circuit is a simple one to tune, and because the usual variometers in the grid and plate circuit have been omitted, it avoids the possibility of difficult tuning operation. This circuit, of course, is of the non-regenerative type.

Grid Plays Important Part

The part that the grid plays in the operation of the vacuum tube, in common use on Radio receivers, is most interesting. This is the electrode that delivers the pulsations of the Radio waves which are received by the antenna to the "B" battery circuit. The current from the "B" battery passes between filament and plate through the grid itself.

The grid adds to or subtracts from the flow of electrons moving from the filament to the plate, and thus controls the phones on the "B" battery circuit so that the phone diaphragms give the corresponding signals to those received by the aerial circuit.

Questions and Answers

Ground Installation

I have been a reader of the RADIO DIGEST ILLUSTRATED almost from the first issue of it, and have obtained much valuable information regarding Radio therefrom, but I am still at a loss to understand some phases of the subject.

I am installing a Radio set in our place of business and I would therefore appreciate any information you can give me in regard to the following questions I am asking you:

1. Will a water meter in the water pipe line that is used for the service ground affect the operation of a set?
2. Is it permissible to run the service ground wire through the floor of the room to get at a water pipe line to be used for service ground?
3. In the diagram herewith could the service ground be same water pipe as used for lightning ground?
4. Would the arrangement drawn in (3) be satisfactory? That is, would it be safe to use a switch as shown?
5. Will a motion picture machine under the roof of the building on which the aerial is erected affect the Radio set while motion picture machine is in operation?
6. Can the "Brach" vacuum lightning arrester be placed inside of the building?
7. Can the aerial be grounded from one end, using a "Brach" arrester, and the lead-in for set be taken from other end if a switch is inserted in lead-in to instrument?
8. What kind of a set would you recommend for giving concerts or entertainments in a motion picture theatre for use with a loud speaker?
9. Would a set using two stages of Radio frequency amplification, employing the familiar variometer, variocoupler combination for tuning, be satisfactory for the purpose outlined in (8) if an aerial of the inverted "L" type is used instead of using honeycomb coils for tuning?
10. If the arrangement in (7) is used, could two sets of instruments be operated from the same aerial (at the same time) as in diagram here?

11. Would the arrangement in (10) give satisfactory results or would it be better to ground second instrument to the same water pipe to which the first set is grounded?

12. Could both sets be operated at once?
 A.—1. The ground connection should be made different on the incoming pipe before the water meter is inserted, as the water meter sometimes offers a faulty connection.
 2. Yes, if properly enclosed in porcelain insulation.
 3. The lightning ground should be a separate outside ground.
 4. Yes.
 5. Not very apt to. The arc may cause some interference.
 6. Underwriter rules state that it should be placed outside.
 7. Not advisable.
 8. Regenerative set with two steps of Radio and two of audio frequency. You may need power amplification in addition to work loud speaker.
 9. Yes; but if possible would recommend both arrangements with switches to cut in either type.
 10. No.
 11. No.
 12. No.

Hook-ups

(608) JG

Please advise me capacities of each variable condenser indicated in Hook-up R. D. 22 sheet 7. Also with 360 wave length duo-lateral coil, would the hook-up be capable of finer tuning and reception than Hook-up R. D. 23?

A.—The 2 condensers for R. D. 22 should have the capacity of .0005 mfd. You will find little or no difference between the hook-ups R. D. 22 and 23. The battery potentiometer in R. D. 23 is intended to boost signals. The honeycomb coil in R. D. 22 is simply a loading coil, to be used where a small antenna is the only kind available, thereby giving the required wave length.

Double Aerial

(623) NMCH

I have a chance to save myself a lot of work and expense in putting up a dandy aerial provided I am not going to get in trouble. There is a man living about 300 to 325 feet away from me and his house is located approximately 50 feet higher than mine. In addition to this he has a 60 foot flag pole. By running an aerial from this pole to one (length 20 to 22 feet) on top of my house and insulating $\frac{1}{2}$ way between the houses, we would both have approximately 150 feet of aerial including the lead-in wire. At the middle the wire would be close to 100 feet high. But—we have to cross a street where there is a trolley line of 600 volts DC but as stated above we would be from 50 to 60 feet over these wires at least. Would you kindly advise me regarding this at your earliest convenience. In the meantime we are arranging to get permission from the city and also from property owners to cross this street.

A.—The aerial will be fine! Keep an open space at the center of about 3 feet by using 2 insulators there. Direct current trolley wire will not affect your reception, besides you are at right angles and far enough away. You'll make out all right.

Too Much Expected.

(677) ARF

Will you kindly advise if an R-3 Magnavox loud speaker, connected to a short wave regenerative receiver and two stage audio frequency amplifier would receive music for the large broadcasting stations, at a distance of one thousand miles, and amplify the sound loud enough to be heard at the far end of a room, one hundred feet long and forty five feet wide?

The antenna I intend using will be one wire, seven strands, fifty feet high and about one hundred and sixty feet long.

A.—No. Insert some Radio frequency amplification. Why add seven strands to your aerial when two are sufficient?

"Which?"

(262) ENC

I am assembling a Radio receiving set for the reception of music and speech and would like to know if the enclosed diagram is the most effective hook-up for the instruments I have ordered. Would you

advise a single wire 100 feet long or a 75 foot two wire antenna.

Under favorable conditions what would be the greatest distance, in your estimation, that I ought to be able to receive broadcast programs with the above set?

A.—Your hook-up is all right. We would advise the single wire aerial. Conditions. About 200 miles.

Moving the Set

(700) GWV

I take this opportunity of accepting your offer of assistance to the readers of RADIO DIGEST. Although I have all publications of the RADIO DIGEST to date, I fail so far to find a hook-up that will relieve me of my troubles.

The set consists of the following: One variocoupler, two variometers, one variable condenser, one detector bulb, two amplifier bulbs, three sockets and rheostats, two transformers, one "A" battery, two "B" batteries, one grid leak and condenser, phones.

I might say that I had this set hooked up so that the concerts came in loud enough to "knock your ear off," but the same hook-up failed me entirely, when I took the set to Flint, Mich., a distance of about sixty-five miles from the Detroit broadcasts. Also I am unable to get anything other than Detroit.

I sure will appreciate any information you can give me, rather I should say "help."

A.—In issue No. 12 are found three hook-ups, two of which will no doubt fulfill your requirements. Your letter does not state whether you have Radio or audio frequency transformers. The location of Flint, Mich., may be an unfavorable one. I am rather inclined to believe, however, that in shifting your apparatus you made some change or made some break in connections that affected your reception. Add a counterpoise ground if you are surrounded by sandy soil.

Variocoupler and Variometer

(638) BR

I am reading your RADIO DIGEST and think it is fine. I will accept your invitation and ask you a question:

1. I have a tuning coil, crystal detector, fixed condenser, and a head set wound to three thousand ohms. How many meters can I hear? If I use loading coils in series, can I hear the powerful Government stations?

2. Which is best, a variocoupler or a variometer?

3. Could you send me the plans for making a good Radio set?

4. What is the lowest aerial I could have and get good results?

A.—1. You cannot hear meters as you state. It works on a wave length range expressed in meters. Yes, load coils will do it.

2. You do not give sufficient data for us to tell just what range your set will have. A variocoupler is best.

3. The RADIO DIGEST in the "How to Make" columns is always giving you information on making parts of sets.

4. Your aerial should be at least 50 feet high. Get the best height you can, "T" and "L" Type Aerial.

(679) HGM

I have a few questions to ask you. 1st: Which aerial is best, one tapped in the middle or at the end? 2nd: Will a loose coupler increase the receiving range of a crystal set? If so, about how many miles?

A.—1st. The aerial tapped on the end. 2nd. It will not increase the range in miles, but will increase the tuning range.

Static

(586) RW

In the May 27 issue of the RADIO DIGEST you published an article on a new device to eliminate static during the summer.

Can you advise me when this new device will be on the market and the approximate selling price?

A.—Write Dr. Louis Cohen, Consulting Engineer, Signal Corps, U. S. A., Washington, D. C.

"Springfield"

(629) CR

Having seen your request to write to you when troubled, I wish you to answer

the following questions: I enclose self-addressed stamped envelope.

Having seen in your last number of a broadcasting station in Springfield, Ill.:

1. Would I be able to receive this station with 100-foot aerial, loose coupler, crystal detector, variable condenser, fixed condenser and 2,000-ohm phones? I live about 26 miles from Springfield.

2. Also, who operates this station? What are the hours of transmitting? What wave length? How far can this station broadcast?

A.—1. You should be able to do so.

2. WDAC is the call; 360 meters is its wave length. Range and program of operating hours will be given in RADIO DIGEST as soon as report is received.

Crystal Detector

(683) JLC

Will you please advise me if the enclosed hook-up for a crystal detector receiving set is correct and, if not, give the right one?

I have a JOVE detector and a Murdock type 56, 3,000 ohms head set and a .01 mfd. fixed condenser.

A.—The enclosed hook-up has been changed. If your fixed condenser is .01 mfd., I would suggest that you change it for one with .001 mfd. capacity.

On Coil Calculations

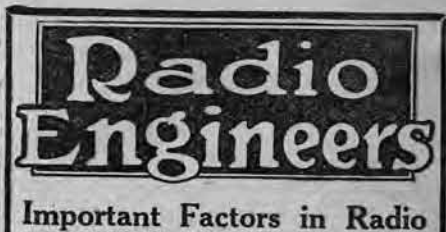
(699) ACJ

After determining with the aid of your instructions the inductance my tuner must have to tune for a given wave length, how am I to know that I should use No. 24 wire on primary and No. 26 on secondary? Also, how am I to know that I should use 20 turns on primary and 22 turns on secondary?

These are questions that may seem elementary to you but they give me real concern. I can see your formula clearly and can apply it in solutions, but, not knowing why I should select these numbers, leaves a link out of my chain of thought.

Also, will you please give me a better explanation of table 3?

A.—It is merely a question of judgment and experience that governs the decision on what wire to use for primary and secondary windings of any tuning apparatus. As a rule, the secondary winding uses a gauge or two smaller than the primary. You cannot tell beforehand how many turns are required in either primary or secondary. An approximate number of turns is assumed, and the value substituted in the formula. If the result is too large or too small, a new value for a number of turns should be assumed and calculations rechecked. This must be repeated until the inductance value checks up with the required amount. From experiment, it has been found that different lengths and diameters of windings give slight variations in the formula. These variations are accounted for by the correction factor "K." Table 3 gives this correction factor, taking into consideration the different windings, length and diameter of the coil.



Important Factors in Radio

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RADIO INSTRUMENTS

(Continued from page 13)

creasing the efficiency of their receiving sets. Years of tedious scientific research by the most capable men in the profession have resulted in the perfection of the modern indicating electrical measuring instruments and it is natural that a person using electricity in any form should avail himself of their achieve-

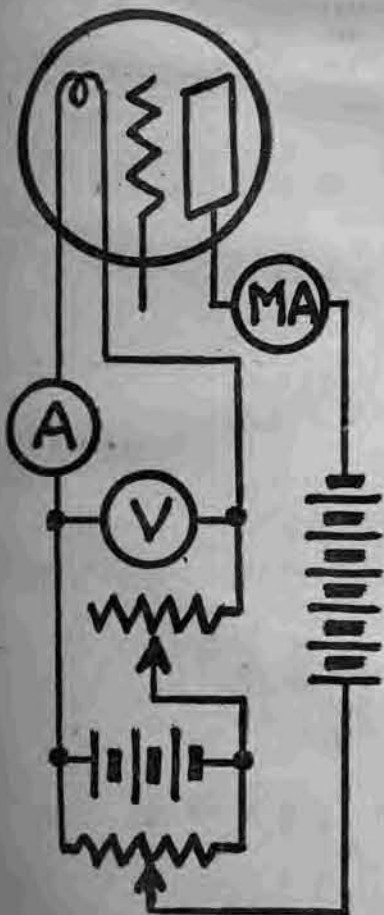


Figure 7

ments. An accurate, reliable indicating electrical measuring instrument is as essential for obtaining the best results from a vacuum tube receiving set and for prolonging the life of the vacuum tubes as for protecting the generators which supply the civilized world with electricity.

Radio Capital Wanted—

by a nationally known Radio engineer. Necessary to manufacture and merchandise several important Radio inventions. Among these is a patented one control receiver, using no aerial or ground and with super amplification on special vacuum tube circuit. Persons capable of investing \$10,000 will be communicated with. Address Box 107, care of this paper.

As Long As They Last

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