

Radio Digest

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TRADE-MARK

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FIGHTS TUBE PATENTS

STEINMETZ DISPELS FIRE HAZARD FEARS

SAYS THERE IS NO RISK IN RECEIVING SET

Expert Replies to Rumors of Opinions Held by Board of Underwriters

CHICAGO, ILL.—Dr. Chas. P. Steinmetz, who is an authority on high power electrical phenomena, was asked the following question during his visit to the Radio Congress held here. His reply to the inquiry follows:

Question: Dr. Steinmetz, many of us have amateur Radio receiving sets in our homes. We have heard rumors that the Underwriters consider that there is a fire hazard because of the antenna and the ground connections and that certain restrictions may be placed on amateur installations. We would like to have your opinion as to the real hazard involved.

Answer: There is no hazard in the amateur Radio receiving station. It involves no fire risk nor risk to life. It is merely a harmless toy, but is a great deal more than a toy. It is one of the most valuable developments of the last years, by its instructive and educational value and the recreation and pleasure which it supplies. It would, therefore, be very regrettable if by a misguided public opinion obstructions were placed in the way of the fullest and freest developments of the amateur Radio station. With regard to the possible lightning risk from the grounded antenna, first—the lightning risk in the city is very remote in any case and, second—the grounded antenna rather acts like a lightning rod and exercises a protective action against lightning. Any danger from the Radio power received by the amateur station obviously is ridiculous when considering that the energy of a single pound of coal would be more than enough to operate the Radio receiving station continuously for over a thousand years. Certainly this is not enough energy to do harm.

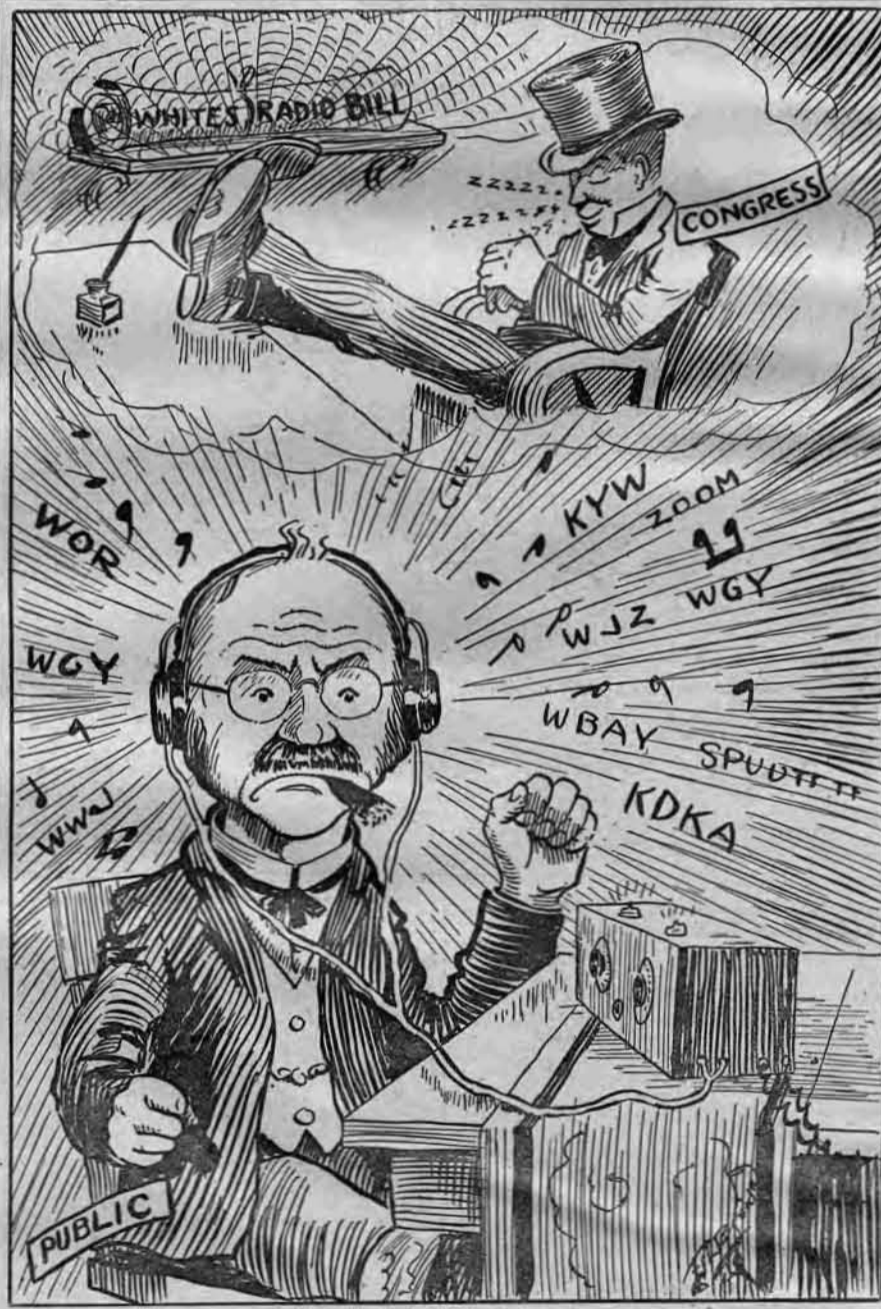
Boston College to Have Plant

BOSTON, MASS.—The Aldis Owen Hall Foundation University and College of Liberal Arts will soon be equipped with a powerful Radio station.

The plant, in the university's new building, will be operated by the Radio engineering department. A feature of the social department will be the regular weekly entertainments to be given by the university's 100-piece military band and its 50-piece orchestra.

300 RUSSIAN PLANTS OPENED TO CITIZENS

WASHINGTON.—The Moscow Izvestia announces that the people's Commissariat of Posts and Telegraphs has opened all government telegraph and Radio stations throughout Russia to public business. Radio stations totaling 300 in number are located in postoffices, telegraph offices and railway stations.



FAMOUS X-RAY AUTHORITY TO TRY VALIDITY

Dr. H. P. Pratt, of Chicago, "First in America to Use Triode Tube"

Announcement a Surprise Interesting Story of Score of Years Ago May Revolutionize Radio-telephone History

CHICAGO.—Dr. H. Preston Pratt, famous X-ray authority of this city, asserts that by reason of his priority claim as being the "first man in America to employ a vacuum tube for the transmission of Radio telephone and telegraph messages" he will be able to manufacture and license other manufacturers to make Radio apparatus regardless of the patents held at the present time by Senatore Guglielmo Marconi, Dr. Lee DeForest and other prominent Radio inventors. His announcement comes as a surprise of overwhelming nature. Should his claims be validated by court action it will mean that a new and earlier birthday will be given the triode tube, as well as other pieces of Radio apparatus.

Dr. Pratt states that many changes are soon to come in the manufacture and sale of Radio devices and proposes to accomplish his share in bringing about such changes not alone by making an effort toward establishing his priority claims but by unfolding to the public several new inventions of which only he knows.

Replies to Inquiry
Consequent to his astonishing revelation, RADIO DIGEST made inquiry to Dr. Pratt's attorney relative to the claims to be made. The reply received from his counsel, Miss Florence King, well-known barrister of this city, is as follows:
"Replying to your inquiry relative to the Radio inventions and scientific work of Dr. H. Preston Pratt, will say:
"I have investigated the state of the art and have read many newspaper articles, written statements, affidavits, etc., made by reliable persons acquainted with
(Continued on page 2)

SHIPPING BOARD WILL PUT 50 SETS ON SALE

Surplus Equipment Is Navy Standard 1-KW. Type

NORFOLK, VA.—Approximately 50 complete Radio telegraph transmitting and receiving sets located at Norfolk, Va., will be sold by the Shipping Board on or before September 16th. The sets are surplus equipment of the Board, such as are now used on service vessels and known as Navy Standard Type 1 KW sets. The apparatus was manufactured by American Marconi Company, Kilbourne & Clark, E. J. Simon and other reputable domestic Radio builders.

Ohio Gets Addition to Stock Report Plants

New Station Completes State-wide Service

(Special to RADIO DIGEST)
COLUMBUS, O.—Another station for the broadcasting of market reports has been started by the Ohio division of markets, according to an announcement made Wednesday by George U. Marvin, chief of the division. It is located at the White Radio laboratory at Stockdale, Pike county, and will cover a radius of from 25 to 50 miles in that vicinity.
This now gives a state-wide service for the broadcasting of market reports.

CAPITOL'S PRISONERS WILL NOW LISTEN IN

WASHINGTON.—Radio connection with the outside world soon is to be enjoyed by prisoners in the District of Columbia jail. It is planned to install instruments to listen to concerts. Much of the \$500 cost has been subscribed already by 200 prisoners as a testimonial to Captain W. L. Peak, assistant superintendent.

FIGHTS TUBE PATENTS

(Continued from page 1)

his work. I am convinced that Dr. H. Preston Pratt is the 'Granddaddy' of Radio. The records examined show that in 1886 he invented his Railway Telephone Signal, the wireless method of telephoning and telegraphing to moving trains and in the nineties, at the request of late Warren G. Purdy, then president of the Rock Island Railroad, plans were being drawn under Dr. Pratt's direction to equip said road for both wireless telephony and telegraphy.

Made Triode Tube in 1897?

"In 1896 he was the first in the world to solve the principles and workings of the X-Ray and was the first person to use it therapeutically in the treatment of cancer, tuberculosis and other diseases. He has perhaps done as much or more scientific work on the inside of a vacuum tube than any man in the world whose work has become known.

"In 1897 he invented several types of Radio tubes. One especially, having three elements, a filament, a wire grid and a wire coil or plate, which was used to detect, amplify and transform Radio currents.

"In 1899 the Chicago Daily News published accounts of his telephoning without wires, illustrating with the article one of the several forms of vacuum tubes invented by him for Radio work with the three elements shown.

"Transmitting Radio currents in any given direction was his invention and published at that time. This, according to recent press reports, was repeated by Marconi a short ago.

Had Carrier Wave Idea

"Superimposing a current of one potential on another or the method of transmitting several messages over the same circuit from the same antenna at the same time without interference and connecting the coils, tubes and circuits for the reception of the varying potentials and different wave lengths was also partially disclosed by him in this and other articles.

"Dr. Pratt without doubt occupies a unique position in relation to commercialized Radio. He antedates all other inventors by a good many years. He has the right to manufacture, sell and dispose of any of his inventions. Through his new inventions and applications that he is now making for patents, it will be conclusively proven that he now is and was a past master in the art years ago. Anyone working under his inventions and licenses can be protected from legal attack under outstanding patents. What he manufactured years ago he can use now and can protect all those who are associated with him."

Has Formed Company

A company which will act as the holding organization for the Pratt patents has been formed under the name, "The Pratt Radio Telephone System." Its purpose is to supervise the development and manufacture of Radio apparatus.

The story referred to in Miss King's reply appeared in the Chicago Daily News April 19, 1899. "Phone Line Without Wire" was the headline.

One patent among several Dr. Pratt has filed recently at Washington is claimed to give to transmitting station and receiving station not only secrecy of communication, but in addition, direction. According to Dr. Pratt the person signalled would be called by the ringing of a bell or the lighting of a light.

Probably the most important development of the announcement will be its effect on the patent situation regarding the three-electrode vacuum tube. Action is to be taken immediately, says Dr. Pratt.

"BLUES" DON'T WORRY THIS WISE ATLANTAN

His Receiving Set Is Solace While in Strange City

ATLANTA, GA.—The lot of the homesick man in a distant city has been lightened by Radio. No longer does he have to seek consolation in an ancient news paper. Instead, he carries his receiving outfit with him, tunes in on the home station, and hears from a familiar voice the doing of the baseball teams and other home news.

Recently 200 electricians were sent from Atlanta to Chicago to handle a job that kept them away from home for six weeks. One of them carried his Radio set, a homemade two-step outfit, and set it up in his hotel room. Every night after work he tuned in on one of the Atlanta broadcasting stations. His visitors soon became so numerous that it was necessary to remove the outfit to the hotel lobby in order that all the Atlantans might hear.

Ask Bids on Radio Towers

BIRMINGHAM, ALA.—Bids for two 80-foot, steel Radio towers on the United States military reservation known as the Montgomery, Ala., Air Intermediate Depot, are being sought. All bids should be in the office of the fourth corps area, U. S. Army, Fort McPherson, Ga., by 10 o'clock, September 25. The Montgomery station will be used for official business of the war department.

Churches and Schools in West Become Popular Radio Centers

Preachers Declare Airphones Do More to Increase Church Interest Than Anything Else—Deny That Ether Wave Chapel Services Will Supplant Local Pastors

CHICAGO, ILL.—Community schools and churches throughout the west are rapidly becoming the centers of the new interest—Radio.

These schools and churches, being the only assembling places of the people, are being equipped with Radio receiving sets, often the construction of ingenious high school teachers or pupils, and into them the people throng nightly to hear the Radio concerts and lectures from the nearest broadcasting station.

The high schools are the centers to which come the farmers for their daily market and crop reports, and the news bulletins, similar to those broadcasted daily by KYW.

But to the rural church, dark and vacant from Sunday to Sunday, the Radio has brought new life.

Many preachers have been quoted as saying that Radio is doing more to popularize the rural church than any other agency. At the same time they decry the theory advanced that Radio chapel services, broadcast from the larger centers, may supplant the local pastors.

"Radio will not take the place of the pastor of the small church," said a prominent religious leader. "The personal touch of the individual minister cannot be supplanted by the Radio service. The minister regards it as supplementary to his work, and offering him opportunities for bigger work, rather than substituting for him.

"Many a church has fallen apart through lack of a pastor, because there was no reason for the congregation to assemble. Radio is expected to remove this condition of affairs."

INSPECTOR, TRY TO FIND THIS'N!



This station, built for H. A. Beale, Parkersburg, Pa., shifts about rural districts giving Radio-phone concerts and stimulating Radio interest. The top photo shows the interior of the house on wheels shown at the bottom. © K. & H.

RECEIVER DETECTS MOTOR BOAT "PUT"

Ordinary Receiving Set Serves as Variety of the Hydrophone

TORONTO, CAN.—During the war thousands of dollars were spent and many lives lost in experimenting with the "hydrophone." Before the armistice was signed, this instrument was developed to a point where it enabled the captain of any ship equipped with it to detect the presence of submarines, while under the surface, for a distance of several miles. Even the direction in which the undersea craft was traveling could be determined. The invisible boat gave itself away by the putt-putt of its engines.

Is an ordinary Radio receiving set a sort of hydrophone? This query is asked by Mr. J. R. C. Hodgson, president of the Disappearing Propeller Boat Company. At his summer home, Hamill's point, Muskoka, Mr. Hodgson has a receiving set, with a piece of wire running out about thirty feet into the lake, for a ground.

Receives Interference from Boats

When the apparatus is being used, either with ordinary telephones over the head, or with a loud speaker, the presence of any nearby motor boat is made known by the interference of "putt-putts," which drowns out whatever else happens to be coming in at the time.

Because of the different number of "putt-putts" to the second made by different boats, it is possible in time to be able to tell by listening in with the Radio

set just what boat it is that is approaching. At summer resorts it is common enough to be able to recognize boats when the sounds from their engines become familiar—provided the sounds are easily heard. But by Radio it is an easy matter to find out just whose craft is approaching, even when one is inside the house and the sounds normally beyond range of the ear. That is, if the Radio set works as Mr. Hodgson's does. The only explanation seems to be in the oscillation set up by the ignition systems of the various boats.

RECOGNIZES SINGER'S VOICE AFTER 15 YEARS

Organist Learns Microphonist Was Church Soloist Friend

MINNEAPOLIS, MINN.—An amusing and rather remarkable incident happened here recently in connection with local broadcasting. Mrs. Alice Adrian Pratt, soprano, sang on the program of Station WCE, a song called "For All Eternity" among other numbers. Several days later a communication from Payette, Idaho, arrived addressed to WCE. The letter was from a Mr. F. K. Gregory, of Payette, who stated that he had heard the song over the Radio set of the Payette Radio Club and that he remembered the song as having been sung by the soloist at the Park Avenue Congregational Church fifteen years ago while he was organist there. He asked if a Mrs. Pratt was the soloist, as the voice was familiar and they had played it during the services. He was informed that the voice was the same, as Mrs. Pratt at that time was the soloist of the church.

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Looking Ahead

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

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

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

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

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

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DE FOREST TALKING FILM REACHES U. S.

CARRIES RECORD OF HUMAN VOICE BY PICTURES

"Phonofilm" May Replace Shorthand as Well as May Silent Drama Squeak

NEW YORK.—Strips of Dr. Lee DeForest's talking film or "phonofilm" have been received by Charles Gilbert, president of the DeForest Telephone and Telegraph Company of this city, and will be exhibited here by Dr. DeForest next month when he returns from a motor tour through Austria.

It looks like ordinary film with almost invisible razor-like lines running vertically on the right edge. The lines are the effect of minute points of light which play upon the edge of the strip under the control of vibrations of the human voice. From this record the voice is reconstructed with the help of selenium photoelectric cells and the vacuum tube invented by Dr. DeForest sixteen years ago.

The invention, it has been suggested, may be capable of use as an automatic interviewer or mechanical stenographer and may become a competitor of the phonograph for general use, in addition to its primary purpose of introducing the spoken word into the now silent drama.

Can Be Attached to Camera

It is asserted also that the apparatus for registering sounds with pictures costs but little and may be made an annex to any motion picture camera, so that when a public man or personage in the news is being filmed his words may be recorded at the same time.

The path of light on the film which registers the sound waves is so narrow that an ordinary inch wide film has room for a hundred voice photographs side by side. The compactness of the film makes it possible, it is said, to carry about a sound recording machine charged with enough film to register a day's proceedings in Congress.

If no obstacle to the success of the invention develops, it was pointed out that the reporter's pad and longhand or shorthand notes may be replaced entirely by the sound camera. The replacement of court stenographers by the testimony camera is another possibility. All sorts of mechanical devices have threatened to oust the shorthand man, but none has succeeded as yet.

"Listeners In" Form National Association

Development of Science Object of New Body

(Special to RADIO DIGEST)

WASHINGTON.—L. C. Hedges was elected president of the newly organized "National Radio Listeners-In Association" at a meeting of Radio fans recently held in this city. Developments of the science is the primary object of the new body. The initial work of the association as outlined in resolutions adopted at the meeting will be as follows:

1. Tests will be made of various instruments, the resulting information to be published for the benefit of the public in choosing the proper apparatus for their particular and immediate needs.
2. To suggest a suitable program for broadcasting stations desiring to know the requirements of the Radiophone listeners-in.
3. To suggest to the amateur organizations such compromises as will effect an adjustment without conflict of the interference now existing.

Officials of the organization believe that the furtherance of its aims will serve to clear the Radio situation in general, in that it is a public body composed of listeners-in who comprise every type of Radio enthusiast.

MAN, 70, CLAIMS HE IS OLDEST RADIO FAN

CHICAGO.—O. H. Hovey of Perry, Oklahoma, claims honors as the oldest Radio fan in the country. He is just approaching the 70-year young mark but is a lively ether "bug." In subscribing to RADIO DIGEST, he stated:

"When in Kansas City recently I ran across a copy of the DIGEST. Say fellows, it's great."

OHIO WEEKLY STARTS RADIO NEWS COLUMN

LONDON, O.—The North Lewisburg Reporter, printed at North Lewisburg, a village of 500 north of here, is believed to be the first weekly newspaper to make a news feature of Radio. The feature, "Radio Flashes," contains interesting items furnished the editor by one of his friends who owns a receiving set. It is very popular with the subscribers.

REVIEW ORIGIN OF FEDERAL RADIO LAW

GOVERNMENT'S FIRST WAS FOR SHIP SAFETY

Regulations Inaugurated July 1, 1911—Extended One Year Later to Commercial Plants

WASHINGTON.—The Government Radio Service of the Department of Commerce which has licensed 3,859 commercial and 15,504 amateur Radio stations, was first organized on July 1, 1911, by the Department of Commerce and Labor. Its original purpose was to aid in enforcing the Radio Ship Act of June 24, 1910, which specified that vessels carrying fifty or more people and plying between ports 200 miles or more apart, were required to be equipped with Radio apparatus operated by a man skilled in its use. In July 1912, the first act was amended to require an additional source of power for Radio, besides the power plant of the ship, as well as a means of communication between the Radio room and the bridge, and two or more persons skilled in Radio communication, one to be on duty at all times when the vessel was under way.

Today the enforcement of the ship Radio laws is under the immediate supervision of the Bureau of Navigation of the Department of Commerce and is accomplished through Radio inspectors assigned to the principal seaports on the Atlantic, Pacific, Gulf and Great Lakes coasts. These inspectors are required, as far as possible, to inspect the Radio equipment before each sailing of a vessel subject to the law, to determine whether or not the apparatus is efficient and afford proper protection to the passengers and crew.

Scope Extended to Land

Commercial and other land stations come in for their supervision in 1912, when "an act to regulate Radio communication" was approved on August 13. This work is also handled by the Bureau of Navigation, and requires the inspection and licensing of all Radio transmitting stations except those belonging to the Government. All operators working in such stations are also examined and licensed by the Radio Section of the Bureau.

In addition to the above laws of the United States, it is a duty of the Bureau of Navigation to require compliance with the International Radio Telegraph Convention of 1912.

There are nine Radio-inspection districts, embracing the United States, Porto Rico, Hawaii, and Alaska. All told the Radio transmitting stations in the United States totaled 20,341 on July 1, but as Government land and ship stations are not controlled by the Department, only 19,363 stations were licensed.

Of the total stations 15,504 are amateur, 2,773 commercial ships, 1,194 Government ships, 575 commercial land, 284 Government land, and 511 special stations.

AMATEURS' WEEKLY TO PRINT RADIO BULLETINS

Correspondents Will File Dispatches at Broadcasting Plants

BEAUMONT, TEX.—The first publication to publish news bulletins dispatched by Radio, was to make its appearance here soon, according to the announced plans of Arthur L. Marek. Its name is the Southwestern Broadcaster, and will be a weekly newspaper devoted to amateur Radio activities.

Arrangements are said to have been made with Radio broadcasting stations in Texas, Louisiana, Arkansas, Oklahoma, and New Mexico to accept and send messages to be filed by the paper's correspondents. A large receiving and sending station is being built here by the Beaumont Radio Equipment company who will handle the traffic for the new publication.

WHAT DO THE WILD WAVES SAY?

Miss Daisy Crossley is experimenting with her wireless buoy and its floating apparatus. It is not possible for her to transmit, but she claims she can receive within a radius of 50 miles. © K. & H.



WBT at Charlotte, N. C., Soon to Be Back In Air

CHARLOTTE, N. C. — Station WBT owned and operated by the Southern Radio Corporation of this city, will soon be in the air again, according to the announcement of William V. Hill, secretary of the Charlotte Radio Club, 311 Commercial Bank Building. The station has not been broadcasting for some time. Mr. Hill states that as secretary of the local organization, he would like to hear from other Radio club secretaries.

Ores Make Broadcasts In Alabama Difficult

BIRMINGHAM, ALA.—Iron ores as well as other metals prevalent in this section makes broadcasting in Alabama particularly difficult according to representatives of the Western Electric Company who have been making a survey for the benefit of the University of Alabama which is soon to install a powerful station. Those making the study here included R. B. Clements, Radio engineer, and G. E. Chase, of the engineering sales staff, both of New York City.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Radio Fruit Control



40 NEW RADIO SETS FOR ARMY "TANKS"

DUAL 'PHONE, TELEGRAPH OUTFITS ORDERED

Success of Ether Wave—Directed "Whippet" Leads to Installation of Equipment in Others

WASHINGTON.—Radio experts of the Signal Corps have just perfected a new tube transmitting and receiving set for the "Baby" or "Whippet" tanks which will handle both telegraph and telephone messages. So successful was the recent demonstration at Camp Meade with the Radio directed tank which took part in the fight of "Hill 285," leading and directing its brother tanks, that from 30 to 40 new sets have been ordered for the master tanks of the Army.

The specifications of the new tank equipment, known as S. C. R. 143, dual telephone and telegraph set, call for a strong and compact set of about 50 watts, which will withstand the jolting of a tank in action over rough terrain and preserve a good tone. It will have a range of from five to ten miles.

Plans of the infantry arm of the service, which includes the old Tank Corps, provide for one Radio or "signal" tank for each group of Whippet tanks, which will serve as a message and control center for the group. The signal tank will be equipped with a six-foot aerial, the ground being the tank itself.

Power for driving a small generator will be derived from storage batteries. A sound-proof helmet with 'phones such as air-pilots use, will be supplied for the Radio man, so that he can hear despite the rattle of the mechanism and roar of the engine.

Future development is seen in the equipment of all tanks with receiving sets, so that inter-tank communication may be had in action, and some prophetic spirits of the corps foretell of Radio control enabling an "Amato!" or "T. N. T." filled tank to be sent into enemy lines and exploded; a "creeping torpedo," in fact which would undoubtedly carry fear and destruction into the enemy camp. But that is a subject for future development, although quite possible electrically and mechanically.

WGY Program Has Four Big Nights

Opera, Classical Music, Popular Tunes and Dramatic Productions on New Schenectady Schedule

SCHENECTADY, N. Y.—A new operating schedule for Station WGY of this city has gone into effect. The station is now on a four-night-a-week schedule which calls for entertainments Monday, Tuesday, Thursday and Friday nights. One evening will be devoted to dramatic productions, another to opera, the third to a semi-classical musical program and the fourth to popular music.

An added feature of the WGY schedule daily except Saturday and Sunday, will be a program every afternoon from 2 to 2:30 o'clock, Eastern Standard time. This program is broadcast especially for the housewife and will include short talks of interest to women.

At the conclusion of the daily reading of the stock market quotations at 12:30 p. m., a short musical program will also be offered.

(The new schedule of WGY will be found in the "Broadcasting Station Directory," pages 8 and 9, RADIO DIGEST.)

Commends Chief Radioman for Brave Rescue of Flyer

SAN FRANCISCO, CAL.—Chief Radioman Claude G. Alexander has been commended by Acting Secretary of the Navy Roosevelt for his exceptional bravery in rescuing the pilot of a burning airplane at the risk of his own life. Chief Alexander was a passenger in the Naval plane, piloted by Ensign Ralph R. Auerswalt on a cross-country flight in July, when the plane crashed near Encinitas, California, and almost immediately burst into flames. When the plane struck, Alexander managed to crawl out of his seat and release Ensign Auerswalt's safety belt, lifting the unconscious pilot partly out of his cockpit before an explosion occurred, throwing Alexander clear of the wrecked plane. When he regained his feet, he saw Auerswalt pitch head-foremost out of the burning plane to the ground; picking him up, the gallant Radioman carried him bodily to a place of safety. Chief Alexander's home is in Seward, Alaska, but he is attached to the U. S. S. Arcoostook, Flagship of the Pacific Air Squadrons now at Mare Island, California.

BRIGHT FUTURE FOR COMMERCIAL RADIO

POSTOFFICE COST FIGURES SHOW SAVING

29 Cents Average Cost of Government Radio Messages; Leased Wire Service Doubles

WASHINGTON.—Radio communication is still so young that few figures are available which show its actual cost in practical use. Its cost, of course, determines its future in realm of commercial communication. Cost accounting figures of the Postoffice Department Radio service, now made public for the first time, point significantly to a brilliant future for the new science.

The figures are on its use by the fifteen stations of the Air Mail Service on the trans-continental route. These stations transact Postoffice Department business besides the air mail communications and broadcasting. It is estimated that the Radio service is now handling 10,000,000 words a year. Only 10 per cent of this traffic is relay. Service for six months for which compilations have been made, was transacted at the rate of \$.00973 per word. This fraction was reached by subtracting the relay communication. If the relays were counted the cost would be \$.0088 per word. Since the messages average 30 words, it is found that the average cost about 29 cents.

Saves Government Over 50 Per Cent

The total cost of the Radio service for a six months period is shown in the report of the superintendent to be \$34,855.21. Leased wire service for a similar amount of traffic would cost the government, it is estimated, \$89,160.00; or more than twice as much. Compared with the regular commercial telegram service, the saving is even greater, totaling \$53,897.81 for the six months. Even assuming that half the traffic would be eliminated in the interests of economy if telegraph were used, the Radio service would still show a saving of almost \$27,000.

Another sidelight revealed by the cost of accounting figures is the gradual decrease in the per word cost of communication due partly to an increase in the use of the stations and partly to the stabilization of the service. Following are the months and cost per word: Decem-

Toronto Leads in Canadian Permits

Issues 110 Licenses in Month—Vancouver Second with Seven Less

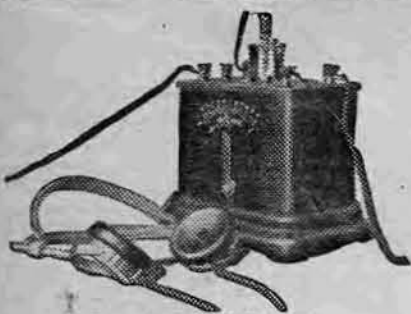
OTTAWA, CAN.—The Canadian department of marine and fisheries announces that Toronto leads the domain for the number of Radio receiving licenses issued during the month of July, 110 having been issued by the postmaster of that city. Vancouver comes second with 103, and Windsor again well up with 90. The total number of receiving licenses issued during the current fiscal year to the end of July is 3,270. Enthusiasts are requested by the department to remember that it is necessary for all persons operating Radio equipments to have a license, the charge for a receiving license being \$1 per annum.

An official list of the Radio stations in the domain is being prepared by the department of marine and fisheries and will be ready for issue at an early date. The cost will be approximately 75 cents per copy, including supplement. Applications are to be made to the director, government Radio service, department of marine and fisheries, Ottawa.

Facilities for obtaining Radio receiving licenses have been extended whereby this class of license, in addition to the post offices already announced, will be obtainable at the following postoffices: South Vancouver, B. C., New Westminster, B. C., Brandon, Man., Fort Williams, Ont., Port Arthur, Ont., Sault Ste Marie, Ont., Peterboro, Ont., St. Catharines, Ont., Niagara Falls, Ont., Itchenor, Ont., Sarnia, Ont., Galt, Ont., Chatham, Ont., Stratford, Ont., Guelph, Ont., St. Thomas, Ont., Kingston, Ont., Lachine, Que., Westmount, Que., Three Rivers, Que., Sherbrooke, Que., Verdun, Que., Glace Bay, N. S., Moncton, N. B.

A system of Radiophony now connects the Turks Islands and the Caicos Islands, in the West Indies, the same installations being used both for communications between the various islands and with ships. The distance covered by the Radio circuit is about twelve miles.

ber, 630,273 words, \$.0010; January, 726,216, \$.0079; February, 588,400, \$.0098; March, 663,190, \$.0082; April, 612,876, \$.0086; May, 745,036, \$.0073. The Air Mail Radio service, like the Air Mail, must operate daily no matter what the weather conditions may be.



Federal Crystal Receiver



Federal Junior Amplifier No. 20

Federal RADIO INSTRUMENTS -ARE SUPERIOR-

The Federal CRYSTAL RECEIVER

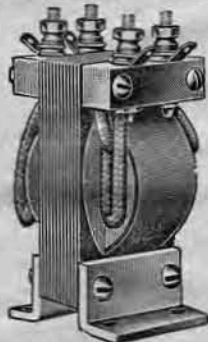
is a highly efficient instrument for the reception of RADIO Programs in a clear, soft, pleasant tone—when used within a radius of 30 MILES of a broadcasting station.

WITH THE ADDITION OF

THE Federal JUNIOR AMPLIFIER No. 20

The receiving range is increased to

100 MILES



No. 226-W Voice Frequency Amplifying Transformer

THE Federal JUNIOR AMPLIFIER No. 20

is equipped with Two of the famous

No. 226-W Voice Frequency Amplifying Transformers

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

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

Federal Telephone & Telegraph Company

BUFFALO, N. Y.
CHICAGO BRANCH OFFICE: 805 STEGER BUILDING, CHICAGO, ILL.

For Those Who Contemplate Making Their Own Outfit

We Recommend CROSLEY Radio Parts Better—Cost Less



The following are the CROSLEY Parts necessary for a TWO-STAGE AUDIO FREQUENCY AMPLIFIER unit to be used in connection with the AUDION DETECTOR set described last week.

- 2 CROSLEY Sheltran Audio Frequency Amplifying Transformers\$ 8.00
 - 2 CROSLEY V-T Sockets..... 1.00
 - 2 CROSLEY Rheostats 1.00
 - 6 CROSLEY Binding Posts..... .30
 - 1 CROSLEY Cabinet 5½x13½x7"..... 3.30
 - 1 CROSLEY Formica Panel 6x14"..... 2.10
- Total\$15.70



This Combination will increase your range and volume 100 times and can be directly connected to the set we described last week or any other audion detector set. Any dealer can show you how to hook up the various parts.

Next week we will publish in this space the parts necessary for a one-stage audion detector set.

DEALERS EVERYWHERE. If your dealer does not handle CROSLEY instruments, write us direct.

Send for catalog and wiring diagrams

CROSLEY MANUFACTURING CO.

Dept. RDI 8 CINCINNATI, OHIO



JOHN BULL PROFITS BY U. S. EXPERIENCE

MANY VALUABLE LESSONS LEARNED, SAYS EXPERT

A. P. M. Fleming Declares Great Britain Will Solve Interference Problem by Government Control

BUFFALO, N. Y.—“Great Britain will solve the interference problem in Radiophone broadcasting by government control and regulation,” according to A. P. M. Fleming, C.B.E., manager of the research and educational department of the Metropolitan-Vickers Electrical Company, Manchester, England. Mr. Fleming represented England at the International convention of the Institute of Electrical Engineers and the International Electro-Technical commission at Niagara Falls, just ended.

“We have learned many valuable lessons from the broadcasting experience of the United States,” said Mr. Fleming after his visit to Station KDKA, situated in the East of Pittsburgh works of the Westinghouse Electric & Manufacturing Company. “One of the things we have learned is to avoid the establishment of innumerable



A. P. M. Fleming

Radio stations, with no plan of co-operation between them. Eight 1½-kilowatt stations are contemplated and some of these will probably be built this year. These stations will be located in the principal cities throughout the British Isles and will be operated so as to eliminate the chaos usually found where no rules are in force.

No Real Broadcasting There Now

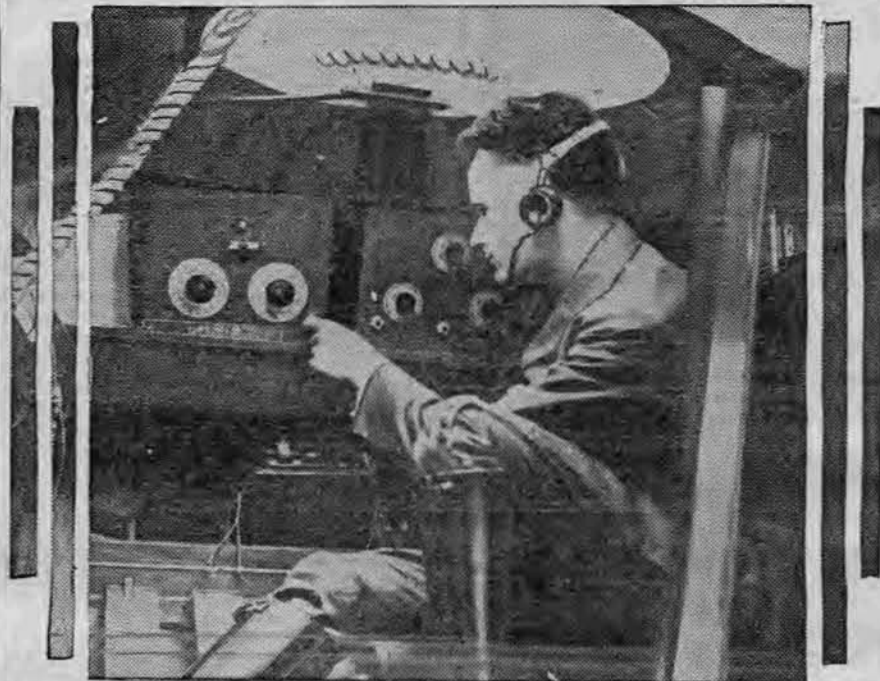
“We have no such thing as broadcasting in Britain at present in the sense in which the term is used in America,” he said. “Government restrictions have prevented it, on account of the possible interference with the requirements of the navy, merchant marine, war services and aeroplane traffic. But the largest manufacturers of Radio apparatus have co-operated with the British Government officials in working out plans for the proper control of broadcasting.”

“The broadcasting stations will be operated on strictly regulated wave lengths and other set rules, which will be published for the guidance of Radio receiver owners. Every Radio set owner will be required to pay an annual tax also, and there will doubtless be special restrictions applying in times of national emergency.

“One thing that British manufacturers have had to do that was not necessary in America, is to study out closely the cost of receiving sets. The average Britisher can afford to spend very much less than the American in purchasing apparatus of the nature of a luxury. But even with that drawback the British manufacturers see a great field ahead.”

Mr. Fleming, in addition to representing the Institute of Electrical Engineers of England at the Niagara Falls convention, is making a survey of Radio developments in America. His survey may have considerable bearing on the regulations drawn up for government control of broadcasting in England.

TUNING UP SET ON PLANE TO BRAZIL JUST BEFORE HOP-OFF FROM NEW YORK



Tuning up the Radio set on the Sampaio Correia, piloted by Lieut. Hinton, just before the hop-off for Brazil from New York. This set has a radius of 500 miles and is the same type as that used by Major Westover in the American entry in the National Balloon Race © INT.

Plane in Flight to Rio Janeiro Carries Set of 500-Mile Range

Most Important Use of Sampaio-Correia's Equipment Is to Receive Weather Reports and Emergency Messages from Shore—“Pick-Up” Programs Relieve Monotony of Trip

NEW YORK.—The Sampaio Correia Seaplane, which hopped off from New York recently on its attempted flight to Brazil, was equipped with a Radio receiving set capable of picking up stations within a radius of 500 miles.

The principal and most important use of the set was to receive communications from shore stations in emergencies and obtain daily weather reports sent from American stations. When the plane gets in range of South America a new station recently opened at Rio de Janeiro will transmit this information twice a day. However, for the first day or two the ship will be within hearing of the stations in this country which broadcast popular entertainment. Interception of these programs will tend to break up the monotony

of the flight which will be over water and therefore devoid of interesting scenery. His technical career is interesting. After receiving his training at the Finsbury Technical College, he spent the following year at the London Electrical Supply Corporation at Deptford, and after a short period with Messrs. Elliott Brothers, Instrument Makers, he crossed the Atlantic and joined the Westinghouse Electric & Manufacturing Company at East Pittsburgh. Two years later he went to Trafford Park, so that he now completes a period of 20 years' service with the Metropolitan-Vickers Company.

For some years he was the company's insulation specialist, dealing with all investigations relating to insulation, the testing of new materials and the investigation of electrical failures. Afterwards he was appointed superintendent of the transformer department and was responsible for the design and manufacture of all the transformers turned out by the firm, totalling some millions of kilowatts. During this period he supervised the department's manufacture of insulating materials and electrical windings of all kinds.

Established Apprentice School

Almost from the beginning he was responsible for the training of the apprentices at Trafford Park. In 1912 he established the work's school. The capacity of this school has grown from the original number of 100 trade apprentices to 650 at the present day, and in addition to this there are about 80 public or secondary school boys and 100 university men undergoing special courses of training.

Since 1916 he has been head of the research organization of the company, and also of the educational and training work. The design and equipment of the extensive research laboratories recently built are his work.

In the midst of all these duties, Mr. Fleming has found time to produce a number of books as author or collaborator on the subjects which he has made his life work. He has also read a number of papers before the Institute of Electrical Engineers and other kindred bodies, and before the Welfare Workers' Institute Conference on matters relating to welfare work.

of the flight which will be over water and therefore devoid of interesting scenery.

Pilot Understands Code

Lieut. Walter Hinton, pilot, understands the continental code and will therefore be able to pick up the daily news report sent by the naval stations to the ships at sea as well as other messages which may be intended for him.

The night previous to departure, Dr. E. Pinto Martins, Brazilian navigator of the party, was on the plane when a concert from Wanamakers was picked up.

“I will confess I was the most surprised person you could imagine when I heard that music while sitting in the cockpit of the plane,” he said. “Never heard anything like it before and it made such an impression on me that I had Mrs. Martins taken to the plane the next morning to listen in.

Set Will Arouse Interest in Brazil

“Airplanes are not common in Brazil, and I know that the arrival of this plane will create great interest, but I feel certain that second in importance to the plane and the trip will be the Radio set. Radio is something my people know very little about. There is no broadcasting there now, but I understand that during the exposition, opening at Rio de Janeiro in September, there will be a powerful broadcasting station in operation. Just imagine the sensation when perhaps some prominent Brazilian is taken up for a flight and hears music and other entertainment while soaring over the city.”

At noon of the first day's flying, WGY, the General Electric Company's broadcasting station at Schenectady, sent the following message to the aerial navigators:

“The General Electric Company extends warm greetings and expresses the earnest hope that Lieut. Walter Hinton and Dr. E. Pinto Martins successfully complete their daring seaplane flight to Brazil. Two nations that can be linked by air through the medium of aircraft and Radio must ever be friendly and an exploit such as yours must help to bring the two Americas more closely together.”

Spark “Hog” Messes Up Ether

BIRMINGHAM, ALA.—Local amateur operators are being worried lately by a spark set “hog” who seriously interferes with the reception of concerts sent out by broadcasting stations. This particular person who is making things hard for local Radio fans seems to hold down his key for long dashes and buzzes which sound like a spark coil going direct to the aerial and ground.

No one has been able to tell who it is that is “messaging up” the air for Birmingham bugs, but he has been asked by means of broadcast and the newspapers to cease his noise during the concert hours every evening or the laws of the United States will be evoked against him. Those attempting to tune the larger broadcasting stations lately have found it a difficult task as a result of the “unknown's” interference.

USES BROADCAST IN SEARCH FOR KIN

CLIFFORD HOLMES HOPES TO FIND RELATIONS

Young Man, Left in Orphanage in 1901, Describes Self and Tells Story in Message

COUNCIL BLUFFS, IA.—Will Clifford Holmes find his parents or relatives by means of Radiophone broadcasts? That is the question that has been in his mind since he first conceived and started on its way his idea of broadcasting the problem, the mystery of his life.

His first broadcast was from Station WAAW, Omaha (Nebr.) Grain Exchange, on Friday evening, July 21, 1922. Since that time many broadcasting stations have sent the story of his life through many miles of space, but no solution or near solution of his problem has been found. Still, today or tomorrow may bring the information that is dear to his heart, for the limits of the broadcast voice are boundless. It reaches all over the world.

What the Broadcast Contains

The broadcast, which Mr. Holmes has delivered and which he has sent to other



Clifford Holmes

broadcasting stations asking for their kind co-operation in delivering, is as follows:

“Ladies and Gentlemen:

“I speak over the Radiophone tonight in the hope that someone in this vast audience, hearing my message, may be able to give me some information concerning myself or my relatives. Twenty-one years ago this coming September I was left in the Christian Home Orphanage in Council Bluffs, Iowa. That was on September 16, 1901. The Orphanage cared for me until February 14, 1902, when I was adopted into a family. This family has reared me since. At the time of my adoption, my foster parents were given the information by the matron of the orphanage (who is now dead) that my name was Clifford Holmes, and that I was born September 13, 1901.

“The information at that time also was that my mother died three days after my birth, and that my father, who was a laboring man, disappeared shortly afterwards. Since then I have been unable to find anything of his whereabouts or the place where my mother was buried, if the story concerning her death was true. The information I now seek is news concerning either my father or mother, relatives of theirs or any friends of either of their families.

Description of Self

“To aid in possible identification, I am giving you a brief description of myself, as follows:

“I am twenty-one years old, six feet three inches in height, weight 170 pounds, complexion medium dark, hair medium brown, eyes brown. My address at present is 635 Bluff St., Council Bluffs, Iowa, and any information any of you may be able to give me will be appreciated to the fullest extent. I also would be grateful to any other broadcasting station operator who might pick up my message and re-broadcast it, or to the American Radio Relay League if they would handle it through

(Continued on page 6)

BRITISH FANS WANT COMPACT RECEIVER

OLD ENGLAND "PICKS UP" EIFFEL TOWER WAVES

Radio Telephony Becoming Popular in Private Use; Hull Has 50 Outfits

NEW YORK.—Old England is beginning to purchase Radio telephone sets and "listen in" to British and Continental broadcasters, according to John H. Grout at Hull, England, who explains that Radio telephony is becoming popular in private use, especially in Hull where about 50 receiving sets are in operation.

Broadcasting stations in England are expected to be in full operation within about two months, sending out programs such as are now enjoyed in the United States. Twenty British electrical firms are manufacturing receiving apparatus.

Although both crystal and vacuum tube receivers, or "valve" sets, as the British call them, are used, the latter are more popular, except for those persons who prefer only local entertainment.

Two- and Three-Valve Sets Wanted

In Hull, two- and three-valve sets are preferred, more of these sets would be used, if they were available. In England they are manufactured principally in London, Birmingham and Manchester, selling in Hull for about \$51. A two-valve set connected with variable inductance and a variable condenser is found sufficient to receive the Hague concerts on 1,070 meters, and the Eiffel Tower broadcasts on 2,300 meters. Most of the fans around Hull use double vertical aeriels with a length of approximately 150 feet, including the "lead in," the British maximum for receiving. Permission of the Postmaster General in London is necessary before setting up a receiving set and the license fee is \$2.43. Oscillating valves are not permitted except in transmitting sets, and a very few transmitting sets are used, the interest being centered on listening in at home.

Boston Broadcast Conflicts Swell

Increasing Stations Cause "Hub's" Problem to Grow Worse Day by Day

BOSTON, MASS.—This city, in common with other large centers, has its broadcasting interference problem. What is more, it is growing worse every day as a result of the steady increase in the number of broadcasting stations. Boston is not so much troubled as other cities, perhaps, because there are only two such stations in the city proper, and the one at Medford Hillside. The two Boston stations, Shepard's and the Eastern Radio Institute, don't conflict as the latter station doesn't send out a daily program. And the stations amicably arrange to sign off for differing periods during the day to avoid interference, and to give listeners the benefit of as clear programs as possible.

The present practice of placing all broadcasting stations on the same wave length, however, does make for interference, especially where stations fail to agree upon sharing the time for their programs, smaller ones taking up time that should rightfully belong to the larger stations which can serve thousands of people instead of hundreds. While the number of New England stations is increasing, there has been no such jamming of the air as has resulted in New Jersey, where a Radio war has been staged as a result of the conflict. So far there has been little trouble except from static, and the outside stations are far enough away from Boston to enable owners of sets to tune in as much as they desire. It is probable that should there be found any interference an agreement will be reached dividing up the time for the different stations, as all are disposed to be fair in the matter.

Five Broadcasters Licensed

CHICAGO.—During the week of August 28 to September 2, five public service broadcasting stations were licensed. The licensees include a paper, two colleges and two individuals. They are as follows:

WNAD, Atkinson County Mail, Rockport, Mo.; WKAY, Brenau College, Janesville, Ga.; WKAX, Wm. A. Macfarlane, Bridgeport, Conn.; WLAC, North Carolina State College, Raleigh, N. C.; WLAH, Samuel Woodworth, Syracuse, N. Y.

BIRMINGHAM, ALA.—The Pensacola Radio club composed of 44 young men has been organized in Pensacola, Fla. The club meets every Thursday night.

Book Reviews

Radio Experimenter's Hand Book. By M. B. Sleeper. Throughout the preparation of this book one purpose was kept in mind, "Answer the practical questions for the novice or the 'beginner' and the more 'advanced student.'" This book will help the selection or construction of simple apparatus for transmission and reception of Radio telegraph and telephone signals. Price, \$1.00.

Radio Engineering Principles. By Henri Lauer and Harry L. Brown. The book covers thoroughly the operation and characteristics of two and three electrode vacuum tubes, the practical application of the tubes, the generation and control of electric flow, and the conditions which must be obtained to cause a tube to operate in any of its functions. Price, \$3.50.

Radio for Everybody. By A. C. Lescarboura. A popular guide to Radiophone reception and transmission and to the dot-and-dash reception and transmission of the telegraph for the layman who wants to apply Radio for his pleasure and profit without going into the special theories and the intricacies of the art. Price, \$1.50.

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

Fowler's Practical Radio Text Book. A text book that tells you what you want to know about Radio. It explains Radio in plain language and it will help to get better results from your set. Price, \$1.25.

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

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

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

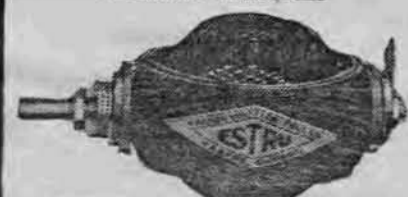
The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money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

RADIOMAN PUTS K.O. ON HUMAN "CYCLONE"

Sailor and Ether Navigator Lands Welterweight Laurels

COCO SOLO, C. Z.—Sailor Joe-Joe, otherwise Radioman Joseph H. Boyer, attached to the U. S. S. Patuxent, now at Coco Solo, Canal Zone, has recently stepped into the limelight as a contender for the welterweight championship of the Isthmus. A few days ago this Radio "Pug" knocked out "Cyclone" Clifford, a local favorite, in the sixth round at the Coco Solo Naval Air Station. This is the first victory of a Radioman over a Cyclone. Nautical witnesses state that Cyclone Clifford didn't know his "code," but admit it may have been that static interfered, as it does with most everything in the tropics.

For Efficiency, Quality, Tone BUY **ESTRU LATTICE**



VARIOMETERS — VARIOCOUP- LERS — INDUCTANCE COILS — RADII TUNERS

For Sale at All Responsible Dealers. If Not, Write Giving Your Dealer's Name **DALTON, WHITTIER, TRUE CO. 2905 W. Madison St. Chicago**

CRIPPLED WAR VET BUILDS, SELLS SETS

Frank Reeves of Columbus, O., Injured in France Making Money While Convalescing

COLUMBUS, O.—The fact that he is crippled in the right leg as the result of wounds received in France during the World war, does not hinder Frank M. Reeves, of this city, former draughtsman, who served in the United States navy at Bordeaux, Rocheford and the Eiffel tower, France, from building Radio receiving sets while he is convalescing at Mercy hospital, Columbus.

He has completed the building of a number of these sets and has sold them to Radio fans in the Ohio capital. At the present time he is doing Radio research work with the aid of a student in the electrical engineering department at Ohio State university.

Reeves has been fighting an uphill battle, due to his inability to get around. His aide-de-camp, a fourteen year old school boy, who is studying Radio under Reeves' instructions, attends to the buying of the necessary equipment for the construction of the new receiving sets, as well as other duties connected with the enterprise.

Reeves attended the Crufts Laboratory at Harvard university, where he was studying in the interests of the United States Navy until he received an honorary degree in 1917 after completing a two-year course. Shortly after receiving his degree, he was sent to France to serve his country during the World war. With his own equipment, he entertains the patients at the hospital during the evenings.

USES BROADCASTS

(Continued from page 5)

their wonderful chain of stations. With the co-operation of other broadcasting stations and the American Radio Relay League, I sincerely hope that I may hear news of my people. I thank you."

Practical Use of Radio

The use which Mr. Holmes is making of the great system of broadcasting and relaying stations extending from coast to coast, is one which is intensely practical. The many hundreds of thousands, or perhaps millions, of persons who possess receiving stations may be reached through the medium of the broadcast. Young Mr. Holmes, whether or not he is successful in receiving news of his people, has at least originated a unique idea which is practical application of the broadcast.

He is greatly interested in following up the work of such stations as tell his story, and hopes by the publicity of the undertaking to eventually attain success.

Radio the Man in the Moon!

Some one started a story recently that a Radio wave would keep on going through space for "years and years" until it reached the moon and the distant planets. As the moon is less than 240,000 miles away, the Radio wave would reach the moon in about one and a quarter seconds. The wave would reach Neptune, the most distant of the planets, in less than four hours. Signals would reach Mars, when that planet is nearest the earth, in a little over four minutes.

1,000 Toasters' Heat Melts Ice from Aerial

ANNAPOLIS, MD.—Imagine one thousand electric toasters of domestic size all going at full blast, and you have a pretty correct idea of the heat that is thrown off from the big aeriels at Station NSS, located here in the winter time when it is desired to rid the wires of ice.

The twelve miles of wires in this vast antenna system would weigh 100 tons if a thin coat of ice were allowed to accumulate over them. This would result in the breaking down of the towers, and to prevent this contingency the antenna, by simple connections, is made in effect a gigantic electric toaster from which all ice may be melted in a few minutes.

But it takes power to do this—two-thirds of the station maximum generator capacity of 750 kilowatts is required, enough to operate 1,000 electric toasters or 12,500 forty-watt lamps. The station at Annapolis is one of the most powerful stations operated by the United States government. The building is nestled beneath a huge rectangle of six towers, each 600 feet high, inclosing an area of 2,000,000 square feet.

Exit New York's Park Bands; Enter Airphone

NEW YORK.—The brass bands that have been entertaining fresh air seekers in New York's parks will soon see their last days. Radio will replace them.

This is one of the changes in public entertainment that recently has been decided on by the city officials. It will be inaugurated when the new municipal broadcasting station is completed atop the Municipal building. A room has been set aside for the studio and another for the transmitting station.

Alterations are being made also on the bandstands of every park in the city. Instead of the music racks for the musicians there will be a receiving set and loud speakers. In this way a single concert broadcast from the Municipal building will be heard in all parts of the city.

When noted persons are received by the city, the ceremonies will be broadcast through this central station. At other times official city news will be sent out.

WARSAW, POLAND.—The building of one of the most powerful Radio stations in the world is advancing successfully. The Polish government has undertaken the erection of the plant here in co-operation with the Radio Corporation of America. It will be working by October.

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

RADIO MAILING LISTS
6900 Retail Radio Dealers covering the United States, by station, price per thousand . . . \$ 7.50
838 Radio Manufacturers . . . per lot 10.00
1022 Radio Supply Jobbers . . . per " 10.00
250 Owners of Radio Stations . . . per " 4.00
14000 Radio Amateurs and Managers of Radio Stations . . . per M. 7.50
These are neatly typewritten and ready to send you on receipt of remittance covering the amounts. Guaranteed 98% correct. Trade Circles Addressing Co., 165 W. Adams St., Chicago, Ill.

THE ACMESTAT

The 100% Perfect Filament Control

Points of Merit Worth Noting

THE ACMESTAT:

- Is a compression type rheostat.
- Is very compact.
- Is practically fool-proof.
- Has one knob to control opening of circuit, the regulation of vernier adjustments, and the final shorting out of all resistance.
- Gives finest vernier adjustments from start to finish without steps, jerks or frying.
- Resistance element indestructible.
- Resistance enclosed in insulation.
- Can be used in any position.
- Pronounced by radio experts 100% perfect.
- Adopted by manufacturers as standard after competitive tests.

Model B

Model A Section

Model A. \$1.75. Model B. \$2.25
Model B has an extra external snap switch allowing instant control of circuit with vernier set at adjustment desired.

MADE BY THE ACME ELECTRICAL MFG. CO. MILWAUKEE, WIS.

Ask for the AcmeStat at your dealer or write us, enclosing 10 cents for postage.
Patented April 16, 1912

The Radiophonist's Mart

THE DEVICE known as Amperite (right current), an automatic filament current adjuster, marks another step in popularizing Radio reception because it tends to make efficient operation of vacuum tubes a most simple matter.

The life of any vacuum tube depends upon the life of the tungsten filament. The best scientists in the world have spent many years in developing a method of making tungsten into fine filaments. The difficulty lies in the fact that tungsten is a very hard and brittle metal. It was like drawing an egg shell into wire. A process was finally developed for drawing tungsten into wire even less than one-thousandth of an inch in diameter.

That is the kind of tungsten used in



Amperite prevents damage to a costly tube by supplying just the right current

modern vacuum tubes. In order to keep the tungsten in the ductile form it must be operated at a definite temperature—the temperature observed in all ordinary incandescent electric lamps. Contrary to popular conception the lamp will not last longer if burned at a lower temperature.

The tube must be flashed to the proper operating point and kept there. Burning it below this point changes the filament into the egg shell structure and it will break at any slight vibration. Heating the tube above the proper point rapidly vaporizes the filament and may be burned out. So it can be seen the temperature and current must be kept within a very narrow range, a feat impossible with the ordinary wire rheostat.

Amperite is designed to keep the temperature of the tungsten filament automatically within the proper range, and entirely eliminates the danger of overheating or underheating. This is accomplished by means of an especially treated filament in the Amperite, itself, which has the property of changing resistance in relation to the A battery voltage. All this is automatic and no regulation whatever is required. The life of the tube is prolonged and efficient results obtained.

Manufacturers and builders of sets are finding this instrument of tremendous advantage, as it brings down the operation of the tubes to a fool-proof proposition. At the same time it entirely eliminates rheostats in all amplifying circuits, both Radio and audio frequency, allows compactness of construction, and simplicity of wiring.

Amperite is manufactured by the Radiall Company, of New York City.

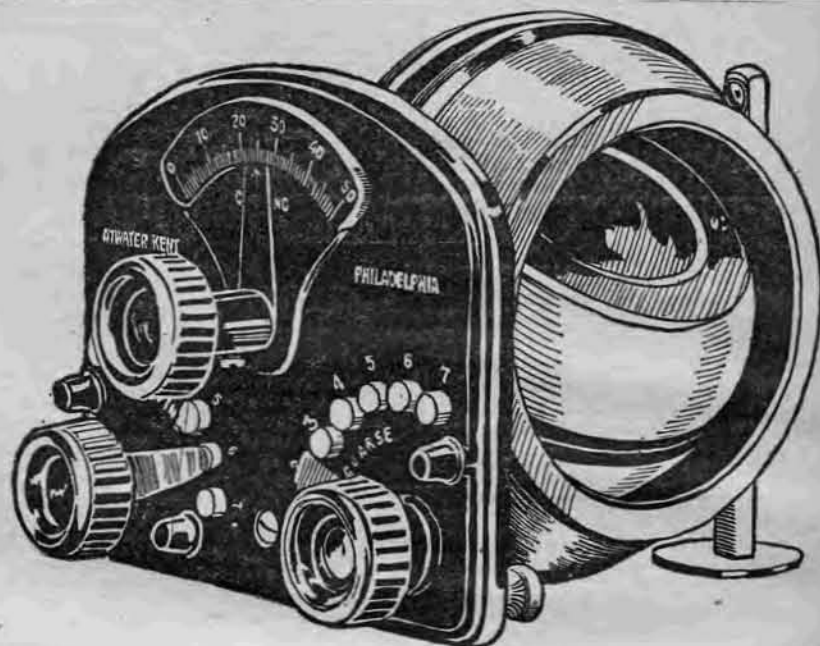
THE RECEIVERS shown in the illustration in conjunction with the usual type of head-piece are manufactured by the Dictograph Products Corporation of New York City. The design throughout each ear piece is entirely new and its construction is extremely interesting. The receiver shells are one-piece, pressed aluminum, highly polished and rust-proof, and are fitted with sanitary, scientifically curved ear caps of hard rubber.

The two receivers are matched in tone and are made with two piece, bi-polar, permanent magnets of the finest quality magnet steel. These are fitted with bakelite spool heads similar to those used in the manufacturers' products for the deaf and also in the official police dictograph.

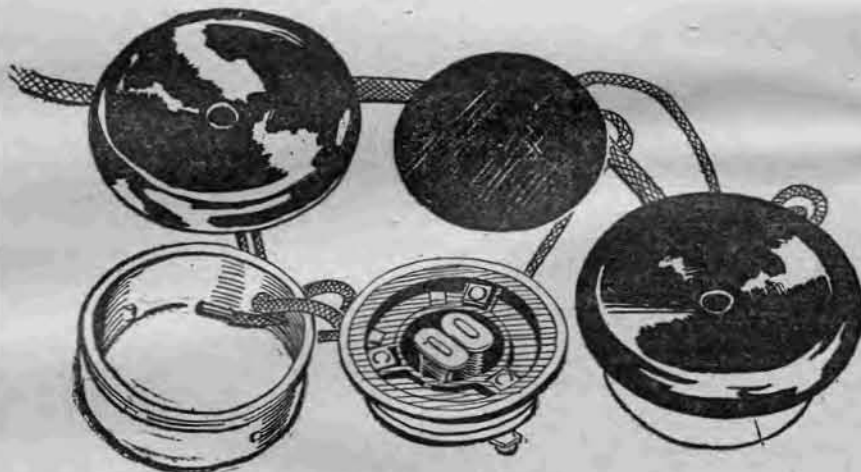
Each coil is wound automatically on special designed machines to 750 ohms resistance with enamel copper wire, .002 in thickness. The coils are connected in series and give a combined resistance for each receiver of 1,500 ohms or of 3,000 ohms per head set. The diaphragms are especially selected for the wide limits of frequencies transmitted by the broadcasting stations and are evenly clamped with proper air gap and are guaranteed corrosive proof.

The receiver interior is assembled as a separate and complete unit. It is insulated from the receiver case and easily removable. This allows for atmospheric changes and insures an entirely moisture proof construction. The units are small in size and compact assembly makes for an efficient receiver.

Individual Panel Mounted Variometer



Matched Receivers of New Construction



VARIOMETERS and variocouplers are by no means a new development in Radio apparatus. There is, however, plenty of room for development of improvements in the manufacture of these two popular tuning devices. For this reason such apparatus as represents features of construction rather than new technical developments deserve the attention of our readers.

The mounted variocoupler shown in the illustration is manufactured by the Atwater Kent Manufacturing Company of Philadelphia, Pa. Moulded condensite is used for the spherical formation on which the coils are wound. The balance of the supported framework is of polished brass.

The special method used in winding the rotor effects a reduction of losses such as distributed capacity and high frequency resistance to a minimum. The parts are proportioned so that an initially loose coupling of the primary and secondary obtains unusual selectivity.

The inductance of the primary is of a value which will permit reception over the usual broadcasting wave length range. The secondary is designed for use in conjunction with the variometers which are manufactured with the same design and construction as the variocoupler.

The primary inductance is so tapped as to permit perfect tuning, for which wave length reception these units used in conjunction make an ideal tuning unit.

The circular bases provided for table mounting can easily be removed for use on panels. The variocoupler can be obtained without the front panel. This panel mounting has two tap switches for control of the primary inductance and a pointer with a 99 degree scale of adjustment for the secondary rotor control.

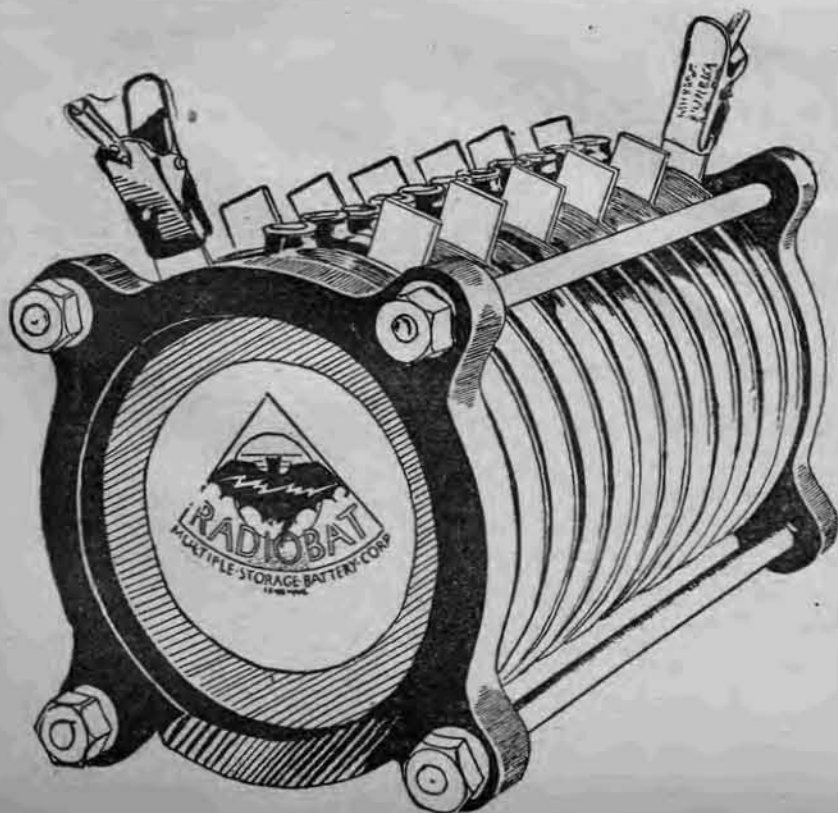
The panel mounting of the variocoupler need not be disassembled if used in conjunction with a cabinet panel. It is only necessary to cut a sufficiently large opening in the bakelite, and mount the variocoupler so that its panel lies flush against the cabinet panel.

Restoring Crystal Sensitivity

Of the various methods discovered for restoring the sensitiveness of crystal and minerals perhaps the one most commonly used is that of washing it in alcohol. Good results are obtained by this method.

An easier way is to take a smooth file and file a new surface on the crystal where the point usually rests. This operation makes the mineral as good as new, removing all the oxidized film, all the dirt particles and presenting a bright crystal surface for the "whisker." This can be done over and over again as the occasion demands.—P J. M.

Round Cells, Lead Disks Make B Battery



THE NEW type of storage battery, the Radiobat, especially designed for compactness, strength and superior electrical qualities in Radio telephony, has been perfected and developed by the Multiple Storage Battery Corporation, of 350 Madison Avenue, New York City. In appearance it is more like a tuning coil than a real storage battery, and its design was evidently based and worked out on this principle.

Up to a few months ago dry cells were the only B batteries available, but now the storage battery companies have suddenly realized the great demand for a Radio storage B battery.

Nearly all Radio reception is blamed on static, whereas experts have often located the cause of the trouble upon examination of the dry cells.

The construction of the Radiobat is unique in that the sides of the lead discs have three functions to perform, acting as a tap, side of a cell and a plate connector as well. The rubber rings are so constructed that in event of any shedding of the active material from the positive and negative plates after long usage, short-circuiting will not take place.

There are no separators of any description to deteriorate, an advantage in event of any idleness of the cells. Four lead coated rods hold the round battery jars together under high compression and thus produce an acid leak proof battery. The ends are made of the same material as the rubber rings in order to prevent a short-circuit, especially when the battery is placed on metallic surface.

The Radiobats are made up in eleven cells yielding twenty-two volts. The ampere-hour capacity is two per cell. This permits sufficient capacity for a long period of use without another recharge.

The Radiobat is built both on the outside and inside of the battery to withstand any rough usage.

The manufacturers advocate its being

charged every four months, and even more frequently if the amount of service put upon the battery is such as to make recharging necessary. Charging can be effected from any 110-volt direct current source of supply when placed in series with one fifteen-watt lamp. Any direct current supply which has a voltage of 28 volts or more may be used for charging when sufficient resistance is placed in series with the battery to obtain a charging rate of approximately 1/10 ampere. The Radiobat can also be readily charged from any 110-volt alternating current supply line by connecting it in series with a small chemical rectifier and a 25-watt lamp.

WHAL, Davenport, Ia. 30 ml. Radio Equip. & Mfg. Co. Daily ex Sat and Sun, 2-3:30 pm, 4:30-5:30, 10-11, Sat, 10-11 am, 2-2:30 pm, 5-5:30, 11-11:30. Central.

WMC, Youngstown, O. 500 ml. Columbia Radio Co. Mon, Wed, Fri, Sat, 8:30-9:45 pm, concert, address etc. Eastern.

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

State, City, Call Wichita, WAAP, WEAH, WEY, WHAN Kentucky: Louisville, WHAS, WKAG, 9ARU Paducah, WIAR

State, City, Call Portsmouth, WDAB Stockdale, WJAK Toledo, WBAJ, WHU, WJK

RECEIVING RECORDS? SEND THEM IN—

The complete list of receiving record holders, appears only once each month. The next complete list will appear in the September 23 issue of RADIO DIGEST.

WCJ—1,000—Ernest Wendt, Hewitt, Wis. WCV—1,100—W. Easley, Enid, Okla.

Peoria, WBAE, WFAP, WJAN Quincy, WCAW, WCAZ Rockford, WIAB, WJAM

Atlanta, WAAS, WDAW, WSB, 4CD College Park, WDAJ

Bluefield, WHAJ Charleston, WAAO Clarksburg, WHAK

Radio Digest Illustrated

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Radio Development Grows Abroad

Japan and Argentina Follow Lead of U. S.

THE ISLANDS of Japan will soon be linked by Radio. Communication will soon be opened across the Chosen Strait. The stations at Fukuoka and Fusan contained necessary equipment and it is expected that shipping along the coast of Kinshu and Chosen will take advantage of the government plan for the development of Radio.

There is a bill being drafted in Argentina to regulate the use of Radio. Receiving sets are being manufactured there to sell for from 200 to 700 pesos. Government stations are going up.

All countries are busy building high power stations and Radiophone broadcasting plants. They are experimenting with legislation. In all their work they are merely following the lead of the good, old United States of America, and the American amateurs who have put this country at the front.

Programs Too Versified

Evening Hours Are for Entertainment

WHEN THE public has time to listen in, there are far too many lecturers on various aspects of business, farming, banking, manufacturing, science, etc. Most of these subjects can be broadcast in the daylight hours. While all of these special talks are highly instructive and serve a purpose, their special appeal is to only a small portion of the Radio audience. The general public are much divided in their desire for popular or classical music. However, most all of them want music in some form.

There is no question but what there are many who want to hear about shipping, markets and various other subjects, but it would appear that these should be broadcast when the more general audience will not be compelled to listen in.

A versified program may be highly meritorious, but it should apply only within certain limits of general types of entertainment which the majority of the listeners can enjoy during the few hours that they can spare to listen in.

Activities of the Boy Scouts

Radio Is a Part of Their Daily Lives

ONE OF the most valuable organizations in this country is the Boy Scouts of America. Naturally the energy of a boy must be expended in some manner and this organization diverts that energy into profitable channels. It is quite a distinction to be a Boy Scout.

There is no question about the Boy Scout being attracted by Radio. He has been a "bug" for years and it was largely due to his interest in this subject that our government was able to secure the necessary operators during the late war. In peace times Boy Scouts and their activities are most valuable. This has been found especially so during the last two years when Radio broadcasting became so popular. These boys have been exceptionally active in this phase of Radio work. A regular bulletin service is maintained in many sections by the Boy Scouts and news events, baseball scores, market reports and many other items of interest are picked up for the benefit of the public.

Because such information is broadcast from the powerful broadcasting stations, which practically cover every corner of the country, there is scarcely a community so remote that this information cannot be received by the apparatus which an enterprising Scout troop will soon gather together, either by making it or through the gifts of far-seeing friends.

One object that the Boy Scout has is to help at least one person each day. The shut-ins and invalids have been aided in this manner by the boys making Radio installations for them so that they may have entertainment in their affliction. Boy Scouts throughout the country who are interested in Radio and have sets are to become members of a special auxiliary organization for the assistance of the government in times of need. This is a special recognition which shows the high esteem in which this body of boys is held in America.

The boys should be encouraged in their work in every possible manner, for theirs is the great future promised by Radio broadcasting which now exists in the imperfect visions of only a few. The fulfillment of these dreams will be determined largely by the amount of interest that is developed in our growing men of the future.

Condensed

By DIELECTRIC

Are there any French Radio fans visiting in this country? If so, they may have listened in vain for a special communique to French tourists. Over in France such broadcasts are sent daily for the benefit of American tourists. Even the Radiotrons are made to be polite in Patee. It wouldn't surprise me to find our stations broadcasting "home news" in several languages before long. We want to make all Fans feel that anywhere they hang their aerials is "home sweet home" to them.

At least one enterprising business man has enhanced his chances for making a living by installing a receiving set for the pleasure of his patrons. This fellow is a bootblack. It seems he tuned in a concert which so pleased one of his customers as to have three shines in succession. Thirsty ones tarry at soda fountains where they are entertained by loud speakers, too.

You've got to hand it to the newspapers for their showing in broadcasting. We can receive "later than the latest" news, providing we're anywhere near one of the sixty-eight papers equipped with transmitting sets. Having been a member of the fraternity, I'm naturally proud of their progress in this line. One country sheet, published weekly, always carries the very latest news of the day it appears on sale. This news is received by Radio from a station in a large city and goes into the makeup of the front page. How's that?

McElroy maintains his position as speed artist in code reception. Fifty-two words a minute is rather rapid, and if you doubt it just try taking code that fast. With new inventions it is now possible to record over a hundred words in a minute mechanically. Our set doesn't work well on code, so I'm thinking of borrowing McElroy's set some time to see what it is like to receive that fast. It may be in the receiver.

Every time you listen to the time signals from Arlington, picture to yourselves a young man with nothing to do but keep his eyes glued on the clock. The old adage about "watching the clock" doesn't apply in his case. He's paid for it.

Given the time, most problems in Radio will be solved by the experts. You remember, no doubt, the attempts made to synchronize sound and sight in the movies. These attempts failed. Dr. Lee De Forest's invention seems to have overcome the discrepancy between the speed with which light and sound travel. He does it all through utilizing Radio. Hereafter when noted foreigners land in America to be confronted by the movie camera men we may hear their remarks while being "shot," though it may be cipher to most of us.

Amateurs will be shaking a lusty insulator in the faces of the fire underwriters, now that Dr. Steinmetz has ridiculed the idea of hazard from Radio sets. Possibly no other individual has tried so many stunts as this electrical wizard. Certainly few of us have held so hospitable a feeling toward lightning, as to attempt to produce it in our own homes. Yet that very experiment of his may have an important bearing on the method best suited to reducing static.

I have been hearing a good deal lately about the effect manufactured receiving sets would have on the youthful fans—damping their waves of enthusiasm for making their own. Most youngsters (plenty of grown-ups, for that matter) will never be satisfied except to fuss with their own pet hook-ups, proud to produce a satisfactory set for reception. Just look at the exhibition by school children at the recent Radio Congress in Chicago. That is a fair example of what is being done by these youthful fans, and they'll continue to do their experimenting regardless of the results achieved by the experts.

Think of the relief Radio is bringing to those anxious for returns at election time. I don't mean to say that all listening in will be relieved when they hear of the successful candidates, but I do mean to call attention to the fact that broadcasting stations are sending the returns out ahead of the newspapers, in many instances. See what was done in Alabama. Voters had the returns several hours sooner than the papers would have given them. It's a pretty sure guess that many head sets and loud speakers will be in demand early in November.

Apartment houses may be short of coal this coming winter, but at least one such building in Newark, N. J., will have ample provision for Radio-fan inhabitants. I understand that two directional antennae will bring the programs of as many stations to each of the apartments. All the fan has to do is plug in to whichever station better suits his fancy. They might have a nightly travelogue on the climate of the South Sea Islands, to help divert the minds of shivering listeners. At any rate, it would be enjoyable to listen to either program without interference, and you know apartments have not always been sources of enjoyment.

Some other means of making money than by selling parking space to autoists on a Government Radio property when a circus comes to town will have to be thought of. The fellow who tried that in Cleveland, O., is now a fugitive. His signals interfered with the operation of the Radio station. He should have parked those cars somewhere else, had a receiving set on hand and charged a fee for listening in while waiting for the parade to come along.

RADIO INDI-GEST

Radio Pictures; Oh Dear, Oh Dear!

Double-quick march of progress gives Radio pictures to the world. Photograph filed with operator in Rome arrives in Bar Harbor five minutes later. Radio photo shows no effects after coming out of ether. Operator



counts up hair, whiskers, wrinkles in Radio message, adds in eyes, ears, nose and mouth, and figures up total charges, night rate collect.

Science is certainly stepping on the gas. Twenty years ago moving pictures ranked as last chapter in Book of Wonders. It looked then like Edison had pulled his masterpiece, next to questionnaires. Now Radio photos make moving pictures look like old family photograph album. Only point lacking to make scheme complete is Radio method for hanging pictures on wall.

As soon as snapshots begin to fill the air, high school boy can hoist antenna and scoop up gallery of expensive sepia photos. Kansas farmer can sit down after evening meal and listen to front view of Annette Kellermann coming in on his Radio set.

Radio stations will mix advertising with concrete programs after static solo by Galli-Curci. Newark can broadcast Mennen's mustache. Chicago will turn on sweet symphony concert and follow up with half-tones



of mail-order suits. There is no limit to awful probabilities of pictures by Radio.—Neal O'Hara, Evansville (Ind.) Courier.

Senator Glass Will Insulate His Aerial

Miss Ruth Sparks gives soprano solos in the east, and in the west Mr. Sexton left his church long enough to broadcast a sermon.

How to Keep 'Em Down on the Farm

The large corporations find it profitable to provide entertainment by means of Radio for their employes in isolated places. This may be the solution of keeping the hired girl on the job in the country.—Daily News.

But He Can Turn Off the Set!

If these Radio telephones keep on, a man's wife can talk to him no matter where he goes.—Greenville Piedmont.

France, Wake Up! 6 O'Clock

A French Radio publication announces that a Frenchman has succeeded in constructing a Radio alarm clock.



He uses, so the story goes, a receiving apparatus tuned to respond only to a call consisting of certain letters sent at a certain speed. When the proper combination of dots and dashes is received the last signal operates a relay that closes a circuit and rings a bell.

Wonder if he throws a shoe at the set?

Human Regeneration

In the Canary Islands the inhabitants convey signals and bits of news by a system of whistling. The system dates back hundreds of years. When Radio takes hold the islanders will not know whether their apparatus is out of tune or some inhabitant is trying to whistle a message.—Daily News.

Use of the Radio Receiving Set in the Home

Part II—Classes of Receiving Sets

By H. M. Towne

IN THE first installment of this series the principles of transmission and reception, the antenna and ground connection were discussed. We can now turn our attention to the receiving instruments.

There are at present numerous types and designs of receiving sets in use and equally as many types and designs on the market. Therefore, before making any selection of the type of receiving set for a home installation, one should first review the more general types. In doing this we can classify receiving sets into five groups. This classification is based entirely on the electrical principles of the equipment, and while it is not in itself a definite quality rating of receiving sets, it is a grading which should guide the novice in the selection of appropriate equipment to suit his individual condi-

tions and his ideas for audibility of signals. The classification is:

1. Mineral detector set.
2. Vacuum tube detector set (no amplification).
3. Vacuum tube set with detector and audio-frequency amplification.
4. Vacuum tube set with Radio frequency amplification, detector, and audio frequency amplification.
5. Vacuum tube set same as Class 3 or 4, but with loud speaking device.

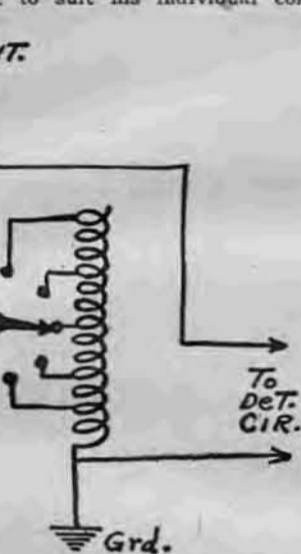


Figure 4

If it is desired to tune up to 600 meters to hear the ship and commercial stations, the inductor should include about 80 turns, and for 2,500 meters, about 350 turns. When using taps with the latter winding these can be taken on every 10th turn for the first 80 turns and then on the 110th, 160th, 220th, 280th, and 350th turns of the remainder of the winding, making a total of 13 taps.

Size of Wire
The size of the wire can be anything between No. 28 and 16 B. & S. gauge but No. 20 or 22 is to be recommended and will possess suitable mechanical strength and low resistance. After deciding on the size of wire and the number of turns, the length of the cylinder can be readily calculated.

The cylinder should be of insulating material and stiff enough to prevent collapsing. A mailing tube, having about 1/8 inch wall will serve well, but it should first be given a coat of shellac and baked in a warm oven or placed on a steam radiator for a few hours so that the moisture is driven out, and the tube is shrunk. If this is not done the tube may shrink after the winding is in place. Heavy cardboard tubes, sliding contacts, and multi-point switches may be purchased at most of the Radio supply stores.

Condenser Completes System

In addition to the variable inductance coil, a variable condenser is necessary to complete the single coil tuning system. This condenser is connected in series with the coil as shown in Figure 4. As previously stated, the antenna represents a certain capacitance (C) and thus when the variable condenser is connected in series with the antenna, we have two capacitances in series. When two or more capaci-



Figure 7

tances are connected in series, the resultant capacitance is the reciprocal of the sum of the reciprocals of the two individual capacitances which may be expressed:

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

Therefore, the addition of the variable condenser reduces the effective capacitance thus requiring a larger value of inductance for a given frequency or wave length. In addition to this, the series variable condenser provides for fine adjustment in between the wave lengths represented by the variable taps on the inductor.

Making the Adjustment

The coarse adjustment can be made on the multi-point switch and the final and critical adjustment made with the variable condenser. Different combinations of L and C will give the same wave length adjustment, but generally the adjustment using the largest value of L gives the

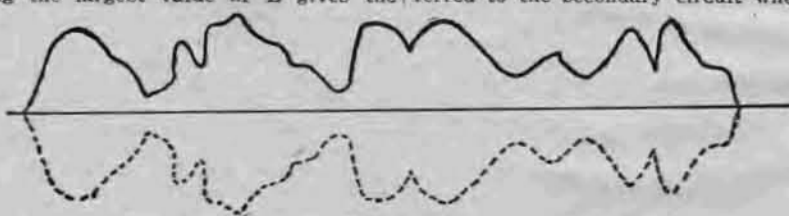


Figure 8

loudest signal. This adjustment is also an easier combination for regeneration when using the vacuum tube detector.

The inductance values recommended in the foregoing paragraphs are correct for use with a series variable condenser. The condenser may be either the 21-plate or 43-plate size, which in some designs on the market represent about .0005 mfd. or .001 mfd, maximum capacitance, respec-

tively. The 21-plate size is usually sufficient and is somewhat cheaper.

Two-Circuit Tuner

The two-circuit tuner is frequently called a coupler, loose coupler or variocoupler. It consists of two inductance coils, each provided with variable contact and the two coils so mounted as to provide a variable degree of coupling of

their electro-magnetic fields. One of the coils is called the primary. This coil may be constructed and connected just as has been described and shown for the single-circuit tuner. The secondary coil is usually mounted so that it will slide or rotate inside of the primary coil. If it slides, the coupling will be "loose" when the secondary is entirely out of the primary coil, and the coupling is "tight" or "close" when the secondary is telescoped inside of the primary.

If the secondary rotates inside of the primary, the coupling is "loose" when the plane of the turns on the secondary coil is 90 degrees from the plane of the primary coil turns and when the plane of both coils is the same, the coupling is "tight." The secondary coil may be wound with the same number of turns and same number of taps as given for the primary, but the tube or form on which the secondary is wound must be of smaller diameter than the primary. A 1/8-inch or 3/16-inch clearance between the inside of the primary tube and the outside of the secondary winding will be satisfactory.

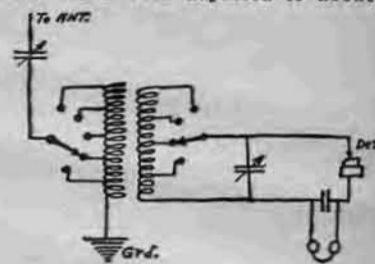


Figure 9

same tap as used on the primary, and the secondary shunt condenser turned until the signal is heard.

The final adjustment is the coupling and a looser coupling will allow sharper tuning, but the secondary variable will have to be readjusted in conjunction with the final adjustment of coupling.

The single-circuit tuner can be used with very good results in some localities, where interference from numerous commercial stations and amateur transmitting stations is not serious.

Gives Sharp Tuning

This style of tuner is cheaper to buy or construct and simpler in adjustment, and usually gives slightly louder signals than the two-circuit method. The latter, however, provides for sharper tuning and better enables the elimination of interfering stations. In other words, when adjusted to one wave length the two-circuit tuner will prevent the detector from responding to other wave lengths more positively than the single-circuit tuner. It does, however, require more skill and a better understanding of the principles involved to make rapid adjustments. For sections like New York City and vicinity where the Radio traffic is very congested, the two-circuit tuner is almost imperative.

There are other forms of inductance for both single or two-circuit tuner than the forms described above. The inductance may be in the form of a so-called "spider web" coil which is a spiral winding on a special flat pressboard or other insulating form. The coils may be so-called "honeycomb" winding, or the inductor may embody the variometer principle for adjustment of the desired inductance. There is little electrical difference in the operation with either form of inductance and the cylindrical inductance is more commonly used and is about as easy to construct and mount.

Mineral or Crystal Detector Sets

The mineral detector receiver is the very simplest kind of a set and represents the cheapest to install and maintain. In its usual form, it consists of tuning in-

(Continued on page 12)

Two-Circuit Connections

The loose coupled or two-circuit tuner is connected as shown in Figure 5. It will be seen that a variable condenser is connected in shunt with the secondary inductance. This provides for wave length adjustments in between those represented by the taps. This condenser may be the 21-plate size. The two-circuit tuner represents two distinct oscillating circuits each having variable values of L and C. While there is no electrical connection between the primary or antenna circuit and the secondary circuit, the currents received in the antenna circuit are transferred to the secondary circuit when the

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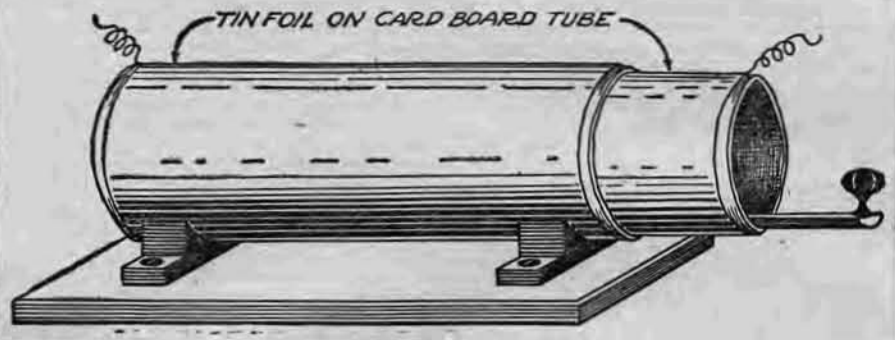
THOS. E. WILSON & Co.
42 South Wabash Avenue
Dept. R. D. Chicago

Variable Condenser Made of Tubes

Tube Surfaces Covered With Sheets of Tinfoil

The illustration shows the construction of a condenser made of cardboard tubes. Two cardboard tubes are selected, one to pass into the other loosely. Tinfoil covers the surfaces of both tubes. Connections are made to the tinfoil. The adjustment

MOUNTING FOR TUBE CONDENSER



good switch points if they are put in through the panel, bent and the wire soldered to them. These fasteners also make good crystal holders when bent in the form shown. Pieces of broom handle make good knobs for various switch levers. When polished and given a coat of shellac they present a neat appearance.—C. E. Rust, Phoebus, Va.

be some increase. Neither has he experimented with twin vacuum tube detectors, but believes it should be successful.—Frank Eastman, Toronto, Can.

Testing Coils and Windings

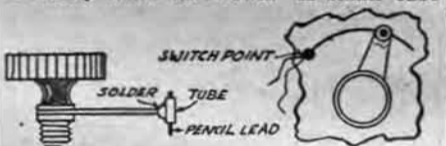
The windings of tuning coils sometimes are a source of trouble in an otherwise efficient receiving circuit. Such trouble is generally due to an imperfect contact or to a broken circuit somewhat, but the exact location is oftentimes difficult to determine.

A dry cell and a small flashlight lamp can be used to test the windings by connecting the latter in series in the circuit with the battery and the lamp. If the lamp glows and then continues to grow dimmer as the slider or switch out in more turns of the coil, the winding is all right. If, however, the light does not glow, or goes on and off, as the slider or switch arm is moved, look for trouble.

First, the slider or switch arm may be making imperfect contact, which condition can be remedied by tightening and cleaning. Secondly, the wire may be loose from the switch contact points, in which case soldering must be done. If none of these defects are apparent, look for a break or open circuit in the wire.—P. J. M.

A Variable Grid Leak

For fine work a variable grid leak will be found of great advantage. One can be easily made as shown. A small tube



is soldered to the end of a switch lever and a piece of pencil lead is held in the tube which serves as a contact with the line it has drawn by moving the lever back and forth several times.—J. S. Marcus, Philadelphia, Pa.

the receiving antenna as produced by the electro-magnetic waves from the transmitting station are very feeble especially when received over great distance.

Connection of Detector

The crystal detector is connected as shown in Figure 9. When the tuning instruments are adjusted to a broadcasting wave, the feeble oscillating voltage of varying amplitude is impressed upon the detector. The detector passes current in one direction only and thus causes a direct current of varying amplitude to flow through the condenser and telephone. The varying amplitude of direct current through the detector is precisely like the amplitude variations created by the voice at the transmitting station. The telephone receiver diaphragms therefore vibrate at the same rate as the microphone diaphragm into which is spoken at the transmitting station. The effect of the fixed or "stopping condenser" in shunt with the head phones is to intensify the current pulsations which pass through the detector. This condenser is not critical in size and may be made by rolling up in cylindrical form two sheets of tinfoil insulated by one thickness of waxed paper and making connection to each foil sheet. The size of the sheets of foil may be 2 inches by 18 inches, and the paper should be 2 1/2 inches by 20 inches, so that the paper will extend 1/4 inch out on each side of the foil strips.

The crystal detector set is very simple, but is not near as sensitive as the vacuum tube detector set. The distance that any station can be heard depends, of course, on the amount of power used for transmitting and the sensitiveness of the receiving set. Considering the amount of power used by the present broadcasting stations, the probable distances of reception using crystal detector set is not likely to be over fifty miles. Therefore, the vacuum tube detector sets are to be recommended for longer range of reception and for louder and more reliable signals.

(Continued in September 23 Issue)

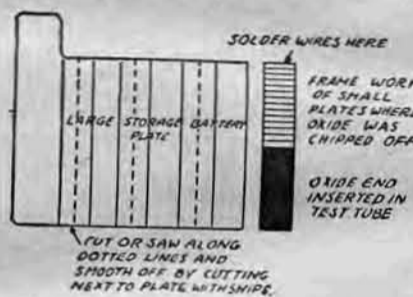
Plates of Old Storage Cells Make B Battery

The materials necessary for making a storage B battery are as follows:

Three each of old storage battery positive and negative plates, and four storage battery separators procured from a battery charging station. From a drug store obtain twelve test tubes one inch in diameter and three and one-half inches in length.

Cut the negative plates along the dotted lines shown in the illustration and smooth off the edges. These will make small battery plates seven-eighths inches wide. Chip the oxide out of the framework of the small plates with an ice pick, leaving about three inches of the oxide on the plates. One positive and one negative plate are put in each test tube with the oxide and in the tube and the other end acting as a post for a connection. A piece of separator is inserted between the plates.

The base is made of a piece of wood eight inches long, five inches wide and two inches thick. Holes are bored in this wood in which to set the tubes. The holes should be bored one and three-quarter inches deep and one and one-eighth inch



in diameter. The tubes are inserted in these holes and the cells connected by soldering the wires to the upper ends of the plates.

The test tubes are filled with an electrolyte which is made of a dilute solution of sulphuric acid. And the sulphuric acid to the water a drop at a time until it tests 1250 on a hydrometer. Do not add water to the acid, add acid to water.

Charge the cells at the rate of one ampere. The battery will last for normal use about three weeks without a recharge. The battery should test 24 volts.—F. Cerniglia, Tallulah, La.

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WORKSHOP KINKS? EARN A DOLLAR—

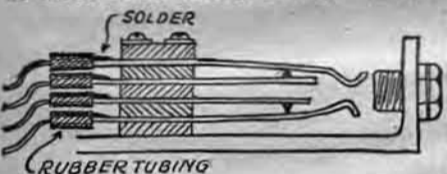
THERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. RADIO DIGEST is very much interested in securing such material. 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.

is obtained by sliding the smaller tube within the larger one.—B. G. Levy, Dodge City, Kan.

Mounting Panel Jack Leads

After having considerable difficulty in soldering leads to panel jacks to prevent their shorting I discovered a way to eliminate all trouble. Remove pieces of insulation from insulated wire. This should be about 1 inch in length. Slip them over



the leads, and after the soldering is completed push them down over the wire where they come close together on the jack.

If the insulated wire is not at hand a length of small tubing known as spaghetti tubing will serve the purpose. This is an excellent way to keep the jack leads from shorting.—G. M. Upton, Philadelphia, Pa.

Odds and Ends Supply Parts

Good cord tips may be made from shoestring tips, if they are scraped and soldered onto the end of the wire. Jacks for these tips may be made from paper clips as shown. Paper fasteners make

Antenna Across Streets

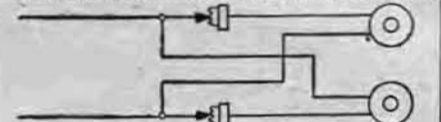
Most cities have ordinances which do not permit antenna wires to be run across the streets, so content yourself with a wire over the yard which need be only about seventy-five feet long.

Twin Crystal Detectors

The illustration shows a simple and original hook-up diagram used successfully by the writer for broadcast reception. Twin crystal detectors are employed with a divided head set, namely, each phone unit in a separate detector circuit.

The theory of this arrangement may be that it catches both sides of the high frequency reception in each phone alternately, whereas, in using a single detector only half of the current in the form of a series of dashes are passed through the phones.

In use there appears to be almost double strength in audibility with the twin detectors and it demonstrates this clearly when one crystal "lays down" suddenly causing a distinctly noticeable decrease. One can adjust a failing detector while



still getting reception in one phone, and it is a decided advantage as both seldom cease to function simultaneously.

The author made no tests as to furthering the range, but believes there should

would be nothing heard since the receiver must have direct current to operate it. Therefore, in order to make these modulated high frequency currents flowing in the receiving antenna and ground circuit operate a telephone receiver or other sound reproducing device, the alternating currents must be converted to pulsating direct currents. This action of converting is called rectifying and the device that rectifies is a rectifier or detector.

Detection or Rectification

The detector, in order to rectify the alternating currents, must pass the current in one direction only. This means in effect that only the upper half of the oscillations will cause current through the detector. See Figure 8. Minerals or crystals to do this must present a low resistance to the flow of current when the impressed voltage is, say, positive, but offer a high resistance when the voltage is negative.

This relation of resistance to positive or negative voltage governs the efficiency of the mineral as a detector. For example, a certain mineral may pass 200 microamps. (1 micro-amp equals one millionth of 1 ampere), while the voltage is in one direction but pass only 3 or 4 microamps, when the same value of voltage is applied in the opposite direction. When this ratio of current is large, the mineral is a good detector.

The minerals or crystals may be natural or synthetic. The more important ones operate with a metallic point contact. Such crystals are galena, silicon, iron pyrites, carborundum, molybdenum and others. The first two are the more sensitive and require a fine point contact with light pressure. A fine steel wire makes a good contact point for either. Silicon is easier to adjust, that is, it has more sensitive spots on its surface which will give the rectifying action. Galena is more sensitive but it has less sensitive spots and several crystals may have to be tried before finding a real sensitive one. By sensitive detectors is meant one which will rectify a very feeble alternating current. The currents which flow in

USE OF RADIO SETS

(Continued from page 11)

struments which may be either the single circuit or two-circuit design, a mineral detector, a fixed or variable condenser and a pair of head phones.

Before further description let us review the function of the detector in the receiving set. In the previous section it was stated that the oscillation frequency of currents for producing the waves is equal to the velocity divided by the wavelength. Then the frequency of the alternating current received on an antenna from a 360 meter broadcasting station would be 835,000 cycles per second. This is a frequency far too high for the human ear to respond to. The audio frequencies that is, frequencies or vibrations audible to the human ear, are from 40 to 20,000 cycles. Frequencies above 20,000 cycles are, therefore, called Radio frequencies. The carrier wave frequency of 835,000 cycles as produced by the transmitting station is continuous and of a constant amplitude when not modulated by the voice.

Theory of Modulation

When someone speaks in the microphone of the transmitting apparatus, the frequency is modulated, that is, the amplitude of the oscillations is varied. These variations are in accordance with the voice or sound frequencies. Figure 6 shows the continuous or carrier frequency, and Figure 7 shows the same fundamental frequency having varying amplitudes. While the fundamental or carrier frequency is 835,000 cycles per second, the variation in the amplitudes is in the neighborhood of, say, 4,000 cycles or less, depending upon the pitch of the voice or sounds entering the microphone.

These varying amplitudes of the fundamental frequency which correspond to the voice must be registered by our sense of hearing at the receiving station. If the alternating current of varying amplitude shown in Figure 7 should be connected to a telephone receiver, there

Simple Instructions for the Beginner

By Harry J. Marx

Filament and Plate Batteries

ONE OF the important problems confronting every Radio fan is that of the batteries necessary to supply current for his tube filaments and also for the plate circuit. Inasmuch as the present tendency indicates a more popular use of the storage type of B battery, the best part of this article will be devoted to the subject of this type with but casual reference to the dry cell form of B battery.

Another feature that must be considered at the present time is the use of vacuum tubes requiring less than a six-volt potential. In such cases the possibility of substituting dry cells for filament batteries is more possible than ever before, especially so since the current required (amperes) is much less than with the old type tubes. Dry cells, moreover, can be replaced as required, necessitating little or no attention and therefore little need be discussed relative to their care and maintenance.

Lead Plate Storage Batteries

Storage batteries are of two types. The first and most commonly used consists of prepared lead plates immersed in an acid solution. The other known as the Edison type has nickelled steel grids, containing nickle peroxide and spongy iron immersed in a caustic potash solution. The former has been most popular for amateur use.

More trouble to the novice can be traced to the storage battery. No piece of apparatus repays so much for attention to its peculiarities. In order to understand how to keep it in good order, it will be first necessary to consider the requirements of a good storage battery and the demands made upon it. It will be found that a six-volt storage battery is made up of three individual cells, each of which is a complete unit in itself. Each cell supplies, when completely charged, a pressure of about two volts.

Ampere Hour Capacity

If a considerable amount of current is taken from the battery, the capacity of the battery will be consumed in a shorter time than with a smaller amount of current. Ratings are, therefore, given in ampere-hours. For example a 50-ampere-hour battery will supply a current of 5 amperes for ten hours, 4 amperes for fifteen hours, 1 ampere for sixty hours and so on. Thus, to find the length of time during which a certain value of current can be drawn from a cell, it is simply necessary to divide the current into amperes into the total capacity in ampere-hours. It is an error, however, to imagine that a current of sixty amperes can be drawn for one hour.

The rule given applied within reasonable limits, and the maximum current pass from the cell for any considerable period without interruption is usually estimated as about 1/10 of its ampere-hour capacity. Then, in the case of a sixty ampere hour battery this would be about six amperes.

Discharge Conditions

The ratings in excess of this figure will be injurious to the cell for reasons which will be explained later, the total capacity working out at a considerable lower figure. Short discharges at higher figures than quoted can be made without injury. For example, take the automobile batteries for lighting and self-starting. Unfortunately, the Radio field demands continuous discharge without much of an opportunity for the cell to rebuild during intervals. In addition, automobile batteries are being constantly recharged so that actual current consumption is reduced to a minimum.

Since storage batteries heretofore have been used mainly for intermittent work the ampere-hour rating is based on this type of operation and therefore will not hold true for continuous discharge. Actually, the rating averages double that of the continuous discharge value. For this reason it must be kept in mind in purchasing and using storage batteries. The continuous discharge rating is rarely indicated on the battery. In fact the average battery salesman would be unable to differentiate between the continuous and the normal rating.

Storage of Energy

It is not an unusual occurrence to find people under the impression that a storage cell actually stores electricity. Of course, it is understood that electricity is put into the cell and subsequently can be withdrawn from it, with a limited loss. Actually the electrical energy is converted and stored in chemical form. The charging current acts on the lead compounds in the positive and negative plates electrolytically to convert them into substances which, when the battery is connected in a circuit and the circuit closed, react again electrolytically to revert the chemical energy into electrical energy. The latter, of course, is in the form of a current through that circuit. Electrical energy is thus first converted into chemi-

cal energy and then reverts to electrical energy.

Taking this into consideration, it is easily understood that in making a cell the plates and the pastes in perforations need careful attention. The total capacity of a cell depends upon the total area of active material in the electrolyte or acid in which the plates are immersed. For example, doubling the plate area means doubling the total capacity. The reduction of area, whether intentional or otherwise, will create a corresponding reduction in capacity. Thus a considerable loss of capacity can very easily take place when the battery is carelessly handled, and for that reason is one of the chief causes of trouble. This reduction of effective area is apt to take place in numerous ways.

Discharging a battery too rapidly will loosen the active material, which will therefore fall to the bottom of the cell where it not only becomes useless but is very apt to short-circuit the plates if the sediment piles high enough to make contact with the plates. Excessive discharge will also cause expansion and bending called "buckling" of the plates. This is apt to develop short-circuits in addition to loss of the active material.

Sulphating

The battery must never be left in a discharged condition for any length of time. When a cell has become discharged it is best to recharge it again without delay. Discharged cells, after a time gradually develop upon their plates an almost insoluble coating of sulphate, a white deposit which reduces the active area. This requires expert and prolonged treatment for removal, and then is possible only if the deposit is not excessive.

For example, if the cell has a 60-ampere-hour capacity and half of its active material is coated, the normal discharge rate of six amperes may prove excessive, causing buckling and disintegration. The electrolyte with an excess of acid in the solution is also apt to cause sulphating. In fact, any prolonged period uninterrupted by charging or discharging is apt to cause this condition.

The Electrolyte

Batteries can be purchased dry without the acid. They are usually shipped to the distributors in this form, or else filled and fully charged ready for service. When purchased dry, the acid or electrolyte solution must be added. The composition of this acid solution is of the utmost importance and for that reason it has become customary to sell most batteries ready for service.

The electrolyte is prepared by adding chemically pure sulphuric acid to distilled water. The specific gravity of this electrolyte varies somewhat with the type of cell and the use for which it is intended. The average value, however, is 1.280. Electrolyte is to be added to the cells only in case of loss due to spilling or when replacement is necessary due to accumulated impurities. It should never be added to merely raise the specific gravity or to replace evaporation.

The water and acid should be mixed by pouring the acid slowly into the water, stirring constantly. The water should never be poured into the acid because of its tendency to boil or splash up with danger to the person handling it. Preferably it should be prepared in an earthenware or glass jar and never in any metallic receptacle excepting possibly, one made of lead.

Measuring Instruments

Each fan should provide himself with a voltmeter and hydrometer. For charging an ammeter will be needed. The voltmeter should give readings to about ten volts. Accurate reading is impractical with much higher ratings. The ammeter should have a maximum reading of about 25 amperes. Cheap instruments will not do. This is true of voltmeters where one-half volt variation may lead to serious consequences. An improperly used voltmeter will give very misleading indications of the condition of the battery.

Fully charged, each cell should have a voltage slightly higher than two volts. It will remain at this figure for a considerable period of time. After it starts dropping it indicates that recharging is necessary.

It is not advisable to continue use of the cell after the reading has dropped to 1.8 volts. Further, a voltmeter reading should always be taken while the battery is in use because of its tendency to rebuild the voltage temporarily after a short period of rest. This rebuilt voltage, however, immediately disappears after a short drain upon the battery. A cell showing two volts when not in use is not necessarily fully charged.

Use of the Hydrometer

The hydrometer is a device for measuring the specific gravity of the electrolyte. This method is a far better indication than anything else of the condition of the cell. When fully charged the specific

gravity varies from 1.280 to 1.310. As the charge is withdrawn, it steadily falls until the safe limit of discharge is reached at about 1.180.

These figures are apt to vary slightly with different makes of cells. A reading of the specific gravity then will permit more accurate judgment relative to the condition of the cell, due to the fact that although the voltage may be temporarily built up the specific gravity remains practically unchanged when the cell is not in use. For example, a reading of 1.240 would indicate that about 50 per cent of the available safe current limit has been consumed.

Gas Emission Evaporation

When the cells are being recharged and nearing the completion of the charge, a fine spray is emitted from the surface of the electrolyte, due to the rising and bursting of numerous bubbles of gas. This gas is hydrogen, an inflammable gas, and the cell therefore should be kept away from an open flame. In addition this acid spray is very corrosive.

The level of the acid may be reduced because of evaporation of the water, which can be replaced by the addition of distilled water. This level should be slightly above the tops of the plates. The addition of the water will not affect the correct specific gravity because the evaporation is limited to the water. The acid does not evaporate. If acid were added, the specific gravity would be increased and would apparently indicate a fully charged battery although it may not be so.

The ordinary drinking or faucet water should not be used as the mineral salts in this water are highly injurious to the plates. Distilling the water eliminates the mineral contents.

Protection Against Acid

All terminals should be kept covered with vaseline or some form of non-corrosive paint such as asphaltum in order to prevent bad effects from the acid spray and from the "creeping" tendency of the electrolyte. The average mineral paint should not be used for coating the terminals as it is apt to create short-circuits and may possibly introduce impurities in the solution.

It is unnecessary to state that carpets and furniture should be protected around the battery because of the corrosive action of the electrolyte. The amateur should realize that although a 40-ampere-hour battery requires the least outlay of cash, its use necessitates constant recharging. This is especially true when more than one tube is used. Any receiving set with more than four tubes requires a battery capacity of 80 to 120 ampere-hours in order to avoid too many trips to the battery charging station.

Edison Cells

Although but little used at present for Radio purposes, the Edison type of battery can be substituted for the usual storage cell. In these cells the positive plates are built up of a series of perforated nickelled steel tubes containing numerous layers of compressed nickel oxide and pure nickel in flake form. The negative elements, also of steel, have a number of pockets filled with iron oxide. The containers are steel and built with strength in view, permitting considerable handling without serious danger or damage.

The electrolyte is a 21 per cent solution of caustic potash with a prescribed amount of lithium hydrate added. The specific gravity of this solution is about 1.210 and does not vary throughout the charge or discharge. For this reason the specific gravity of the electrolyte cannot be used to indicate the state of charge of the nickel-iron cells.

Care of Edison Battery

As before, evaporation is made up by adding distilled water only. The cells have an open circuit voltage varying from 1.45 to 1.52. When discharging the voltage gradually drops to a value of .9 volts per cell. The average voltage while in use runs about 1.14 volts per cell. The whole battery can be completely discharged and left in this condition for months without injury. Even short-circuiting does no harm.

The main reason for its limited application to Radio is due to its variation in voltage while discharging. For this reason when the cells are used to supply current to the filament of the tube, it is necessary to adjust the rheostat in the filament circuit occasionally. Because of this voltage variation the lead cells are better suited for Radio work. If the specific gravity of the electrolyte falls to 1.160 it should be renewed.

B or Plate Batteries

The high voltage battery is often as much mistreated as the storage cells. Although it does not require the same amount of attention, still some thought should be given to its care. The faults in the plate batteries are not so readily recognizable and therefore trouble arising from this source is too often neglected. In selecting these batteries the first consideration is the question of voltage necessary for the particular tubes in use.

Although the tubes are usually given

an operating plate voltage, much depends upon the particular circuit in which the tube is used. The UV 200 requires a plate voltage of 22½ but it has been found from experiment that when used in regenerative circuits a high voltage is possible. Most of the amplifier tubes require a plate voltage of from 45 up, with a limit of about 100. The new Myers Audion is recommended to operate best on from 80 to 100 volts in a plate circuit.

All these values are apt to be amended by a particular method of coupling used in the amplification stages. For example, the resistance capacity coupling permits 100 volts on the plate circuits of the amplifier tubes, whereas the transformer or reactance capacity coupling will operate the best on a slightly lower voltage. When a plate voltage rating is given for particular makes of tubes, rarely is a drop in potential in resistance capacity couplings taken into consideration. For this reason an increase of about 300 per cent is apt to be necessary.

Forms of Plate Batteries

Plate batteries are sold in many different forms. Some are made up of small 1½-volt units which are connected together so as to permit individual cell replacements. Others are in sealed cases and yield either 22½ or 45 volts. The latter type may or may not be equipped with taps for smaller voltages. A new battery on the market at present has a tap switch furnished with the battery to permit adjustment of the plate voltage without extra switch connections.

It must be stated, however, that very close adjustment of the plate voltage is seldom required, variation of the filament brilliancy being all that is necessary for accurate adjustment in the most cases. In purchasing the battery, it will be found that the average manufacturer makes two types of similar voltages. One will possess higher amperage with a slight increase in cost. In most cases it will be found advisable to purchase the higher amperage battery because in the long run the expense will be justified.

Battery Noises

If the plate battery is bad, failing or worn out, it is apt to give a series of noises that are often thought to be static. A simple test to discover whether such noises are due to static or to faults in the set, is to disconnect the aerial and ground and see whether such noises continue. If so, it does not necessarily indicate bad batteries but may also be due to poor connections, defective tubes, incorrect grid leak or coupling resistances, defective or discharged A battery, or poor transformers.

A method of investigating the taps or individual cells of the plate battery to discover the cause of noises, is to short-circuit successive cells to see whether it will have an effect in eliminating noise in the receiver. In this way the defective section can often be discovered.

The storage type of plate batteries are becoming more popular in spite of the considerable initial expense. With the numerous home chargers at present on the market equipped for a high voltage charging rate, it is becoming a simple matter to charge this type of plate battery. After extended use each day it is advisable to leave the battery on charge over night.

There is a distinct advantage in shunting a .01 mfd. condenser across the plate battery and even the phone receivers as it serves the double purpose of preventing high frequency current passing through the battery, apt to be a cause of considerable damage, and smoothing out slight irregularities in voltage. This practice has not been very prevalent in this country but is usually indicated in most diagrams of foreign circuits.

Variable Condenser Types

With the new crop of variable condensers which is flooding the market, it is difficult to distinguish between the various types and to know exactly the one to buy for a particular purpose.

There are in a general way four types of variable condensers. These are the sliding plate type, the rotating square line type and the square law type, to which may be added the geometric progression type.

The rotary type of variable condenser is probably the best known and the one most commonly used today. It consists essentially of two sets of semi-circular plates, one set being stationary and the other allowed to revolve between the others.

Not only is this type rigid in construction but it changes its capacity very little and may be so constructed that its wear will not affect the distance between the plates. It's easy to mount on the panel or to place on the table, thereby being adapted to the cabinet types of receivers.

A point which should be remembered when the condenser is used in calibrated circuits is that it give a constant ratio of scale degrees to capacity. Thus it is possible to mark off the scale in wave lengths instead of degrees of an arc on the receiving set.

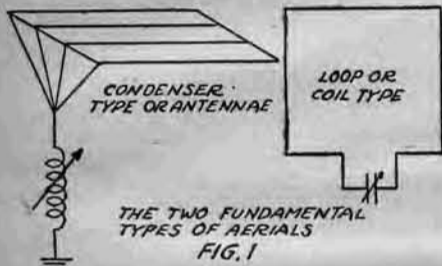
Design and Construction of Loop Aerials

By Thomas W. Benson

IN A RADIO transmitting or receiving set comprising an inductance and a capacity in the primary tuning circuit, either the capacity or inductance is made large and thus acts as an absorber of Radio waves. When the capacity is made large, as in the usual flat top construction we have the condenser aerial or antennae, Figure 1. The elevated wires serve as one plate of a condenser while the ground is the other. When the inductance is made large we have the loop or coil aerial. With the condenser aerial a variable inductance is connected in series to tune while the coil or loop used is made of a variable capacity.

Advantages of Each Type

Each of the two basic types of aerials has its advantages. The flat top has predominated in the past due to the fact that with a given power and distance the signals are loudest. To obtain the same signal strength with a loop aerial it must approach the condenser type in size and



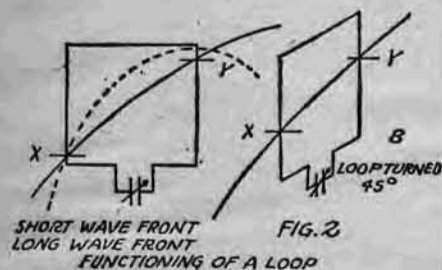
would then offer no advantages. However with the development of super sensitive regenerative sets and multi-stage amplifiers it is possible to overcome this limitation and do satisfactory work with a small loop. In this manner it is possible to utilize the other characteristics distinguishing the loop aerial. These are its directive properties, compactness, low resistance and greater freedom from strays and static.

The directive property of a loop enables one to select a particular station when several are transmitting at similar wave lengths. Its compactness allows of the use of a Radio set where conditions or surroundings prevent the erection of a flat top antenna. Its low resistance makes for increased signal strength offsetting to a great extent the loss due to reduction in size of the aerial. Its freedom from static and strays permits reception with comfort the year round. Each of these four factors make the loop particularly useful for Radiophone reception. In addition to these the loop aerial is more efficient on short wave lengths than on the longer waves and thus fits in nicely for Radiophone work.

Principle of Operation

A consideration of the principles of operation of a loop aerial will show why it possesses directive properties and will account for its efficiency on the shorter waves. It is clear that in order for a current to flow in a loop a difference in potential must exist in the different sides of the loop. If equal voltages were set up on opposite sides of the loop no current would flow.

In Figure 2, the loop is shown at A with its side towards a transmitter. Now conceive the wave shown as moving across the loop. It is evident that the side near-



est the transmitter will be cut by the lines of force before the other side. In this manner a difference of potential is created in the two sides of the loop and a current will flow depending upon the resistance of the circuit. The difference in the heights of the points X and Y shows graphically the difference of potential at a given instant.

As the wave moves across the loop these values change until X is higher than Y then the current flows in the opposite direction. This gives rise to alternating currents in the loop of a frequency depending upon the wave length.

Greater Potential on Short Waves

When the wave length is shorter the number of alternations is increased making the curve of the wave front steeper. Under this condition a greater part of each cycle is included in loop as shown by the dotted line and the difference in height between the wave form on the respective sides of the loop is greater. This naturally causes a greater difference

of potential with an increase of signal strength. This explains the higher efficiency on short waves.

As to the directional properties, consider the loop given one-eighth of a revolution as shown at B. This results in a smaller portion of the wave form being enclosed in the loop with a lower difference of potential as can be seen

Loop Size	2 Ft. by 2 Ft.		4 Ft. by 4 Ft.		6 Ft. by 6 Ft.		8 Ft. by 8 Ft.	
	Turns	W	V.R.F.	W	V.R.F.	W	V.R.F.	W
5	200	1200	250	2500	400	4500	500	4500
10	250	2000	450	3100	600	5000	900	5800
15	425	3100	800	3700	950	5400	1300	6300
20	550	4500	1200	4300	1450	5900	1700	6900
25	700	5000	1450	4700	1700	7000	2100	7600

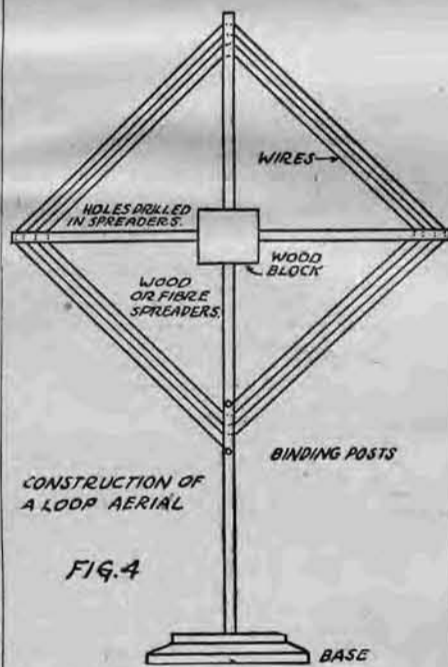
Figure 3—Table showing wave lengths loops will receive and voltage reception factors at these wave lengths

by the smaller difference in heights of X and Y. The signal strength has then fallen off. When the loop is turned so that its plane is at right angles to the wave front the currents in both sides of the loop will be equal and neutralize thus giving rise to no signals.

It will be found that the point of minimum signal strength is much more definite than that of maximum signal strength. Therefore in taking direction reading on a station the loop is turned till the station cannot be heard and the axis of the loop will be pointing directly at the transmitter. A full description of orienting stations will not be covered here, the above being but an outline of the theory of operation.

Size of Loop to Use

The above does not imply that any loop will work more efficiently as the wave length decreases. It has been found that



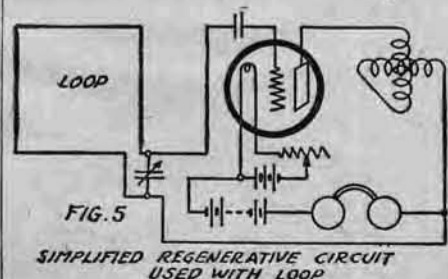
for best results the natural wave length of the loop and that of the received signal wave should bear some relation. Under no circumstances should the wave length of the loop exceed one-third the wave length of the received waves or poor reception will result.

The efficiency index of a loop aerial is obtained by means of a voltage reception factor calculated from the formula:

$$V_r = \frac{N a L}{W^2 R}$$

Where V_r = Voltage Reception Factor
 N = No. of Turns
 a = Area of Loop in Centimeters
 L = Inductance of Loop in Centimeters
 R = Effective Resistance
 W = Wave Length of Incoming Signal.

To determine the efficiency of an aerial the reception factor is calculated at a



series of wave lengths and plotted against those wave lengths to form a curve. From these curves a comparison can be made of the different loops on a given wave length. To eliminate this work and simplify the

process a table is given showing the voltage factors of various loops.

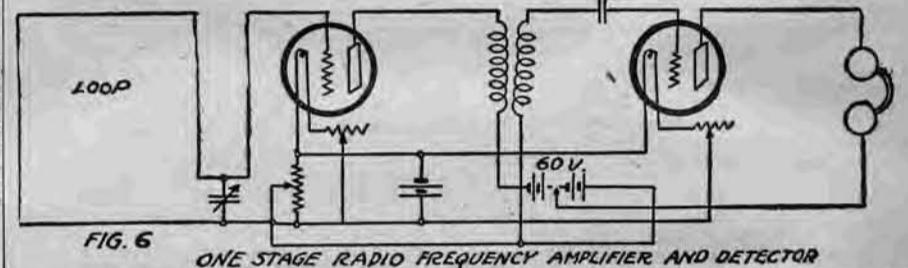
Square Loop Preferred

The square type of loop is preferred and should be mounted with one corner down to reduce capacity to ground. By standardizing on several sizes of loops we simplify greatly the design of an aerial. We

4 ft. loop, 7 turns, 350 meters, 2,800 volt., Rect. F.
 6 ft. loop, 4 turns, 350 meters, 4,000 volt., Rect. F.

find that with loops two, and four and six feet on a side the best spacing of wires is 0.1, 0.3, and 0.5 inches respectively. Spacing the wires more reduces the inductance of the loop and more turns

must be used. As this rapidly increases the resistance, the above spacing is recommended and can be adhered to with satisfaction.

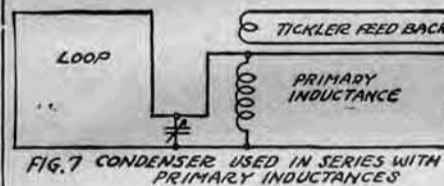


From the table given in Figure 3 it is possible to determine with fair accuracy the size of loop and number of turns to use for the reception of a given wave length. Local conditions may alter the results slightly due to stray capacity effects to pipes and metallic masses but the table forms a safe guide.

When a loop is used below a wave length shown in the table its efficiency drops off rapidly because the wave length is not three times as great as the loop as previously mentioned. Wave lengths above those shown will be received with a slower drop in signal strength as the wave goes up.

Selection of Loop Size

In order to select a loop to receive a given wave length we proceed as follows: Determine from the table, interpolating roughly if necessary, the loop having the highest reception factor for the desired wave length. For instance, say we wish to build a loop to receive Radio broad-

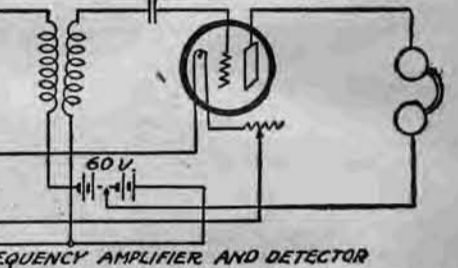


casts at 350 meters. This wave length is not given on the table but we can interpolate and find the following:
 2 ft. loop, 13 turns, 350 meters, 2,600 volt., Rect. F.

point of simplicity the helix is to be preferred and it likewise makes a neater appearance when completed. A form of frame suitable for a helix loop is shown in Figure 4. A vertical shaft of wood or fibre tubing has a cross piece rigidly attached slightly above center. If turned wood parts are used a beautiful instrument results.

Constructional Details

Now to constructional details. Two general forms of loop are in use, the solenoid and the helix. From the stand-



Holes are drilled the proper distance apart in the sticks and the wire strung through them. The lower stick is fitted into a base so the frame can be stood on the floor or table. If desired the loop can be attached to the ceiling by means of a hook and eye. Two binding posts are mounted so that flexible leads can be connected to the loop. To get the benefit of the directional effect the entire structure can be turned.

Circuits With Which to Use

In Figures 5, 6 and 7 are shown different methods of connecting a loop aerial. Figure 5 is a very simple circuit that possesses a number of advantages. A .0005 mfd. condenser is used to tune the aerial circuit while regenerative feedback is obtained by a combination of the ultra-audion and tuned plate circuits.

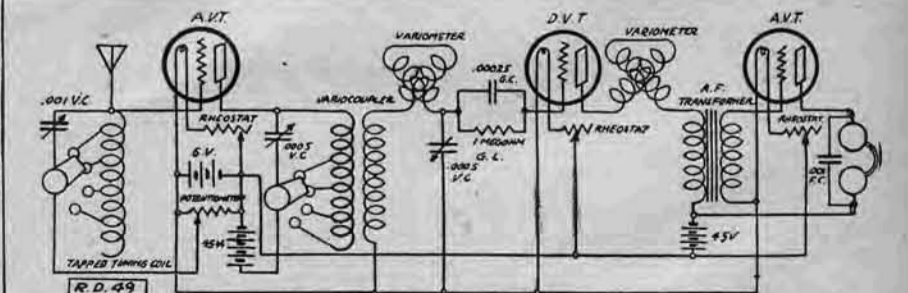
Figure 6 shows the use of a single stage Radio frequency amplifier with a loop, audio frequency amplification being added to either circuit by simply connecting the primary of the audio frequency transformer in place of the phones.

In Figure 7 a condenser is shown connected in series with the primary inductance to tune the circuit when tickler feed back is employed.

This arrangement permits of more inductance being used in the primary of the variocoupler than when it is shunted across the condenser.

In using a loop aerial it will be found that the signals are increased at times by grounding one or the other terminal of the loop.

HOOK-UP R.D.-49



The hook-up shown uses one stage of Radio frequency amplification, detector and one stage of audio frequency amplification. A typical variocoupler and two variometers regenerative circuit is used in the detector stage. The ordinary commercial single-slide or tapped tuning coil is used to tune the primary circuit. A potentiometer is shunted across the A battery and is used to control the grid potential of the R. F. amplifier tube. A 43-plate variable condenser is shunted across the tuning coil for control of fine tuning adjustment. The variocoupler takes the place of the usual Radio fre-

quency transformer and two 23-plate variable condensers are used in the primary and secondary circuits for close adjustments. The plate and grid variometers are located in their usual place in the circuit. Two 45-volt B batteries are used, one for the Radio frequency plate circuit and one for the detector and audio frequency plate circuits. The only drawback to this type of hook-up is the multiplicity of controls, making it a rather difficult one to tune. Its distinct advantage is the opportunity it presents to the amateur for testing out Radio frequency amplification without the use of a Radio frequency transformer.

Questions and Answers

Reception Troubles

(381) FWC
I am having difficulty with a Grebe CR-9 outfit and a type three Magnavox, getting nothing but weak and faint sounds from the loud speaker, and am writing to your question department for what relief they can give me. You had a wonderful sketch of hook-up and all for Grebe CR-8 May 13th. Have you had such a one for the CR-9?

To begin with I have about a 120-foot single wire antenna, front pole about 38 feet high, real pole about 45 feet high and lead in from rear pole about 60 feet to machine and ground on pump about 12 feet. I use regular Radio A battery for filament, four B batteries in series for amplifiers and Magnavox with first one only connected up for detector tube. And another ordinary 6-volt A battery for Magnavox. Music comes in better on head set than on Magnavox but what shall I do to remedy this? Now since warm weather has arrived I have difficulty getting anything. I keep A batteries charged well around 1,300, connections are O. K. and wires soldered.

A.—We have not shown the CR-9 and do not have information regarding it. You ought to increase the height of your aerial.

Believe you have your batteries connected wrong. Your main trouble is probably due to poor tuning. Are you following directions? Is your ground good? You may have a defective tube in your amplifier stages.

Fading

(743) TS
I am a constant reader of your valuable magazine and am taking the liberty of asking you a few questions which I hope you will answer.

1. I have a one step amplifier and an Audiotron Detector. I can receive much louder using detector alone than when I plug in the amplifier. I have 45 volts on the detector and 22½ on the amplifier. Please let me know if the trouble is from not having enough voltage on the amplifier.

2. What is the cause of music fading away and coming stronger at intervals. This has happened to me several times.

3. Will honeycomb coils work good for phone reception or will I have to use a variometer set?

A.—1. If anything, your voltage on the plate of the amplifier should be greater than that of your detector. Put the 22½-volt battery on the detector plate and use the 45-volt battery for the amplifier. Also make sure that you have the primary and secondary terminals of your transformer connected right.

2. Your plate or filament batteries may be run down, although fading is not uncommon in some localities.

3. Both will give good results.

Variocoupler in Super-Regenerator

(784) EKS
Have your July 22nd issue of RADIO DIGEST at hand. Am interested in Mr. Armstrong's super-regenerative circuit S-17. Would please like to ask a question relating to same.

Could one replace the honeycomb coils, used for tuning, with variocoupler and variometers without disturbing the balance of the circuit? Or could one use the variocoupler, with the secondary of same as a tickler coil, along with one variometer?

I have been reaching most Eastern stations with one stage of Radio, and two of audio, but would like to try out circuit S-17, as other circuits have not been satisfactory.

A.—Yes. Use ordinary variocoupler, but with secondary rewound with twice as many turns. A good proportion would be 50 turns on primary, to 100 turns on secondary. The only way to use this satisfactorily is with primary of variocoupler shunted across loop antenna and with rebuilt secondary used as tickler coil. The circuit may have a variometer in series in the tickler coil circuit for fine adjustment.

Armstrong Super-Regenerator Coils

(786) WCH
In RADIO DIGEST dated July 22, 1922, on page 11, you published the Armstrong super-regenerative circuits.

I am building the circuit marked S-17 and would appreciate a reply to the following questions.

1. Is the 10-millihenry choke coil (20) to be an air or iron core choke, or is it a concentrated inductance like a honeycomb coil?

2. Are honeycomb coils (16) and (18) placed in inductive relation to each other, or may they be placed anywhere in the circuit?

3. Does the choke coil referred to in my first question also set in inductive relation to honeycomb coils (16) and (18)?

A.—1. Air choke (Radio frequency.) A duo-lateral or honeycomb coil L400 (that is, 400 turns) has a value approximately of 11 millihenries and would do.

2. Any place, NOT in inductive relation. Advise placing them at right angles to one another.

3. No, put it at right angles to the other two.

Note: See RADIO DIGEST, week of August 12 for a real working model with full explanation.

Transformer for Super-Regenerator

(787) ER
Will you please answer the following questions? Am enclosing stamped self-addressed envelope.

1. In Mr. Hollingworth's article on super-regenerative circuit Figure 1, do the coils L-4 and L-5 have to be inductively coupled or not?

2. In Figure 2 is it necessary to use a UV-712 transformer or can I use an All American 3 to 1?

A.—1. No, put them at right angles to one another. They are not inductively coupled.

2. No, your transformer will do.

How to Make 10-Milhy. Choke Coil

(788) BRJ
Referring to Armstrong's super-regenerative circuit as shown on page 11 of July 22nd issue of RADIO DIGEST in circuit S-17, Figure 20 is a 10-millihenry choke coil. I would like to know the specifications for making a choke coil of this value. I have all the material and could easily make such a coil if I knew the dimensions, size, and amount of wire, etc.

A.—An L400 d. l. coil has 11 millihenries inductance. Use one of these or make similar air core choke coil. See issue number 10, volume 1, June 17, page 13 for design data. Note: 1,000,000 centimeters equal one millihenry.

More Information on Super-Regenerator

(789) EWE
A few questions concerning the simplified Armstrong super-regenerative circuits described in your issue of July 29th:

1. What tubes give best results in these sets?

2. Are all the coils specified honeycomb or duo-lateral?

3. Can the set be used with equally good results with an outdoor antenna? If so, what length for one wire L-type is necessary to equal the loop specified in your article?

4. Is shielding of parts in the set essential?

Please answer in your Questions and Answers department, and oblige.

A.—1. Hard tubes preferably. Western Electric T-2V, Meyer Amplifier tubes, Radiotron UV-201, Cunningham, or Atlantic and Pacific, amplifier tubes. The first two kinds will probably work best.

2. Not necessarily. They are convenient, however. In the article, L-6 is better a honeycomb or duo-lateral coil of 400 turns (in Figure 2), and a one-tenth henry choke coil (iron core) should be in series with and right above C-4 (Figure 2). Instead of the L-50 and L-100 used as loop tuning and tickler coils respectively in both circuits, a variocoupler with a 50-turn primary (connected in place of L, both diagrams) and 100-turn secondary (in place of L-2, both diagrams) may be used.

L-4 and L-5, figure 1, are NOT in inductive relation and should be placed at right angles to one another so as not to be. Then L-3 should also be at right angles to L-4 and L-5 (Figure 1) and L-6 (Figure 2). L-3 is shunted by a condenser (C-3) in both figures. This should be a .005 or .001 mfd. variable condenser preferable as this adjustment depends on the capacity of the tubes themselves. C-3 will vary according to the different tubes used.

3. Yes, but it radiates very much. Static also will be bothersome. Ordinary 100 to 150-foot antenna system will be O. K.

4. See 2 for coils at right angles. Other shielding is unnecessary.

Long Distance Receiver

(467) MC

1. Could you tell me the necessary parts to construct a 2,500-mile receiving set?

2. Can I make a loose coupler and how, what size and how much wire does it take?

3. How many wire aerial is best for receiving?

A.—1. Use 2-stage Radio frequency and 2-stage Audio frequency. See page 13, issue 9 and 10, June 10 and 17.

2. See page 13, issue 11, June 24, for winding data.

3. Single wire aerial.

Super-Regenerators of July 22

(753) HB
Having read in your July 22 issue of RADIO DIGEST of the Armstrong Super Regenerative Circuits, I have a few questions I would like to ask you.

1. In the S-13 circuit could I use a variocoupler rewound instead of the honeycomb coils?

2. How many turns of winding on the primary, secondary and tickler?

3. If I couldn't use a variocoupler what are the values of the coils i. e. how many turns?

4. The two L 1500 coils for the R. F. transformer are how mounted?

5. In the S-16 circuit where would you put the L-35 coil? Against the end,

or how would you mount it?

6. In circuit S-17 couldn't you use a variocoupler rewound instead of using the two coils, using loop aerial?

A.—1. Yes.

2. Using a loop aerial, the secondary is disregarded and instead is used as a tickler. Ordinary short wave variocoupler will suffice. If not, add to get twice as many tickler-secondary turns.

3. L35, primary or No. 2, L25, secondary or No. 3; L35 or L50, tickler or No. 1.

4. Two L1500 coils can be laid one on top of the other. Might put a piece of

cardboard between to cut down too much capacity effect.

5. It should be inductively coupled to the tuner—as against the end—making sure turns run in same direction as tuner's turns.

6. Yes you can. Honeycomb coils are, however, so easy to change around, till you get the right adjustment that they are recommended. Using a loop aerial, the secondary is disregarded and instead is used as a tickler. Ordinary short wave variocoupler will suffice. If not add to get twice as many tickler-secondary turns.

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The knickerbocker girls are with us to stay, also the Radiophone. Herewith shown are two of the latest enjoying a concert while in outing attire and with all outdoors over them



Little Jesse Coleman, Jr., who lives in the Sunny South, is enjoying the Radiophone immensely, but he is too young to understand the hook-ups in the copy of RADIO DIGEST he is supposed to be reading. The set shown was made complete from parts described therein.