Radio Topics

June, 1923

20 Cents

Get a Job Like These

Earn $3500 to $10,000 a Year

in the Big Pay Field of ELECTRICITY

20 Years Old—Makes Almost $500 a Month

Harold Hastings of Somers, Mass., says: "The profit on my electrical business amounts to $475.00 a month. My success is due entirely to your instruction. You make your men just what you say—Electrical Experts. No man will ever make a mistake enrolling for your course."

Dickerson Gets $7500 a Year

"I earned $30 a week when I started with you—$50 a week when half through your course. Now I clean up at the rate of $7500 a year. Thank you a thousand times for what you did for me. Electricity pays big on the farm." Herbert M. Dickerson, Warrentown, Va.

$20.00 a Day for Schreck

"Use my name as a reference and depend on me as a booster. The biggest thing I ever did was answer your advertisement. I am averaging better than $500 a month from my own business now. I used to make $18.00 a week." A. Schreck, Phoenix, Ariz.

Pence Earns $9000 a Year

W. E. Pence, Chehalis, Wash., says: "Your course put me where I am today, Mr. Cooke—making $750 a month doing automobile electrical work—think of it—$9000 a year. Besides that I am my own boss. My wife joins me in thanking you for what you did for us."

$30 to $50 a Day for J. R. Morgan

"When I started on your course I was a carpenter's helper, earning around $5.00 a day. Now I make from $30 to $50 a day and am busy all the time. Use this letter if you want to—I stand behind it." J. R. Morgan, Delaware, Ohio.

Spare Time Work Pays Stewart $100 a Month

"Your course has already obtained a substantial increase in pay for me and made it possible for me to make at least $100 a month in spare time work. You can shout this at the weak fellows who haven't made up their minds to do something yet." Earl Stewart, Corona, Calif.

It's your own fault if you don't earn more. Blame yourself if you stick to your small pay job when I have made it so easy for you to earn $3500 to $10,000 a year as an electrical expert. **Electrical Experts** are badly needed. Thousands of men must be trained at once. One billion dollars a year is being spent for electrical expansion and everything is ready but the men. Will you answer the call of this big pay field? Will you get ready now for the big job I will help you get? The biggest money of your life is waiting for you.

I Will Train You at Home

I will train you just like I trained the six men whose pictures you see here. Just like I have trained thousands of other men—ordinary, everyday sort of fellows—pulling them out of the depths of starvation wages into jobs that pay $12.00 to $30.00 a day. Electricity offers you more opportunities—bigger opportunities—than any other line and with my easily learned, spare time course, I can fit you for one of the biggest jobs in a few short months' time.

Quick and Easy to Learn

Don't let any doubt about your being able to do what these other men have done rob you of your just success. Pence and Morgan and these other fellows didn't have a thing on you when they started. You can easily duplicate their success. Age, lack of experience or lack of education makes no difference. Start just as you are and I will guarantee the result with a **signed money back guarantee bond.** If you are not 100% satisfied with my course it won't cost you a cent.

Free—Electrical Working Outfit and Tools

In addition to giving my students free employment service and free consultation service, I give them also a complete working outfit. This includes tools, measuring instruments, material and a **real** electric motor—the finest beginners' outfit ever gotten together. You do practical work right from the start. After the first few lessons it enables you to make extra money every week doing odd electrical jobs in your spare time. Some students make as high as $25 to $35 a week in spare time work while learning. This outfit is all FREE.

Mail Coupon for FREE BOOK—
The Vital Facts of the Electrical Industry

The coupon below will bring you my big free electrical book—over 100 interesting pictures. The real dope about your opportunities in electricity—positive proof that you, too, can earn $3500 to $10,000 a year. Send for it now. Along with the book I will send you a sample lesson, a credit check allowing you a $45.50 reduction, my guarantee bond and particulars of the most wonderful pay-raising course in the world. Send the coupon now—this very second may be the turning point in your life. Send it while the desire for a better job and more money is upon you, to

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Chicago Engineering Works, 2150 Lawrence Ave., Chicago, Ill.
Without obligating me in any way send me the "Vital Facts," your Free Book, Sample Lessons and particulars of your Free Outfit Offer, Free Employment Service, and proof that you can fit me for a big-pay electrical job.

Name.....

Address.....

"He who lightly promises, is sure to keep but little faith"—Lao Tzu

Wink knowingly at him who would sell you something "just as good" as a

Grebe Receiver

Doctor Mu.

A. H. GREBE & CO., Inc.
Richmond Hill, N. Y.

Western Branch
451 East 3rd Street, Los Angeles, Cal.

Write for "Musings of Dr. Mu."

Radio Topics

An Illustrated Monthly Devoted to Radio

Volume III JUNE, 1923 Number 5

Get this—Mary Pickford, "America's sweetheart" of the movies and the world's highest salaried actress, uses a crystal set. This photo was snapped by a staff photographer while Mary was on "location" for a scene for "Tess of the Storm Country," her latest United Artists' film.

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RADIO TOPICS is on sale the 10th of preceding month. Text and advertising forms close the 22nd of second month preceding issue.

Vol. III June, 1923 No. 5

A Boon to Radio

THE reallocation of wavelengths effective May 15 by the Chamber of Commerce was one of the greatest steps for the benefit of radio yet made.

Interference, the great bugaboo of both radio operators and fans, was reduced to a considerable extent, if not eliminated, in many parts of the country. Secretary Herbert C. Hoover and his aids are to be congratulated upon their tentative plan, and it is now up to the local, or district radio inspectors, to see that the new wavelengths are adhered to. It is now up to the broadcasting stations to a great extent to do so themselves and see that others do so.

Practically every B station now has a national exclusive wavelength between 300 and 445, or 375 and 545, except where there are two in a locality. In some cities they have to be shared as the waves are assigned to localities rather than stations.

However, it makes for better reception, and already we have received favorable reports from delighted fans in the Central West who heretofore complained of a great deal of interference. Hurrah for Hoover!

Music Publishers Back Down

THE radio broadcasters of America won a signal victory when the music publishers agreed to make no charge on their copyrighted numbers. The publishers show a decided "change of front" in their statement that they "wish to co-operate in developing the music possibilities of the radio." Wonder if the hostility of the general public toward the music folks had anything to do with it?

It would, undoubtedly, have soon developed into a serious controversy, serious for both sides, as already several clubs had pledged themselves not to buy any phonograph records, music rolls, or sheet music which bore the A. S. A. P. C. stamp. And because of the large number of radio fans affected, it would soon have resulted in a "buyers' strike" throughout the country.

The radio had the advantage of the argument from the start, as the various broadcasting stations could get in touch at any time with their audiences and make a clear statement of the case from their viewpoint. And it had its effect.

The Tube Supply

THE Hoover conference brought out many interesting sidelights during its investigation. The survey of the country's supply of vacuum tubes, now in progress, was suggested at one of the hearings and is another important step toward clearing the general situation and assuring a long life and a healthy one for radio.

Can't Wipe Out CW

THE spark sets aboard ship create considerable interference at times, but under the present radio law any ship that carries more than fifty persons aboard must be so equipped, and there seems but little chance to eliminate this, and until such time as continuous wave apparatus is opened up for free competition the radio fan will have to bear with it.

Handy U. S. A. Booklets

THE government has issued, through the Bureau of Standards, circulars Nos. 120 and 121 —two interesting and instructive papers, fully illustrated, describing a crystal receiving set and the antenna and ground connection. Circular No. 133 also describes an electron tube detector which can be substituted for the crystal detector. Get them as they're both valuable to the amateur. They may be obtained from the Government Printing Office, Washington, D. C., for five cents each.

Pack up your little old tube set and batteries when you take along your fishing pole and bathing suit to that summer resort this year. You'll get an infinite amount of pleasure out of it if you do. Many traveling men include the receiving set in their equipment and hook it up every evening in their hotel rooms, for there is but few towns that are not within easy distance of some large broadcasting station.

The movies used to be blamed for almost everything under the sun. Now it's the radio. A New Jersey man killed his wife and daughter recently and his defense was they listened to the radio too much.

New Plan Cuts Interference

Department of Commerce Assigns New Wavelengths and Divides Countries Into Five Zones

By J. RAY MURRAY

AT LAST we have an end to "QRM," as interference is known in radio code. On Tuesday, May 15, the new wavelengths, approved by the Department of Commerce, went into effect throughout the country and the one big bugaboo of both radio operators and fans was greatly reduced, if not entirely eliminated.

On that date the assignment of thirty-five exclusive wavelengths in some thirty localities, where Class B stations were situated, took effect and gave every radio fan a more diversified local program, free from interference, while those seeking wider range with their "DX" receivers could reach out and get almost anything.

The new distribution of broadcasting waves is based on the recommendations of the Second National Radio Conference, as stated in Radio Topics last month, and is the first step in the application of the wave band allocations. It means considerable to the amateur, as almost anyone with a good receiver can pick up each and every high-powered radio broadcasting station and most of the local stations without experiencing annoying interference.

Under the new plan the small powered stations are given the option of operating on wavelengths ranging from 222 to 300 meters or remaining on the 360-meters. The band between 222 and 300 has been so divided between the various radio inspection districts there is absolutely no possibility of "QRM" between these stations. All stations working on these waves are included in a new group—Class A. In four instances, New York, Philadelphia, Los Angeles and San Francisco, two or three additional wavelengths will be assigned, but they will not be exclusive nationally.

The waves allocated on the Atlantic coast will be repeated on the Pacific and will aid in supplying additional facilities without causing interference, because of the 3,000 miles between them.

Following are the Class B stations and the zones into which they are divided:

Class B Stations

	Frequency, Kilocycles,	Wave Length, Meters
Zone 1		
Springfield and Wellsley Hills, Mass.	890	337
Schenectady and Troy, N. Y.	790	380
New York City and Newark, N. J.	740	405
	660	455
	610	492
Philadelphia	590	509
Washington, D. C.	690	435
Reserved—303, 319, 369 (357) (288).		
Zone 2		
Pittsburgh, Pa.	920	326
Chicago, Ill.	670	448
Davenport and Des Moines, Ia.	620	484
Detroit and Dearborn, Mich.	580	517
Cleveland and Toledo, O.	770	309
Madison, Wis., and Minneapolis, Minn.	720	417
Reserved—345, (294) (366).		
Zone 3		
Atlanta, Ga.	700	429
Louisville, Ky.	750	400
Memphis, Tenn.	600	500
St. Louis, Mo.	550	546
Reserved—300, 316, (353) 375, 462, 333.		
Zone 4		
Lincoln, Neb.	880	341
Kansas City, Mo.	730	411
Jefferson City, Mo.	680	441
Dallas and Fort Worth, Tex.	630	476
San Antonio, Tex.	780	385
Denver, Col. (reserved)	930	323
Omaha, Neb.	570	527
Reserved—(361) (291) 306.		
Zone 5		
Seattle, Wash.	610	492
Portland, Ore.	660	455
Salt Lake City, Utah	960	312
San Francisco, Calif.	590	509
	710	423
Los Angeles, Calif.	760	395
	640	469
San Diego, Calif.	560	536
Reserved—(297) 330, (349) (370).		

The reserved stations do not exist at the present time.

Class A Stations

There are sixteen Class A stations in the new classification as arranged by the Department of Commerce, and although several of them are of the same wavelength, they are located in widely separated districts and states. Louisiana has three, Kansas, Nebraska, Missouri, Oklahoma and Texas each have two and Illinois, Indiana and Pennsylvania get one apiece.

Following is a list of the Class A stations and the wavelengths under which they operate:

	Meters
KFGM, Abilene Daily Reporter, Abilene, Tex.	233
KFHF, Central Christian Church, Shreveport, La.	266
KFGP, Cheney Radio Co., Cheney, Kans.	229
KFHI C. V. Dixon, Wichita, Kans.	224
KFGV, Heidbreder Radio Sup. Co., Utica, Neb.	224
KFGC, Louisiana State University, Baton Rouge, La.	254
KFFX, McGraw Co., Omaha, Neb.	278
KFGJ, Missouri National Guard, St. Louis, Mo.	266
KFHC, University of Oklahoma, Norman, Okla.	254
KFHD, Utz Elec. Co., St. Joseph, Mo.	226
KFFZ, Al G. Barnes Amusement Co., Dallas, Tex.	226
KFGD, Chickasha Radio & Elec., Chickasha, Okla.	248
WABA, Lake Forest College, Lake Forest, Ill.	266
WABB, Dr. J. B. Lawrence, Harrisburg, Pa.	266
KFFY, Pincus & Murphy, Alexandria, La.	275
WRAF, Radio Club, Inc., LaPorte, Ind.	224

Figuring the Kilocycles

In computing kilocycles, which is used as the basis of assignments of the Class B stations, you divide the speed of radio waves (300,000,000 meters per second) by the wave length, which gives the frequency in cycles. A kilocycle is 1,000 cycles, and the difference between local stations, it will be noted, is 50 kilocycles.

All stations will be required to keep within two kilocycles of their assigned waves.

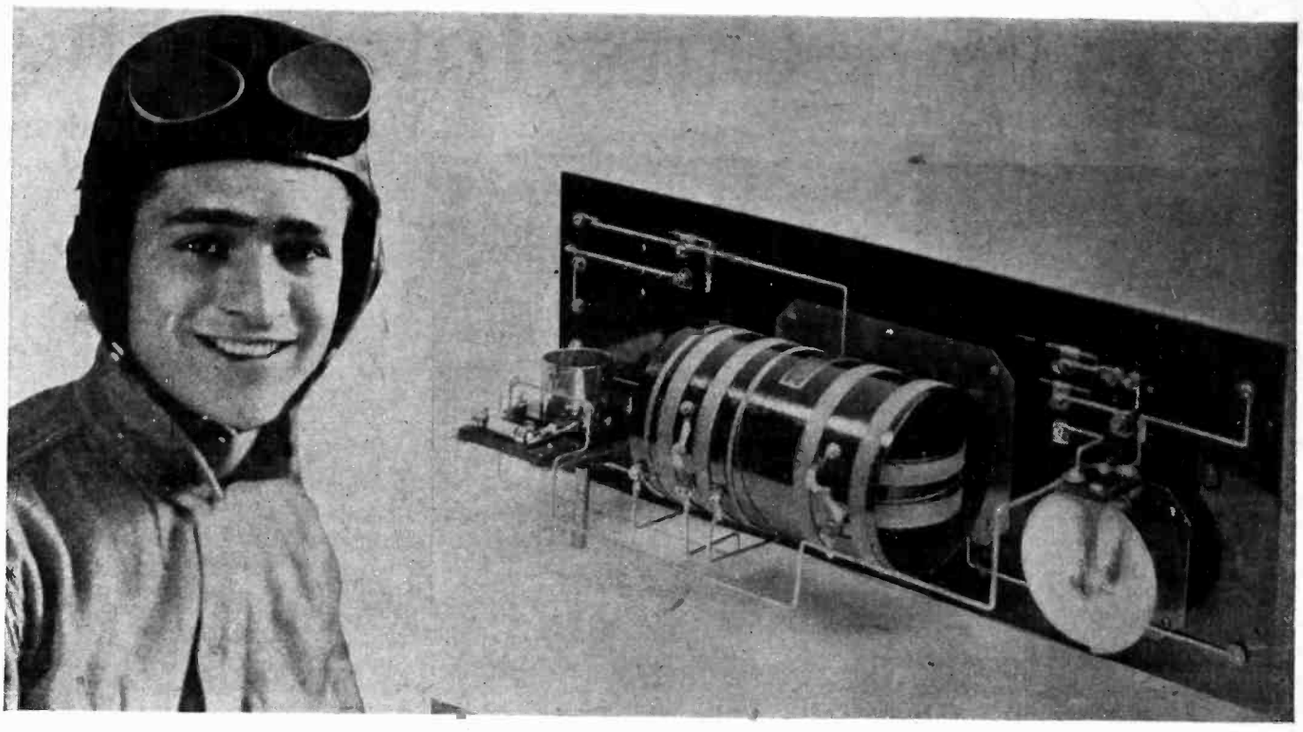
Boost Radio This Summer

DO you know that there are 607 licensed radio broadcasting stations in the United States, and that there is not one large town that is not within listening-in distance of some station?

Do you know that there are two million receiving sets working every night in this country, and between six and seven million people are enjoying music, lectures and bed-time stories from these two million receivers?

It looks as though the radio has come to stay and will not soon pass into the land of "forgotten fads," as so many of the wiseacres predicted.

Therefore, let us encourage the broadcasting of good programs; encourage the youth who is building his first receiving set, and get all the enjoyment out of this new and interesting pastime that there is.



GETS BOTH COASTS ON THIS SET

V. M. Moen of St. Paul, Minn., and his new single dry cell tube receiving set, which enables him to list-in on broadcasting stations from coast to coast. This has hitherto been impossible, it is believed, without the aid of amplifying tubes. It is an entirely new circuit, the feature of Mr. Moen's hook-up being a combined variometer unit, shown in the center of the photo at the right. This unit is composed of two rotars, which take the place of two variometers and a vario-coupler. Two small stationary condensers and a two-plate vernier do away with the usual 23-plate or 43-plate condensers. A two-point switch on the front of the panel enables the operator to use 300 or 400 meter wave length. It is a set that may easily be constructed at home for $30, says Mr. Moen. (International Newsreel photo.)

Looking Into the Tube Supply

THE National Radio Chamber of Commerce is making a sweeping investigation of the vacuum tube supply throughout the country, it has been announced from headquarters of the chamber, 165 Broadway, New York.

The survey is well under way and vitally concerns everyone in the radio industry as well as the entire public. The Chamber of Commerce, it is said, is acting at the request of members and of other elements in the radio industry.

T. O. Gregg, one of the engineers and manager of the chamber, aims to disclose the actual situation nationally as to the tube supply, especially with regard to tubes 200, 300, 201, 301, 201-A, 301-A, DV-6, DV-6A, WD-11 and WD-12.

The Questionnaire Used

The following questions are being asked in prosecuting the survey:

"Have you an adequate supply of these tubes?"

"Have you an adequate supply for the next two months?"

"If the supply of any of these tubes is short, when did such shortage first appear?"

"What number of each would you deem an adequate stock?"

"What number of each does your trade normally demand for the season?"

Part of Wide Plan

The tube supply survey being conducted is part of a comprehensive program which the Radio Chamber of Commerce is carrying out for the purpose of aiding the orderly development of the industry. Co-operation with the department of commerce, and other governmental departments, as well as with universities and institutions, both public and private, is part of the board's plan.

This body is also looking into the broadcasting situation with regard to the copyright music controversy. A conference was held recently at which a definite plan was to be submitted to the music publisher and it was thought an amicable settlement of the difficulties would be arrived at. John E. Jenkens of Chicago represented the Middle West broadcasters at the meeting.

WATCH FOR THIS

In the next issue of RADIO TOPICS we will present the first of a series of valuable radio articles written by Frank R. Carney, division manager of trans-oceanic department of the Radio Corporation of America. Don't miss the July issue—out June 20.

Copyright Music War Short Lived

Music Publishers See Handwriting on the Wall and Withdraw Demands Made of Broadcasters

THE short but bitter struggle between two important industries of the country—the radio broadcasters and American Society of Authors, Composers and Publishers, ended in a decided victory for the radio people.

The publishers of popular music, after making a survey of the situation, adopted the recommendations of a special committee on radio broadcasting. M. E. Thompkins, of the G. Schirmer, Inc., and chairman of the committee, reported:

"We report that music publishers are vitally interested in radio broadcasting as a great future user of music and that our rights in the use of our copyrighted music in public performances must be protected. However, we appreciate that radio broadcasting is still in a chaotic and experimental state and that, while ultimately it will have to be placed on a commercial basis, it is to develop its potentialities; nevertheless, the commercial side of the broadcasting problem has not yet been solved.

"In view of these facts and also because we desire to co-operate in developing the music possibilities of the radio, we believe we should allow the use of our copyrighted musical compositions for broadcasting without charge for the present and without prejudice to our rights."

No Copyright Music Used

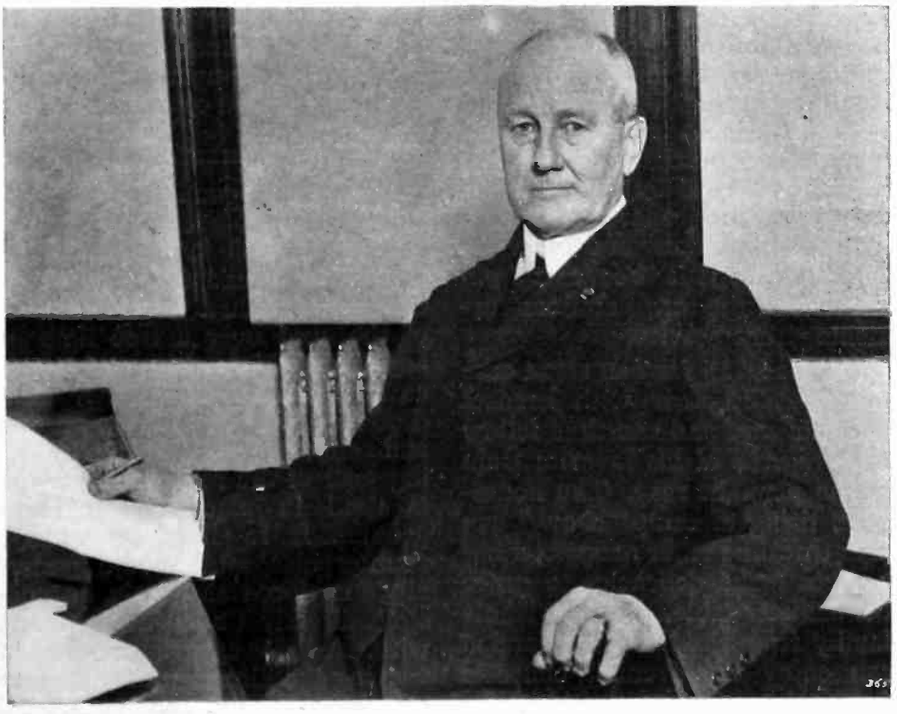
However, the letting down of the bars to the broadcasting stations did not result in an immediate continuance of "jazz" music, for at a meeting of the National Association of Broadcasters held at the Drake Hotel, Chicago, recently, it was decided to avoid legal entanglements with the music publishers, and they agreed to refrain from using all copyrighted music which is controlled by the Society of Publishers.

The National Association of Broadcasters under Paul Klugh, manager of the newly formed organization, has opened offices in New York city, and the office expenses of the association have been underwritten for three years by the Chicago Board of Trade, WDAP, the Chicago Radio Laboratory, the Shepard Stores of Boston, and the American Radio and Research Corp., of Medford Hillside, Mass.

To Make It Pay

Mr. Klugh at the Chicago session outlined a plan to the broadcasters that will place broadcasting upon a paying basis without levying a tax upon the users of radio receivers. The plan incidentally will make available to broadcasters also all varieties of music, including the classical as well as popular numbers, and at the same time will open up a new source of music for motion picture theater, hotels and dance halls. The methods to be pursued in achieving this, however, will not be made public for several weeks.

One of Radio's Big Men



GENERAL J. G. HARBORD

WE have no more interesting figure in the radio world than General Harbord, president of the Radio Corporation of America. Nor in fact in any other commercial field. The general was born in Bloomington, Ill., March 21, 1866, and after graduating from the Kansas Agricultural College in June, 1886, taught school in Butler County, Kansas, and was instructor in his old college until 1889. The general served in the army in the United States and Philippines, and later in the World War, accompanying General Pershing to France as chief of staff in May, 1917. He served in various capacities in Europe from 1917 until 1919, when he was reappointed chief of staff, A. E. F., and returned to America. He retired from active service December 29, 1922, and became president of the Radio Corporation January 1, 1923.

Vacationing With Radio

By DANIEL GRAHAM

THE vacation days are at hand when the city denizens will answer the urge to get back closer to nature, where the pine trees whisper of peace and contentment, where streams babble happily and where soft breezes banish the worries and cares of the work-a-day world.

To the youngsters the vacation period means a release from school books, and discipline of the study rooms. To the office workers it means an opportunity to breathe the free air of the country and to the radio fans it means new adventures exploring the ether, using portable outfits, rigged on auto, canoe, boat, or at the camp.

Thousands of people who have become fans during the winter months are laying plans to keep up with the new form of entertainment by taking radio apparatus with them on their vacations. Business men who keep their fingers on the pulse of commerce can do so by radio, listening to the stock reports, the board of trade quotations and other information as it is broadcast from any one of the many stations furnishing that service.

The baseball fan can sit at ease in his cabin door with headset over his ears and can thus follow the progress of his favorite team in the pennant race. The housewife, tiring of camp "chow," can pick from the ether recipes telling how to make delicacies to grace the summer table. And the whole family from the baby to grandpa can enjoy the evening concerts from the stations within the range of the set. The pall of boredom, which so often settles down upon the vacation camp when the sun retires beyond the horizon, is dispelled by the fascinating entertainment of the radio apparatus.

This summer has everything in its favor for making it a radio summer. Government regulations, allocating wavelengths in a vastly greater variety than heretofore, have driven "QRM" into outer darkness, thus making reception surer and the ability to hold stations infinitely easier.

Some specific suggestions are given herewith, to enable the radio fan to take his outfit along with him or to make an outfit suitable for transporting.

Portable Set

The two-tube and crystal detector reflex circuit set, which combines the power of the tube set and the clarity of sound of a crystal set, is recommended for the vacationing radio fan. It is suggested that the new UV-199 tubes that require very small "A" battery current be used, thus doing away with storage battery difficulties and the necessity of replenishing "A" batteries. The set can be easily transported and may be used either on a loop or with an outside antenna. Such a set is an excellent companion for autoists, boaters and campers.

Portable Outside Antenna

To make a good portable outside antenna get 200 feet of stranded flexible lamp cord, which may be obtained from any electrical goods store. Throw 100 feet of the cord over a tree limb or any handy high place and use it as an antenna. The other hundred feet is thrown on the ground and connected to the ground binding post of the receiving set, and is used in place of an earth ground. It, in effect, serves as a counterpoise and should generally be placed as nearly as possible directly under the antenna wire. A little experimentation in varying the direction of the counterpoise will enable the fan to discover the position best suited for obtaining the most efficient service from the set. Since it is not always possible to make a good ground connection the counterpoise ground wire is an excellent substitute.

Use of Radio on Boats

Antennae used on most motor boats should be made of stranded flexible wire, since the masts may have to be lowered from time to time and the stranded wire will stand such severe treatment as would be received in such disturbances considerably better than solid wire. The ground may be made by attaching a wire to the metal parts of the boat, such as the motor, or if the boat has a metallic deck the ground connection can be made to the deck. If the set is installed while the boat is in dry dock a heavy copper wire should be fastened to the hull and run around it several times well under the water line. Most any standard made set can be satisfactorily used on water craft from a crystal to a three step radio-frequency and two step audio-frequency amplifier.

The UV-199 vacuum tube will be regarded as a boon to radio devotees when they make the acquaintance of the new tube, which may be used with two or three flashlight dry cells to furnish the "A" battery current. The ordinary type of "B" battery is used. The dry cells may be fastened into position in the cabinet of the set together with the "B" batteries, thus making a compact and efficient outfit.

The experience of last summer proved conclusively that static is a much over-press agented bugaboo and that the interference from this source is not sufficient to rob the radio fan of entertainment except in a few instances. To overcome the interference from static a loop antenna may be used, or if the set is located near a lake the antenna wire (which must be insulated) may be submerged. Radio frequency amplification is another foe of static and short antennae have been found to give a satisfactory signal-static ratio, so that the foreign noises are eliminated from the set.

Since static noises and signals are amplified alike, it is suggested that the radio enthusiasts cut down audio amplification and to use headphones instead of loud speakers whenever practicable.

Static is, of course, a problem to be solved, but radio is bringing out the latent talents of many a

(Continued on page 33)

Two New Stations Open

Chicago and New York Have Super-Radio Stations—Edgewater Beach and Broadway Central

TWO important broadcasting stations were opened during the month of May, one in Chicago to be known as the Edgewater Beach station, "WJAZ," and the other in New York, Broadway Central, with the Newark call letters "WJY."

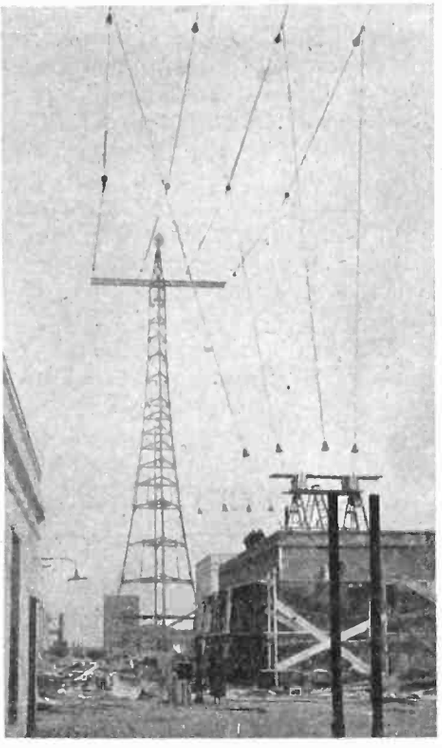
The Chicago station will be one of the most powerful in the country, when it is fully equipped and ready for business, with a range of from two to three thousand miles. At present two small buildings house the giant transmitter, while an aerial 130 feet high is used for sending. The wire used is of gold plated copper, insuring it against corrosion and a cage lead-in is used to secure maximum efficiency.

When the new Edgewater Beach Hotel is completed the station will be located on top of the eighteen story structure. The studio which is one of the most beautiful in the country is located on the first floor of the Edgewater Beach Hotel and is in charge of L. M. E. Clusing. It is known as the Crystal Studio as it is made entirely of plate glass, beautifully draped, allowing the public to see how the artists work before the microphone, which is hidden under the shade of a beautiful floor lamp.

Novel Tube Arrangement

THE transmitter stands in the middle of the floor of a little shack a half block away. The tubes are arranged in a complete circle surrounding the set so that all of the wires leading to the tubes are of the same length and the radio frequency current can be delivered to the oscillation transformer and thence to the antenna with very little loss of energy. A seperate compartment underneath the battery of tubes is provided for the master oscillator and the modulator tubes. This is screened off with copper wire. The filaments of the tubes are supplied with low voltage alternating current from a special step down transformer. The plates of the tubes are supplied with two to four thousand volts, generated by a large motor, the work of David P. Moreton of Armour Institute of Technology. James Fitsmaurice, chief electrician of the hotel, designed the intricate wiring of the controls. The entire system of broadcasting was designed by L. M. E. Clusing.

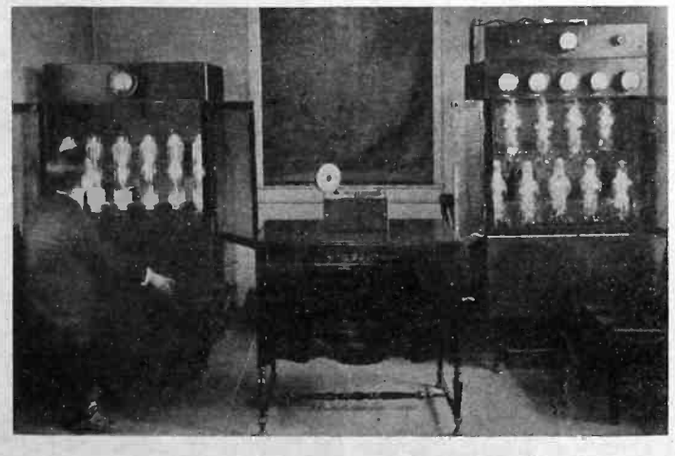
The controls of the elaborate apparatus are located in a separate room near the studio and consists of a series of buttons. A receiver also enables the operator to know just how the music is coming in. An amplifier which amplifies the microphone output 5,000 times before it reaches the transmitter, where it is again magnified about a million-fold, is also located in the room next to the studio.



The antenna of the new broadcasting station of Radio Corporation of America, atop Aeolian Hall, Forty-second street, New York.

Opened on May 1

The work of broadcasting regular concerts started May 1 from "WJAZ." The present site of



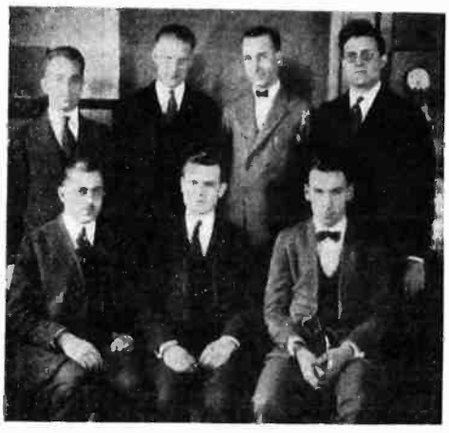
THE OLD "WJZ" STATION, NEWARK
Which was closed May 15, and its call letters transferred to the new Aeolian Hall station of the Radio Corporation of America, which is located on Forty-second street, New York. (Photo by International Newsreel.)

BROADWAY CENTRAL
New station "WJZ," which will transmit on 455 meters. This is the first interior view of the new Radio Corporation of America station, Aeolian Hall, New York City, which will broadcast on two wavelengths simultaneously.

the Edgewater Beach station is the same as the old relay station 9ZN operated for years by R. H. G. Mathews, who worked every station in the union, every province in Canada and was heard in Hawaii regularly.

Broadway Central, the new radio station on Forty-second street, New York, operated by the Radio Corporation of America, is known as "WJZ." it is located on the Aeolian Hall, in the heart of the musical and theatrical district, and plans to give the public most elaborate programs with a degree of faithfulness in reproduction that will mark a new era in radio broadcasting.

The antenna towers stand 400 feet above the street and support two sets of antennae, as this super station will transmit two broadcast programs simultaneously on different wavelengths.



MEET "WJZ" BOYS

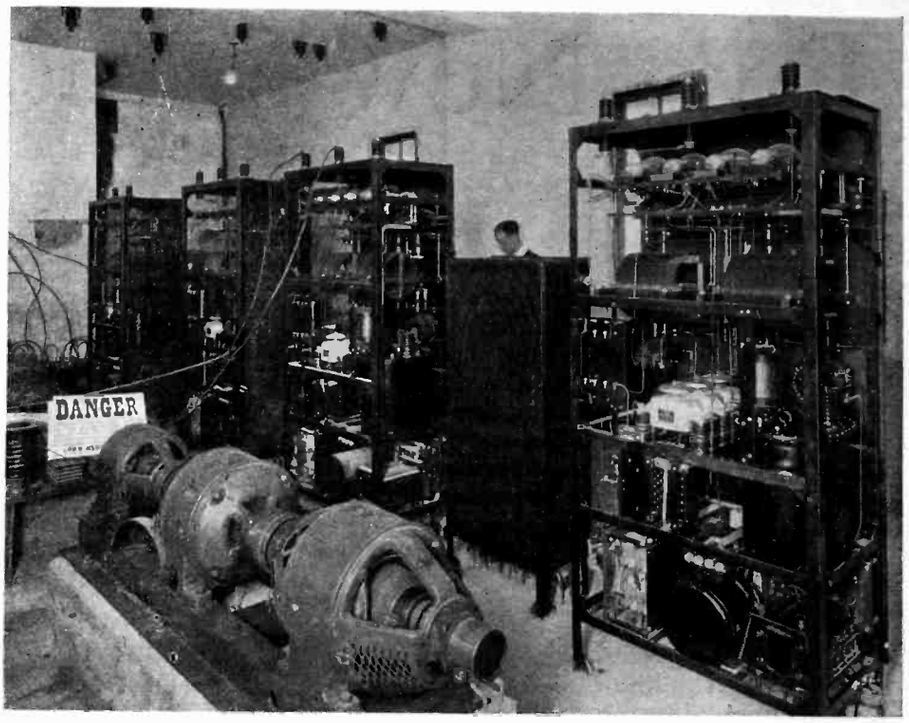
You may know their voices. Front row (left to right)—Harry E. Hiller, senior operator; George E. Bliziotis, chief operator, and R. F. Guy. Back row—J. L. Watt, stock reports; G. E. Oliver, operator; P. W. Harrison, in charge of Newark and Waldorf studios, and M. J. Cross. Mr. Cross is also soloist. (Photo by International Newsreel.)

One transmitter will broadcast classical or serious entertainment, the other, popular airs, dance music and lectures.

"WJZ" Call Transferred

The closing of station "WJZ" at Newark, N. J., which was operated jointly by Radio Corporation of America and the Westinghouse Electric & Mfg. Company, occurred with the opening of Broadway Central, New York, on May 15.

Broadway Central is a model station both in electrical design and operating facilities, incorporating the most advanced ideas of



SUPER RADIO STATION

Some idea of the magnitude of the new station "WJZ," opened May 15 by the Radio Corporation of America, atop the Aeolian Hall on Forty-second street, New York, can be gained by the photo of the generators and transmitters.

RCA engineers. One of the outstanding improvements is the "checking up" of the broadcast programs for clearness in transmission. This is accomplished by a "moving picture" device connected with the antenna which shows at a glance the perfection of music or voice as the radio waves leave the antenna. Any distortion occurring during the rendition may be instantly corrected by the operator who watches the electrical vibrations as they radiate into space.

Milwaukee Radio Amateurs Meet

BEFORE an audience of over five hundred people, many of them being broadcast listeners, the Milwaukee Radio Amateurs' Club, Inc., recently exhibited the two-reel radio film, "The Wizardry of Wireless." Following the exhibition, A. R. R. L. City Manager I. H. Strassman, 9AHO, and E. T. Howell, Sc. M., technical committee chairman, addressed the gathering on the subject of the relations between the amateurs and the radiophone people. The progress that was being made in ridding the air of unlicensed stations was spoken of, and the efforts of the traffic committee to bring about favorable feelings between the two classes was called to the assembly's attention as well as a description given of that committee's work.

"Radio Frequency Amplification Systems" was the title of a paper presented by E. D. Nunn, ex-9FE, a Milwaukee radio engineer, in which stress was laid on the use of radio frequency amplification with two variometer receptors. This lecture is the first of a series being arranged by the new program committee chairman, H. F. Wareing, pre-war 9AEX, and president of the society. H. P. S. Day, Sc. B., a telephone engineer, presented the second, its title being "Vacuum Tube Characteristics," and in non-technical language the fundamentals as well as some of the applications of the thermionic valve were treated in an interesting fashion.

Upon his return from California, Charles S. Polacheck, a former secretary-treasurer, addressed the members, under the title of "Some Experiences of a Wayfaring 'Ham' in the West," and told of his meeting with one of the speakers at the club last year. L. E. Grogan, formerly radio engineer to the government of China, also he related his experiences as being a guest of the San Francisco Radio Club, Inc., at several of their lively meetings.

Radio Saves American Cablers Millions Every Year

An Interesting Interview With Frank R. Carney, the Man Who Developed Trans-Oceanic Radio Communication Throughout Central West

By N. C. Bos

IT has been said, "One kind of business does not differ much from another—the knowledge acquired in the first will probably be seventy per cent of all that one needs in the second."

The foregoing statement is unquestionably true in the case of Frank R. Carney, known yesterday from coast to coast in telegraphic circles as a practical telegraph and cable man, and today, as the pioneer developer of trans-oceanic radio communication throughout the Central West.

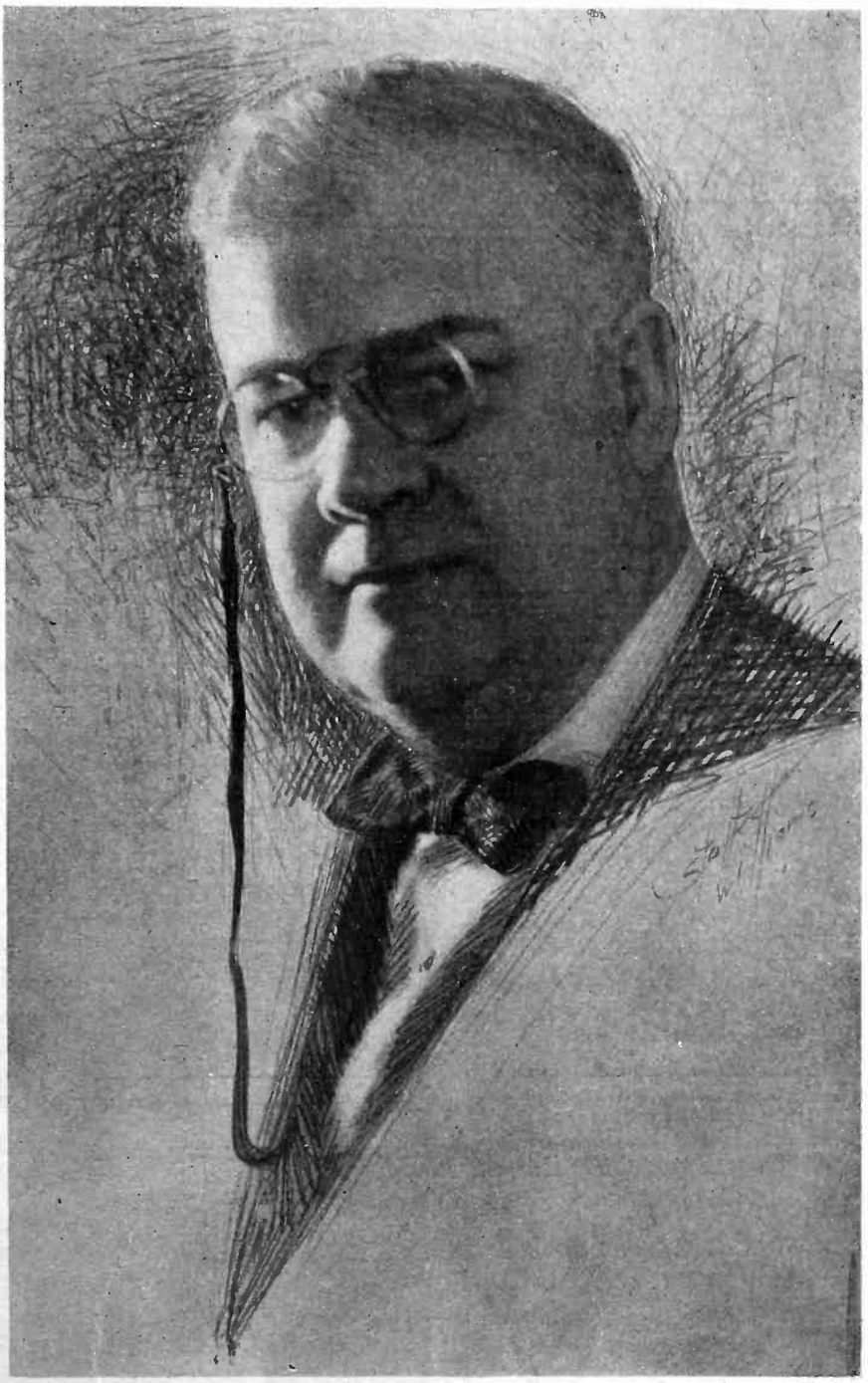
During the interview Mr. Carney remarked: "At first I thought trans-oceanic radio communication too far ahead of the times to be generally accepted, but our success during the past seven months of practical operation throughout the United States has proved conclusively that the American people are alert and willing to accept and promote any new legitimate, progressive enterprise.

Welcomed to Field

"That the business men throughout the country welcomed our coming into the field, as a third factor in foreign communication, message and press service, is evidenced by the fact, that at the close of the first seven months of our existence, the Radio Corporation of America handled 30 per cent of all messages filed in the United States for Europe and South Africa across the North Atlantic and 57 per cent (over half) of all messages across the Pacific to Honolulu and Japan.

"My associates are all practical telegraph men, cognizant of the requirements of commercial and social interests. They have labored incessantly to bring the Radio Corporation of America's service up to the present standard of efficiency. The great scientific forces of the General Electric Company, the Westinghouse Electric and Manufacturing Company, as well as our own engineers (the cream of their profession) are constantly increasing the interest of world-wide wireless."

"It is a peculiar co-incidence," Mr. Carney continued, "that you should



FRANK R. CARNEY

Division Manager of Trans-Oceanic Dept. of Radio Corp. of America

call at this time, for today, April 20, will be recorded as 'Radio Red Letter Day.' Today all criticism and adverse propaganda against us has ceased; the cable and wire companies have recognized us as a factor, a keen competitor. During the past seven months we have been the means of securing for the American business men a more efficient foreign service at a lower rate. Today the cable companies have cut their rates in order to meet our competition.

Enormous Saving Effected

"My opinion is that the American public will continue to co-operate with us, for this reduction in rates means that we have saved them approximately five million dollars per month in cable tolls alone. With the public's continued co-operation we will hold the rates at their present low level. When you pause to consider this enormous saving and what the Radio Corporation of America has accomplished in the seven short months, you must admit that it is marvelous."

"Has your corporation stations in all European cities?" Mr. Carney was asked.

"Oh, my no! That is a point which is not generally understood by the public. First, you must clearly understand that the best any American company can do is to transmit your message across the ocean. All European countries own and operate their own land and line systems. When your message is sent to the other side it is turned over to the wire route, which transmits to the city of destination; unless the destination is at one of the European connecting centers, in which case our connections make the delivery.

"We work with four distributing points, namely, London, Paris, Berlin, and far off Stavanger, Norway. No relays—communications are sent direct from New York with as much ease and accuracy as if the foreign receiving stations were located across the street. As we are the only company working direct with so many centers in the heart of Europe, we naturally get messages into Europe more quickly than is possible via any other route. Our traffic for Germany goes direct to Berlin. However, in many cases, we turn over traffic to the same governmental controlled landlines as do all American companies."

Quicker Than the Cable

"Do you use the Morse system?"

"No, sir. When the Postal Telegraph Company (which company is our land line feeder for Europe and South Africa) delivers your radiogram to our general operating department at 64 Broad street, New York, if it is destined, say, to Norway, the radiogram is placed in front of one of the Norwegian division operators. This man writes your message on a keyboard similar to that of an ordinary typewriter. When he has finished this simple performance, your message is in far-off Stavanger, Norway, recorded accurately in less time than it takes to tell about it.

"You wish to know how this is possible? A highly technical description would fill your magazine. Suffice it to say that it is being done. Millions of messages of all classifications; some carrying the weight of thousands of dollars in negotiations, offers, acceptances, some of love and cheer, others containing the sad news of the death of a loved one; all languages; all codes; sent across the three thousand miles of rolling sea at the rate of one hundred and twenty words per minute, clear as a bell, and with force enough to work automatic telegraph machines.

"Greater things are to come and all without wires."

Wisconsin Baby Is "WGY"

"WGY," the Schenectady broadcasting station of the General Electric Company, has been honored by a Wisconsin family. A brand new baby, according to the father, has been named after the Schenectady station. He is Wallace Gordon Yadon, and he lives in Delavan, Wis. M. E. Yadon, advertising manager for the Bradley Knitting Company, writes as follows:

"We have a baby called the 'radio boy' because we have named this child after your station, which indicates that not only the child is a favorite, but that your station is our favorite. We only hope that you would broadcast twenty-four hours daily.

"The boy's name is Wallace Gordon Yadon. The receiving set has been placed at the hospital for the past five weeks and even the little fellow is getting so he can recognize the announcer. We are proud of our son and trust that you will welcome what we think is your first namesake."

Health Hints via Radio

AN interesting contest was recently conducted by Charles DeForest, national executive of the Modern Health Crusade, a movement to develop better health habits among school children, by means of the radio.

A talk on health was broadcasted from station WDAP, Chicago Board of Trade station, May 17, at 9:30 p. m. Central Standard time, and under the conditions of the contest it was necessary for radio fans to take down the speech and submit at least 50 per cent of the talk, the judges passing on the amount of speech sent in and the accuracy.

Several states, through the tuberculosis societies, gave prizes ranging from $25 to $5 for the best papers submitted.

LONDON FANS

America is not the only place in the world where the radio is popular. Here is a London family listening to the Hippodrome pantomime. The whole darn family—9—count 'em—9—is here. (International Newsreel photo.)

Elementary Electrical Principles

This is the Sixth and Final Paper in RADIO TOPICS' Prize Contest. It Treats on Electrical Measuring Instruments

By HARVEY MITCHELL ANTHONY

WHEN the pilot of an ocean-going vessel is preparing for his journey overseas, one of his chief duties before leaving port is to inspect his compass to see that it will guide him correctly to his destination. It is true indeed that his little compass is but a small-sized item in the enormous equipment which comprises his vessel. But so far as usefulness is concerned there is nothing in his whole layout which carries a deeper sense of responsibility than this little device so small and yet of such consequence. No doubt you have often realized the importance of the compass in little journeys through the woods. What more faithful guide could one have? The writer is never without this little guide and it is very frequently used. The idea of the compass is brought to your attention mainly from the viewpoint of responsibility.

Electricity is something about which we know practically nothing, even though we may think we do. We must remember that during all the countless ages in which man has inhabited this earth it has been but the last fifty years or so that we have reached the point where an elementary knowledge of electricity has come to us. You may recall the experiments of Franklin with his kite; you have studied of the forefathers of the electrical science; but you must appreciate the age in which you yourself are living, for it is this age which has brought to us the fairly well developed electrical knowledge which we now possess.

Electricity has always been present, even though we go back hundreds of millions of years, that is, this "something" which we call electricity. Nature has been extremely kind to us to saturate our whole universe with this medium. Akin to this we may go a step further and mention the "ether" which has also been present since the creation of the universe, the beginning of which even the most vivid imagination cannot conceive.

* * *

Evidently the Great Creator in the formation of it all gave to us those things which in His best judgment would make for a harmonious abode of life and wellbeing. It has remained for the inhabitants of this little speck of dust upon which we live to turn over the stones and unravel the countless mysteries of matter. While we have apparently been doing this for many generations, it is truly said that the last few years have seen greater progress than has all time since the advent of man.

Along with this past few years' development has come the automobile, airship, submarine, giant steamships, radio telegraphy, wireless telephones, moving pictures, phonographs, and even photographs, which are transmitted over space not only by wire but by wireless. We stand at times bewildered at the progress being made and we wonder if there is anything else to achieve. Some persons may believe that we have just about reached the climax, but a learned man would only smile and say, "My goodness, we have only started." Scientific development is indeed a curious thing, mysterious, bewildering and endless. It is a long road to journey, and as the scientist tramps along and counts the milestones of progress he adds one little thought, one little discovery after another, and his followers then add a few more pages to the book of knowledge and his masterpiece remains uncompleted. The end of this scientific development lies only in infinity.

* * *

Electrical measuring instruments discussed! No. The above is merely a little food for thought, when you pick up that device which you call a voltmeter. You look upon it as a means of immediate service to you. You should ponder a moment over the history of it.

Just study it and try to visualize the development of each small item which enters into its construction. Had it not been for those slaves who toiled day and night from the pure love standpoint of electrical science we in this day would in all probability be burning the candle and coal oil lamp. We would know nothing of our data for electric generators and illumination. These men loved their work. They played at it as they worked, for even the most severe study is only play after all for the true student. To delve into the unknown and invisible world, that world which does not manifest itself to our five senses, was their heart's desire, not only for the mere sake of emulating themselves in the pages of history but to render service and to give to the world greater conveniences and comforts.

* * *

The instruments which we use in the calculations of electricity are as essential to us as the compass is to the mariner. Why? Because electricity is invisible, it is intangible, its nature is unknown. Real electricity is absolutely beyond our five senses. We are only familiar with its effects. While we may understand these effects, does this mean that we understand electricity? It simply means that we have been able to harness this "something" and make it useful.

We can see water flow from point to point in a pipe. We understand its measurements largely because it is visible, right before our very eyes. We understand its method of flow and we can derive accurate formulas. This is so different from this airy nothing which glides along a copper wire over thousands of miles and furnishes heat, light and power to hundreds of cities, in rain or shine, in winter or summer, in fact, under all conditions, even when the wire itself is covered with tons of ice and snow. It is the outstanding mystery of the world—what is electricity?

Since electricity is invisible and since we must deal with it in such a state we therefore must have some kinds of indicating devices to help us determine those factors which are so obvious in the case of water.

Electricity may be judged from two standpoints. One form of electricity is called "static." The other is called "dynamic." It is not the aim to convey the idea that there are two kinds of electricity, but simply two forms of the same thing. Static is electricity at rest. It may be developed by rubbing a piece of sealing wax with catfur or a silk handkerchief. It has no definite direction of flow and is not useful for power purposes.

On the other hand, dynamic electricity is current electricity. This

EDITOR'S NOTE:—This article differs somewhat from preceding lessons, in that it is not so technical, and is dedicated to the electrical measuring instruments—the voltmeter and ammeter. Often the radio experimenter fails to recognize the value of these instruments and Mr. Anthony herein calls attention to their importance.

In answering these lessons please observe the following rules to facilitate marking the hundreds of replies received. (1) See that all answers are written on uniform size paper; (2) That you ring your answers, preferably with a red pencil; (3) That you write clearly, typewrite answers if possible, as neatness will count in grading all replies.

Send all answers to questions in this issue to RADIO TOPICS Editorial Dept., 1112 North Boulevard, Oak Park, Ill. Announcement of winning paper will be made in an early issue.

form apparently moves along conductors, assuming a definite path and direction. In present day electrical engineering we are not interested in the static form. It is the dynamic which gives us the power to light our lights and operate our machinery.

In the operation of this machinery we would be positively lost were it not for the means we have for measuring current strength and voltage. We would know nothing about power and its measurements. We would be floundering around in the dark guessing at all values and working on the "hit and miss" principle. The student of radio and electrical engineering should appreciate this fact and learn to comprehend the significance of electrical measurements. This is probably the reason why the electrical man who is good at wiring houses can never become professional in the true engineering side of his study. He should be good in the mathematics of the electric current and know the use of his formulas, the values of which in most cases, are taken from his instruments. The very base of electrical engineering is precision measurement.

We are all familiar with the word "voltmeter." This word means nothing more than a meter for measuring volts, or units of pressure. Imagine yourself connecting up an electric generator and after you have it in working order you are ready to close the switch so as to light a group of incandescent lamps. What should be the first move you should make before you close that switch? Would you just throw in the switch regardless of what might happen?

Only a very thoughtless person would do such a thing. The experienced electrician would first connect to the generator brushes a voltmeter and ascertain what the machine's pressure was. If you did not do this, as far as you know, this machine might be giving a thousand volts and this pressure would burn out all the lamps connected to the line wires.

The operating engineer at the electric light palnt understands these things and he is responsible for thousands and thousands of lights all over the city. Just a small bit of this carelessness would result in many thousands of dollars damage. Here the voltmeter is the compass which points out the pressure value. With its aid the engineer is not like the seaman blindfolded to conditions because of the lack of a guide, but he knows to a high degree of accuracy just where he stands.

* * *

The operating principle of the voltmeter is a very interesting one. Wherever dynamic or current electricity is flowing in a wire there is always present around that wire a magnetic field. The extent of this field depends upon the amount of current flowing. If a small fraction of an ampere is being conducted the electromagnetic field will be small.

As the current value becomes larger the magnetic field becomes larger and stronger around the wire. Most all electric measuring instruments work upon the principle of this phenomenon, namely, electromagnetism. If you will study the following diagram which represents the simple internal wiring system you will note several interesting points.

If you have a voltmeter or ammeter, you may have been told many times the proper method to use when connecting it in circuit. You have been cautioned to connect the voltmeter across the main line wires, and the ammeter in series with the line. A little thought will convince you why these methods must be used.

Since the voltmeter is a device primarily designed for measuring pressure it must be connected across the main lines for the reason which follows. The volt is the unit of pressure, and when we speak of voltage we mean the amount of push available. There is a positive brush at the generator, or, if it is a battery, it is called the positive pole. At this positive brush or pole there is a higher degree of electrification than at the negative brush of the generator or negative battery pole.

* * *

Let us assume the degree of pressure electrification at the positive brush to be 110 volts. There is a force, therefore, of 110 volts pressing out from the positive brush, which is available for use in pushing the current around the circuit. Be sure to understand this. The degree of electrification, we'll say, is 110 units higher at the positive brush than at the negative.

We may go further and call this the potential drop or potential difference between these two brushes. Now when the current is allowed to flow over the circuit the 110 volts of pressure potential pushes this current down grade, so to speak, overcoming what resistance it can, until the pressure has used up its force. The pressure thus corresponds to water pressure, forcing electricity from a higher level to a lower one. You will remember that the speed at which the current travels is dependent upon the resistance it encounters, and if the resistance is great a correspondingly higher pressure is necessary to carry on the work.

Now it is essential that the construction of the voltmeter take this fact into consideration. It must be adapted to this type of measurement. Since the voltmeter is placed directly across the line of the brushes of the generator, it must be able to withstand the difference in potential being generated. Referring to the voltmeter diagram you will note the movable coil winding. This winding is of very high resistance. It must be so in order that the entire pressure may be applied without doing injury to the wiring system in the instrument. As the pressure forces the current around through this little fine wire winding a magnetic field is created around the coil. This magnetic field depends upon the amount of current flowing around through the coil, and this amount of current depends in turn upon the amount of pressure acting.

The movable coil is located between two permanent magnetic poles, one north and one south. The permanent magnetic field is always constant between these two poles, the lines of force passing across the chamber in which the movable coil is located. As the current flows through the movable coil the magnetic field set up around it reacts upon the permanent magnetic field of the magnet poles. When this reaction takes place the movable coil is twisted slightly from its position, the amount of twist depending upon the amount of current flowing in the movable coil winding. Remember that this current depends upon the pressure and this pressure is what we are getting at.

* * *

The electromagnetism around any current-carrying conductor always takes a definite form and since the reaction between the electromagnetism around the coil and the permanent magnetism from north pole to south pole are working against each other, if the meter is wrongly connected, that is, the positive wire on the negative and the negative wire to the positive button of the instrument, the meter needle will swing backward. If this occurs the two line wires should be reversed, then the current will flow properly around the coil and a reading will be given.

It was stated above that the voltmeter coil was of very high resistance because it had to take care of all the potential difference across the brushes. This resistance often is of many thousands of ohms. Just consider for a moment a 110 volt instrument. With good designing, let us say that the fine wire of the movable coil must be limited to 0.005 ampere, a very small amperage indeed. If we subject this wire to more than this current value, it will be burned up. Now you can easily calculate what resistance is necessary to hold back the current to this amount.

By Ohm's Law we find this resistance to be 22,000 ohms. If we should by accident connect this meter to a 220 volt line it is obvious what will happen. The resistance will remain the same, but since the pressure is doubled the current will be doubled, the result being that instead of the 0.005 ampere a 0.01 will circulate through the coil. This may burn out the winding if left running sufficiently long. This same principle holds true with low reading voltmeters of 5 or 10 volt design.

* * *

Sometimes there is an additional resistance winding which is in series with the movable coil winding. This additional resistance is wound around a spool and is inserted inside of the voltmeter case. With this arrangement two or three different voltages may be measured by taps being taken from the additional resistance at the proper places. This is a common method of making voltmeters which will read different voltages such as 10, 150 and 300 volts. The scale is called a triple scale, and the leads from the taps are brought up to the proper buttons on the outside of the instrument case. An instrument of this type is quite handy since it combines in

(Continued on Page 39)

Detector-Amplifier Tube Popular

UV-201, NEWLY DEVELOPED FIVE-VOLT VACUUM, HAS HIGH DEGREE OF EFFICIENCY

THE Radiotron type of tube, recently put out by the Radio Corporation of America, is proving its worth as a detector, or a radio or audio-frequency amplifier. It has a very high degree of efficiency due to the gases being thoroughly exhausted during its construction, and it requires less adjustment of the controlling elements than gas filled tubes.

Because of its specially designed filament and other features it is proving exceedingly popular with RADIO TOPICS readers. With a potential of five volts across the terminals of the filament, the current flow is 0.25 ampere or about one fourth the current necessary for tubes of the old type. This current may be supplied by four dry cells connected in series, or a six-volt storage battery.

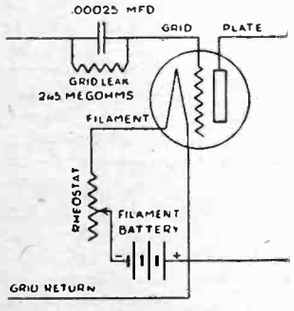


Fig. 1. Proper hook-up for detector.

High filament emission in a vacuum tube when accompanied by exhaustion which is carried to the lowest pressures obtainable in production determine, in a large measure, the success of the tube as an amplifier of radio frequency currents as well as low frequency energy. The practical significance of these features is shown below:

(1) Electron emission from the filament, averaging about 5 times that of the ordinary amplifying tube, make it an exceptional tube for power amplification such as that required for loud speaker operation.

(2) The filament of one tube consumes one-quarter ampere and it may be operated from 4 dry cell in series, thus eliminating the use of storage batteries. If more than one tube is used, it is recommended that a storage battery of from 20 to 40 ampere-hours be employed. If Radiotrons, UV-201-A, are used instead of UV-201, the battery will last four times as long.

(3) Having exceedingly high vacuum, the tube is exceptionally quiet in operation, there being no inherent tube noises such as hissing and cracking. High vacuum also assures uniform characteristics.

(4) It is paraticularly adapted to radio frequency amplification.

(5) In its operation as a detector, radio-frequency or audio-frequency amplifier, the results obtained are exceptionally independent of filament adjustment, it is said. Critical adjustments of grid leak or grid condenser are not required.

(6) It can be used in any equipment which at present uses the ordinary tube and give improved results. No adaptor is necessary when the standard four prong socket is used.

(7) If the filament is supplied by a 6.0 volt battery, the resistance of the filament rheostat should be at least 4 ohms, preferably 6 ohms.

(8) Filaments should always be operated at the lowest current consistent with satisfactory results.

(9) The tubes should be mounted on cushioned bases, when used for detection and audio-frequency amplification.

Uses as a Detector

When the tube is used as a detector it is usually preferable to connect the grid return to the positive side of the filament exactly as shown in Fig. 1. A grid condenser of .00025 mfd. and a grid leak of 2 to 5 megohms are recommended. Critical adjustments of grid leak and condenser are not required. The best plate voltage for detection is approximately 40 volts.

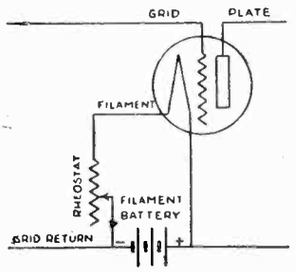


Fig. 2 shows hook-up for amplifier.

When the UV-201-A Radiotron is used as an amplifier it is important that the filament rheostat should be placed in the negative lead from the "A" battery and that the return lead from the grid circuit should be connected to the negative side of the "A" battery and not to the negative side of the filament. These connections should be made as shown in Fig. 2.

For the best results the negative grid bias voltage should be increased with increase in plate voltage. In general, the following grid bias voltages are suitable:

40 Volts	Plate	0.5—1.0
60 Volts	Plate	1.0—3.0
80 Volts	Plate	3.0—4.5
100 Volts	Plate	4.5—6.0

Negative biasing cells should always be placed in that portion of the grid circuit where it returns to the filament circuit rather than next to the grid terminal of the tube.

Hiram Jones Soliloquizes

By C. M. BUCHANAN

WHEN you're spirit's kinda drooping and things don't seem to go at all, when you're feeling blue and crabby and morose, when the clouds of darkness hover and all sweetness turns to gall, and pleasure's g o n e to—heaven only knows; don't go and fill yourself with poison whiskey, or try to drown your troubles out with gin; why take a method that's so awful risky, and only leads to sorrow and chagrin? Much better go and listen on your radio, forget your grievance for two little hours; hear music from plain jazz to oratorio, and soon your face will shine like springtime flowers.

HIRAM JONES.

The UV-199 Tube Operates on Flashlight Battery

A RADIO tube, which consumes 70 per cent less current than any of the small or so-called peanut variety now being sold and the first to operate with the filament current supplied from the ordinary flashlight battery, has been perfected by the General Electric Company. It is known as the UV-199.

This new type radiotron has the X-L tungsten filament, which according to radio engineers, is considered as great an advance over the old tungsten filament for vacuum tubes in radio work as the tungsten incandescent lamp is over the carbon lamp in the field of electrical illumination.

The filament wire in the new tube is extremely small, being but one-fourth the diameter of an ordinary hair. However, this is not an indication of any weakness, for this tungsten wire has the strength of the best steel piano wire. By radio engineers, this new filament is considered practically ideal. It has the high efficiency of electron production of the coated filament and the uniformity of operation and ruggedness of the tungsten filament. It has the quietness of operation of the coated filament and a lower operating temperature than the old tungsten filament. It has the long length of the coated filament and the long life of the tungsten filament.

The oustanding features of this new tube in comparison with previous tubes are shown in the attached summary.

Outstanding Features

The watts consumed by the filament of this tube is .18, or approximately but one-twenty-seventh of the energy used in the UV-201 tube. Yet the characteristics when used in a radio set are slightly better.

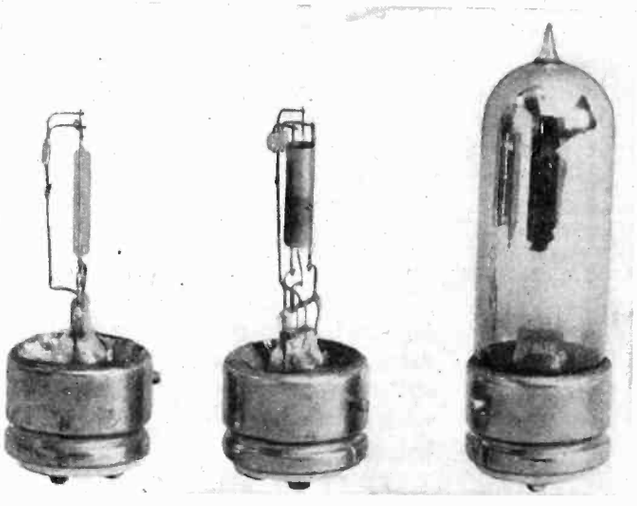
The filament of this tube runs at a temperature about 400 degrees cooler than the old type of Radiotron tube.

It is interesting to note that fourteen different chemical elements are utilized in this tube besides traces of several others.

This radiotron might almost be termed "the tube with nine lives," because if the filament is operated at too high a temperature, the electron emission falls off and the tube becomes inoperative. However, by operation at rated voltage with the plate voltage off for a period of time normal electron emission can be regained. The length of time required to perfect this recovery is proportional to the length of time at which the tube was operated at abnormally high filament voltage. This does not mean that for uniformly satisfactory results careful adjustment of filament voltage is not essential. It does mean, however, that improper filament operation does not spoil the tube beyond recovery.

This new Radiotron tube is an excellent radio frequency amplifier, because the capacity between elements is lower than that of the UV-201-A tube.

Although the base of this tube is of the same general design as the standard four prong base, it is of smaller diameter and the arrangement of the leads to the contact pins is different, the grid and plate contact pins being opposite rather than adjacent. This has been done to facilitate wiring and simplify connections in a multi-tube set.



Three photos of the new UV-199 tube, showing filament, grid and plate.

This tube operates satisfactorily in all circuits which were used with the old UV-201 tube and should give slightly superior results, especially in radio frequency amplification. Constant voltage operation of the filament is recommended. However, constant current operation does not entail the serious loss of life that followed constant current operation in the old tungsten filaments.

Small Filament Energy

The UV-199 tube requires so little filament energy that the ordinary No. 6 dry cells give remarkably long service. For instance, three No. 6 dry cells in series will operate one of the UV-199 tubes one hour a day for a whole year; or will operate two hours a day over the entire "radio season." This is a very advantageous feature, because it allows dealers to equip sets in the beginning of the season with batteries which with ordinary and intelligent use will last the entire active part of the season.

On a three tube set three No. 6 dry cells will operate the tubes one hour per day for a period of over four months.

In the case of portable sets using three cell flashlight batteries, it is recommended that one set of three flashlight cells be used for each tube in the set. It is immaterial whether each tube is wired separately to one of the batteries or whether they are all placed in parallel, provided separate rheostat control is made for each tube. If separate rheostat control is not employed for each tube and only a common rheostat provided the batteries should be connected in parallel.

In common with all receiving tubes, there are certain precautions which should be observed in order to obtain satisfactory results.

The proper grid bias must be used, depending in amount upon the plate voltage employed. Under certain conditions of small interference, slight static and weak signals, a grid leak resistance as high as six to ten megohms can be employed with success. With strong signals and heavy interference or static a lower grid leak resistance down to possibly two megohms should be used.

It should be understood that this UV-199 tube will not deliver the energy as an amplifier that the UV-201-A will. The UV-201-A is a remarkably powerful tube and has electron emission, mutual conductance and amplification far above any other receiving tube. It must not be expected that with a filament expenditure of only .18 watt that as powerful results can be obtained as an amplifier as with the expenditure of 1.25 watts.

Proper Rheostats Required

On account of the low filament current required by this tube it is essential to have the filament rheostat of sufficient resistance. For operation from three dry cells, the filament rheostat resistance should be at least thirty ohms per tube. If a six volt storage battery is used, the resistance should be at least sixty ohms. In multi-tube sets the sockets for the tubes should be cushion mounted so as to minimize the effect of vibration.

Department of RADIO ENGINEERING

Radio Topics Institute

Nanko C. Bos, Chairman Advisory Board

Look for the Approval Seal

Such as the one just above which are furnished manufacturers whose radio merchandise has been tested and approved by the Institute Laboratory. We urge you to purchase only such apparatus, for it carries the guarantee of our organization.

Send all inquiries and material for test, calibration, or reconstruction to Radio Topics Institute, *Oak Park, Ill.*

Overcoming Antenna Difficulties

By DONALD A. WILLIAMS

A CAMERA with a defective lens is at best a poor piece of apparatus, because the part of the instrument supposed to bring in the light rays fails in its function. In the same way a radio receiving set with a defective antenna system is an equally unsatisfactory piece of apparatus, because the part of the outfit which is supposed to catch the signals sent out from broadcasting stations has failed in its task.

Most radio fans will accept the foregoing statements as axiomatic, yet they will continue using poor antenna systems and will wonder why their sets don't pick up distant stations or once they pick up the stations fail to hold them.

On the other hand, there are fans who lean over backwards in the efforts to stand straight on the antenna question. They rig up elaborate antenna systems such as a high-powered broadcasting station might use and wonder why their set doesn't do its work. To use the illustration of the camera again, this is precisely like putting a very large lens in a small camera.

The extremely large antenna has a fundamental wave length too high for the set and for that reason will not give efficient results. Conversely the antenna that is too small is not large enough to absorb a sufficient amount of energy and hence the set fails to operate satisfactorily.

If the fans thoroughly appreciated the problems of the antenna, one of the most neglected and most important parts of the set, many of the weird aerials that grace the horizon would be replaced by antennæ as workmanlike and as efficient as the sets that skillful fans are now able to make.

In seeking the happy medium between the too large and the too small antennæ the first thing for the radio devotee to consider is the wave length upon which he expects to receive most of the signals. If he wants a 360-400 meter reception he should have an aerial, whether made in one, two or three lines, totaling between 125 and 150 feet, including the lead-in wire. Such an antenna has a natural period most adapted for receiving waves 360 or 400 meters in length.

The allocation of new wave lengths to the broadcasting stations, effective May 15, may give rise to the question: "What size antenna should I use for general all-wave reception?"

The answer is: "Stick to your antenna 125 feet long."

For amateur work, including reception of trans-Atlantic telegraph stations employing a 25,000 meter wave length, for the reception of low wave amateur signals and anything between those extremes the 125 feet single wire antenna "delivers the goods."

For distance work a two-wire antenna, about 70 feet long, will work better than the single wire, because it absorbs as slightly smaller amount of energy from local stations and hence is able to cut through to pick up the waves of distant stations. In other words a greater selectivity is obtained from a two-wire antenna 70 feet long than is obtained from a single wire antenna 125 feet long.

It is a frequent sight to see two or three wire antennæ rigged up a foot or a few inches between the wires. Such rigging is fatal to good results, because the capacity between the two wires when close together is rather large, whereas the desired thing is capacity be-

tween the aerial and the ground. It is best, authorities agree, to space the wires of the antenna about three feet apart to eliminate these capacity effects.

Many of the common difficulties of radio reception can be traced to the antenna, just as fading signals can in numerous instances be traced to the antenna. In one case the writer has in mind it was possible to get stations very clear, but they faded and then came back, repeating the process over and over. It was discovered that the antenna was swaying in the wind. It was guyed taut and the fading immediately stopped. That is the reason why the government will not issue a license for a class B station unless the antenna is guyed to prevent swinging, because the fading signals of a transmitter can be caused by swaying just as the same cause will make received signals fade.

Another thing to be guarded against is the proximity to trees or telephone lines which can sway until they touch antenna. The momentary touches ground the antenna and the signals do not reach the receiving set. In fact, it is not necessary that the trees or wires actually touch the antenna wire in order to interfere with reception of signals.

The reason for this is that the increasing and decreasing distance of the wire or tree to the antenna changes the thickness of the dielectric—in this case the dielectric is the air—and thus causes fading signals in exactly the same way that the swaying antenna above the ground changes the distance between ground and antenna with every swing.

Look to your antennæ. See that your connections are soldered, that you give the little electrons a chance to get into your set to bring you voice and music.

Care of Radio Tubes

The inexperienced radio fan is apt to meet with disappointment when he finds that the high voltage leads from the "B" battery have been accidentally connected across the filament posts of his receiver and one or more tubes are burned out.

Although the normal life of the average Rarlotron filament is considerably more than 1,000 hours, it requires but an instant to destroy this delicate filament when excessive voltages are applied to the terminals.

When filaments are shorted across a twenty, forty or sixty-volt battery in new condition, the "burnt-out" requires but a fraction of a second and unless the user happens to be inspecting the tube at the instant of the flash, the damage would not be discovered until the set was used again. It is a very easy matter to protect tube filaments by either of the following means:

Insert a 100-ohm (non-inductive) resistance for each 22-volt block of "B" battery in the circuit next to the positive terminal of the "B" battery. This resistance may be left permanently in the circuit without any effects whatsoever in the normal life of the receiving set.

Probably the most convenient form of resistance is a 25-watt, 110-volt tungsten lamp, which will provide sufficient protection for plate voltages up to and including 100 volts. This resistance automatically increases with the current so as to act, in effect, as a protective ballast lamp.

Troy Station Changes Wave

Beginning on Monday, May 21, the Rensselaer Polytechnic Institute, Troy, N. Y., station WHAZ commenced to broadcast on 380-meter wave length as assigned by the U. S. Department of Commerce. Before it used the 400-meter wave.

Coincident with the change in wave length, station WHAZ changed the hour of starting its broadcast programs Monday evening from 8:15 to 9 o'clock, Eastern Standard Time, in order that its programs may be broadcast without interference and completed without interruption. Heretofore this station has been restricted to the period between 8:15 and 9:30 p. m. and frequently its programs have had to be curtailed. This change to a later hour will also meet the approval of many listeners to WHAZ programs in the middle and far west and western Canada.

Powel Crosley, Jr., president of the Crosley Manufacturing Company, dedicating the new 500-watt Western Electric radio broadcasting equipment at Station WLW, Cincinnati, Ohio.

Correspondence With the Institute

The Director of Radio Topics Institute will answer any questions puzzling radio fans in this department. Make your letters as short as possible, write on one side of the paper only, and give name and address. This is your department. Use it.

Uses Meyers Tubes

WHITINSVILLE, MASS.—Please send me a diagram of a radio set using Meyers tubes and choke coils for three steps of radio frequency amplification and three steps of audio frequency. I should prefer a honey-comb coil set.

What can you tell me about the new Meyers tube that uses either 110 volts A. C. or D. C.?—CHARLES A. ALLEN, 122 East St., Whitinsville, Mass.

ANSWER: The hookup you ask for was mailed today. As far as we know, the new Meyers tube is not yet on the market. When it does come out it will be a great help to many fans because of its ability to use either kind of the commercial current that is now furnished for power and lighting and is in most every modern dwelling.

What Is "A. F." and "R. F."?

CHICAGO, ILL.—I am seeking full information on what is meant by, and how can you tell the difference between audio and radio frequency?—EMIL BEGUHN, 2156 N. Momence St., Chicago, Ill.

ANSWER: The terms radio and audio frequency are used to distinguish between two different types of alternating current that are commonly used in radio work. Radio frequency is a current that is above the range of audibility of the human ear, which is generally about 10,000 cycles. That is to say that the ear will not respond to a sound that has a frequency above 10,000 cycles, or 20,000 alternations (of current in this case), and this frequency is about the highest limit. As a general thing, the average ear will not hear any sound that is above 10,000 alternations. In some cases ears will hear sounds as high as 20,000 alternations, but these cases are very rare. Audio frequency current is a current whose range of alternations is below 10,000 cycles. That is to say that the human ear can easily hear any frequency below this down to about sixteen cycles, at which it becomes individual sounds. Both these frequencies are used in radio work, in transmission and reception. In a transmitting station there is a current being sent into the ether at all times when the transmitter is in operation. This current is at a radio frequency. When the microphone is spoken into, a current impulse is set up in the microphone line which is suitably amplified and impressed on the transmitting tubes, which in turn is carried out into the ether. This current that is sent out is a combination of radio frequency and audio frequency currents, the voice current and the transmitter tube current. This energy is then received on a receiving antenna and the voice is again brought out by means of the detector and the phone.

Radio and audio amplification is often mentioned in radio work as well as the two kinds of current. By radio frequency amplification is meant that the current is amplified while it is still at a radio frequency and then detected, while audio frequency amplification means that the current is detected and then amplified at an audio frequency.

Can't Get DX

CHICAGO, ILL.—I have a short wave regenerative set consisting of two variometers, one variocoupler grid leak and detector tube. I am able to receive local broadcasting, but not distance. Can you give me the reason? Will you please send me a hookup, using these parts in connection with a two-step radio frequency amplifier and an audio frequency amplifier?—EDWIN C. REYNOLDS, 1635 S. Komensky Ave., Chicago, Ill.

ANSWER: This non-reception of long distance signals may be due to a loose or poor antenna connection or a ground connection that has become corroded. Also, be sure to keep all your leads as short and straight as possible.

Am mailing today the radio and audio frequency circuit you requested.

Poor Results With 201-A

COVINGTON, KY.—Looking over the RADIO TOPICS of April, which is always a welcome visitor, I noticed your write-up on the new UV201-A tube on page 28, which stated that it was more powerful and could be used as a detector or as an amplifier. I bought two such tubes and have not been able to get results with them, whereas the UV200 gave splendid results. In order to make use of these tubes I intend to build an amplifier set, but on looking at the sketch on page 28 I cannot understand what is meant by "grid return."

I would appreciate it if you would give me a little help on this matter and if possible a hookup for a two-stage amplifier to use other tubes. I am sending with this letter a hookup of my set and an amplifier diagram which I have figured out but do not know if it works with the UV201-A tubes.—AEMILIAN SCHILIMM, 338 E. 17th St., Covington, Ky.

ANSWER: Sorry to hear that you had such hard luck with your new tubes. You might try varying the "B" battery voltage and also try a different value grid condenser. By grid return is meant the lead that is opposite the grid in any circuit. In a detector circuit the lead that comes from the side of the variocoupler is opposite the lead to the grid, known as the grid return lead. In an amplifier circuit the lead that is taken from the side of the secondary opposite that which goes to the grid is known as the grid return. This is illustrated in the circuit which is returned to you.

The hookup you sent is O. K. and will work with any three element tube now on the market.

Range of Reinartz Set

CASTALIA, OHIO—I wish to ask you a few questions about the Reinartz circuit which you published in the February issue of RADIO TOPICS.

1. What is the range of this set?
2. Is this set very selective?
3. Would I be infringing on any patents by making this set and selling it? If so, how much would license cost?—ARTHUR WOBSER, Castalia, Ohio.

ANSWER: Question 1, this set has a range of about 500 miles, but many users report twice that distance.

Question 2, this set is very selective.

Question 3, yes, you would be infringing on the patent held on regeneration. For the cost of a license communicate with The Radio Corporation of America, New York City.

Add a Honey-comb Coil

HAMPSHIRE, ILL.—Being a subscriber to RADIO TOPICS, I saw the short wave receiver, which I built and am very well pleased with it. Will you tell me how to get longer wave lengths with it?—ELIAS KLINK, Hampshire, Ill.

ANSWER: Glad to hear that you are getting such fine results with your set You may increase your wave length by the addition of thirty-five honey-comb coils as shown in the diagram that has been mailed to you.

CHICAGO, ILL.—Please send me an Ultra-audion set hookup, using three stages of amplification, four jacks with WD11 tubes.—J. A. SYKES, 1734 W. 21st St., Chicago, Ill.

ANSWER: The hookup has been mailed as per your request.

BELLEVUE, KY.—I am a subscriber to your most excellent magazine, and would like to see the answers to the questions below in your query column.

Am sending a diagram of a circuit and would like to know if it is regenerative. What would I have to add to reach 2,400 meters? I intend to use WD11 tubes with this set. Could I receive WGY with it?—JACK MAYER, Bellevue, Ky.

ANSWER: The circuit you inclose is regenerative. You may load it up to 2,400 meters by using a honey-comb coil as shown in the diagram sent you.

You will probably be able to hear WGY on your set, as these sets have been doing some good work.

To the Amateur

DON'T let the old-timer with a complicated regenerative set talk you out of building a crystal receiver, if that's all your pocketbook can stand. You can get just as much enjoyment out of a good crystal set as the experienced electrician gets out of his $300 outfit, and, in many cases, a darn sight more.

New Licenses Affected by New Ruling

THE law of 1912 is still in full effect. The recent National Radio-telephony Conference at Washington recommended that an extension of the amateur band from 200 to 222 meters be made under special license, for CW only, all higher special waves to be cancelled. In accordance with this recommendation the Department of Commerce is recalling special amateur licenses and assigning 220 meters as an upper limit.

A. R. R. L. representatives, in conference with the department, were given the opportunity of making recommendations to the department respecting a possible subdivision of the amateur band by classes of transmitters. A detailed study of the matter was made by the directors of the A. R. R. L., located throughout the country, and at their meeting on April 27 recommendations were adopted and transmitted to the department. These call for the segregation of all modulated services (spark, 1CW, 'phone, ACCW) within the limits of 176 and 200 meters; pure CW 150 to 200 meters; special license stations with pure CW, 150 to 200 meters; all stations to be permitted to operate on any wave within the band to which that type is eligible. It was recommended that special licenses be issued only to holders of a new type of extra-first grade amateur operator's license to be established, requiring two years' amateur experience and a code speed of twenty words. It should be noted that the present law prevents the assignment of waves above 200 meters except upder special license, and only to applicants of experience and ability.

* * *

This recommendation, if adopted, will result in bands reserved for CW exclusively at either end of the amateur allocation. It should be noted that in general no changes will be necessary in the adjustments of the average transmitter to comply with this proposal. No changes in power limits were recommended. The idea of an elaborately subdivided amateur band, as tentatively announced by some of the supervisors, has been abandoned. No decision has been received from the department at this writing.

CW has been tentatively defined as a continuous oscillation telegraph system in which the power supply is substantially direct current as obtained from a generator, a battery, or a rectifier plus an adequate filter. It was felt that a more ambitious definition would be impracticable of enforcement.

* * *

The telephony conference made no recommendation respecting amateur quiet hours. The A. R. R. L. board, however, has been on record as advocating voluntary quiet hours from 7:30 to 10 p. m., local time. In the belief that better amateur conditions would exist if the plan were observed uniformly, the department on April 6 authorized supervisors of radio (inspectors) to note on licenses "This station is not licensed to transmit between the hours of 7:30 and 10:30 p. m. daily, local standard time." Although discretionary with the supervisor, some of the supervisors began recalling licenses to be so indorsed, whereupon the league sent a representative to Washington to protest. As a result, instructions were telegraphed the supervisors to apply the notation only to new licenses, pending consideration of the matter by the A. R. R. L. board. At its meeting on April 27 the board reiterated its recommendation of voluntary quiet hours, as before, but opposing enforced quiet hours in the conviction that they would be destructive of co-operation with the department. Recommendations to this effect have been made to the department and we now await their advice.

The Radio Telephony Conference regarded the waves below 150 meters as reserved and recommended an amateur assignment having 150 meters as its lower limit. The league feels that no restrictions should be imposed which will prevent experimental investigation of this field, and regards its members as better able to develop these waves than any other interest. Strong representations accordingly have been made to the department to permit the continued non-exclusive use of the waves below 150 meters on all amateur licenses. No reply has been received at this writing.—N. Y. Radio Globe.

Simplicity of Radio

Many books have been written about radio but a majority of them are so technical that the average reader does not understand them and the result is a lack of interest in the greatest of modern sciences.

After a careful survey of all radio books, the Crosley Manufacturing Company, of Cincinnati decided that there was a need for one which could be easily understood by the layman. Therefore Mr. Powell Crosley, Jr., president of the Crosley Manufacturing Company, wrote the "Simplicity of Radio," which describes the function of the radio parts and their combined use in the reception of broadcast concerts. Another interesting chapter in the book, is a description of broadcasting station WLW.

Probably one of the most interesting portions of "Simplicity of Radio," is devoted to the erection of the antenna. This is given such clear description that it is used as part of the instructions which go with every Crosley radio receiving set.

"Simplicity of Radio" is fully illustrated, in a way that may be easily grasped by the average reader. It was printed by the National Label Company and has been copyrighted.

Radio Exercise

Keeping fit by wireless has been added to WSB's service through a series of "setting-up" exercises conducted on The Atlantic Journal's 10:45 broadcast, I. C. Matheny, physical director of the Atlanta, Ga., Y. M. C. A., designed and conducts the course of six simple drills every Tuesday, Thursday and Saturday night at 11 o'clock. Music sets the tempo for the calisthenics which occupy but a five-minute session.

An Efficient Indoor Antenna

By HENRY F. WORNER

USUALLY the indoor aerial as devised by the apartment house dweller or others who, for good and sufficient reasons, are unable to erect the conventional outdoor type is, to say the least, an unsightly affair, especially if it is a wire strung hither and yon beneath the ceiling. Owing to the limited space available, it is mostly too short, and consequently its natural wavelength too low to function properly at broadcasting wavelengths, unless it is strung in a long hallway or through several rooms.

On the other hand, a loop aerial by reason of its limited range, is out of the question for the usual type of radio receiver, which is a detector and two-stage audio-frequency set. The novice thus handicapped is, therefore, hard to get entire satisfaction from his otherwise excellent instrument.

The writer believes that an indoor aerial of the type outlined below will be of vital interest to a large number of radio enthusiasts. Such an antenna has been in constant use by the author for more than a year and is working very satisfactorily within a 750-mile radius in winter and is good for about 250 miles in the hottest of summer weather. The total cost is well within a dollar and a half, and the materials required are 100 feet No. 14 stranded copper aerial wire, four medium sized closet wire, and a half pound of wire of the kind used for hanging pictures, together with four strips of bakelite, 7x2x⅛ or 3-16 inches thick.

* * *

Procure four pieces of sheet bakelite or other high insulating material, ⅛ or 3-16 inches thick, and seven inches long by two inches wide. Dress up the edges and slightly round the corners for better appearance. Clamp the pieces together flush after marking off the top piece as indicated in Fig. 1 and drill the two ⅛ inch holes shown, drilling through all four pieces at once. Next mark off four points an inch apart along one edge and after sliding the under piece a half inch to one side, cut four notches ⅛ inch deep as shown in Fig. 2, by slipping two hacksaw blades into the saw frame, so as to make the slots wide enough to receive the wire. Now single out the odd piece and cut an extra notch the same distance from the others. This will make one strip with five slits, and three having four notches each. Next drill a ⅛ inch hole a quarter inch below the end of the five-kerf piece only for securing the ends of the aerial wire. The strips are now ready for use.

Having produced the four screw hooks and picture wire mentioned above and decided upon the room which is to contain the aerial, proceed in the following manner: Place a hook in or near each corner of the room and about 18 inches from the ceiling, making sure to locate them in a solid part of the wall, preferably a joist, the location of which may be found by sounding the walls lightly with a hammer. The hollow parts of the wall give off a ringing sound. Next bear in mind that your aerial will be in the shape of a square coil of four turns spaced an inch apart, each side of which will be approximately six feet long. Then figure just how much picture wire you will need to go from the corner of the antenna to the hook in the wall and back again, taking the precaution of allowing about a foot more for contingencies. Thread the wire into the two end holes in each piece and twist one end securely together, the other end being fastened temporarily so as to allow for necessary take-up or slack, as the case may be. In their final positions, the strips stand out horizontally toward the center of the room, forming angles of about 45 degrees with the walls, the saw-kerfed edges facing the corners.

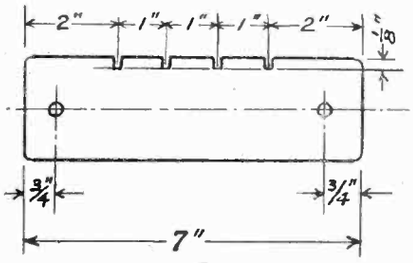


Fig. 1.

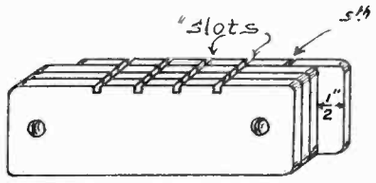


Fig. 2

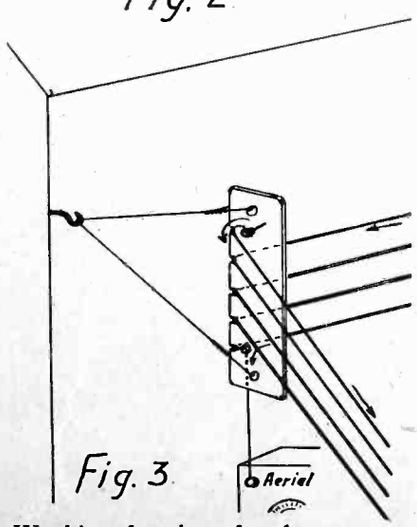


Fig. 3

Working drawings for the construction of an efficient indoor antenna.

* * *

After hanging the supports on their respective hooks, thread two pieces of string through the top and bottom holes and take up the slack until the pieces stand out from the walls in the positions they are to occupy (Fig. 1). Now commence to readjust the lengths of supporting wire until the strings line up parallel with the walls and twist the bottom ends of the wire securely to prevent slipping.

Now comes the hanging of the aerial itself. Start at the piece having five notches, and pass the end of the aerial wire through the hole near the top notch and put a knot in the end of the wire. Then return the wire through the

top saw slot, assisting the process by bending with the fingers, and thence through all the top slots, until you arrive again at the first strip pass wire into second notch, and continue in the manner of winding a large coil, finally returning to the five-slot piece, through bottom notch, and through hole near bottom notch in opposite direction, after which the wire is again knotted to keep it in place.

It is advisable at this point to make a neat looking job, to go over the entire wire again, gradually taking up all slack, always assisting by bending new bends and unbending the old, which will help in holding the strain, until the aerial is nice and square and the turns are all parallel with each other and as tight as a drum.

Now the two strings, which probably have slackened considerably since, may be removed. The lead-in wire is fastened to the remainder of the wire, left over after the tie knot is put in, and the aerial is now ready for use.

Experiments will determine whether the tuning condenser in the aerial circuit should be connected in series with the tuning inductance or in parallel. The writer found in his particular case that the set performed best with the parallel (shunt) connection.

Radio Table and Chair

HERE is a table, the product of Toledo Metal Furniture Co., especially designed for the ardent radio fan. And there is a chair that goes with it. The table was built it is said at the request of a radio experimenter who has had more than ordinary success at his receiver.

The table is grounded, which eliminates body capacity to a marked degree, making finer and more stable tuning possible, as well as eliminating many of the undesirable noises that are generally present when one is operating a three tube set. It also furnishes something to rest the receiver on.

Something new—a Radio table and chair that is proving a boon to radio fans

A peculiarity in connection with the use of this table was discovered by one user, in that in tuning a circuit with a 43-plate and a 3-plate variable condenser, the radio fan was able to get an additional vernier adjustment by inserting a 13-plate condenser in the line used to ground the steel table.

The chair is especially designed to rest the back of a person operating a receiver, and as it furnishes the proper body support it eliminates all fatigue from long sitting in one position.

Antenna Strung in Attic

An RCA representative recently stopped in a certain rural community and although the local radio dealer seemed to be doing a flourishing business, hardly five outdoor antennæ were in evidence. Upon making inquiries, he was told that because of the lightning-fire fear on the part of many residents, he had advocated and personally installed the so-called attic antenna in dozens of homes. The psychological effect of having the antenna indoors had so reassured the people that he was advocating the same practice in nearby towns with marked success.

For medium distance reception, the attic antenna is just as effective as the outdoor antenna especially in detached frame houses. By virtue of its short span, it permits sharper tuning with consequent decrease of interference. Then, too, the indoor antenna does not require elaborate insulation since it is never exposed to moisture or rain.

When erecting it, however, string the wires as far from the house lighting wires as possible so as to overcome annoying alternating current hums in the receiver.

"Built Like Brooklyn Bridge"

THE Clapp-Eastham Company of Cambridge, Mass., manufacturers of Radak radio equipment, have brought out a new receiver incorporating many novel features.

This Type C-3 Receiver is housed in an attractive walnut cabinet. All binding posts have been removed from the front, and connections are made through the back of the cabinet. All tuning controls are equipped with a single-knob vernier. The vernier has no back-lash or lost motion, it is said, and has a ratio of 5 to 1. A new vernier rheostat is used on the detector, which is a single-knob vernier, and is very simple to operate. All tube bases, rheostats and telephone jacks are in line, making a symmetrical appearance.

The new Clapp-Eastham Radak receiver.

The set is regenerative, licensed under the Armstrong Patent, and probably the most interesting feature of the set is its rugged construction. In place of the wire commonly used, a 3/8 x 1-16 inch brass buss bar is used throughout for connections. This makes a very attractive proposition, and certainly eliminates the trouble from soldered joints, etc.

The makers say, "This set is built like Brooklyn bridge—to last forever," and one look at the interior convinces the average person that this is so. In addition to tuning to the usual broadcast wavelengths, this set tunes to 3,000 meters.

B. & O. Railroad Uses Radio

SUCCESSFUL TEST MADE ON MOVING TRAIN BETWEEN CINCINNATI AND LOUISVILLE

THE first successful public reception of radio broadcast concerts was enjoyed on Wednesday, April 25, 1923, from the time the train left the Grand Central Station at Cincinnati, O., at 8:20 in the morning until the arrival of the train at Louisville. Broadcast music was heard on the return trip, leaving Louisville at 5:45 in the evening and arriving at Cincinnati at 9:10 p. m.

The trip was made in co-operation with the Crosley Manufacturing Company of Cincinnati and the Baltimore and Ohio Railroad, St. Louis Division.

Crosley Set Used

A Crosley Model X receiving set was installed in the regulation day coach and placed on the seat in one end of the car while a Western Electric Loud Speaker was placed in the other end, up in the rack. The Crosley Model X consists of one step of tuned radio frequency amplification, detector and two stages of audio frequency amplification. A Western Electric amplifying tube was used in the second or last stage of audio frequency amplification. The "B" batteries were placed in a separate cabinet and a switch was used to cut-in and out, the head phones or loud speaker as desired. The eighty-eight volts of "B" battery were used in amplification and 22½ volts of this was utilized for the detector. A 6-volt "A" battery was utilized. The aerial consisted of a single wire, 58 feet long, stretched along one side of the roof of the car, with supports and insulators fastened to the ventilators in the roof of the car. A current-lighting generator was in operation during the trip. Despite the handicaps of the all-steel car and the generator the Model X gave perfect satisfaction.

The antenna was strung along the roof of the regulation day coach which is part of the equipment of the Baltimore and Ohio trains. The set and loud speaker were placed on a seat in the forward end of the car. Passengers were permitted to witness the special test.

Original arrangements for this history-making radio-train trip were made by Alvin Richard Plough, of the Crosley Manufacturing Company and F. B. Dickinson, City Passenger Agent of the Baltimore and Ohio Railroad. The details of the trip were arranged by W. A. Radspinner, special representative of the General Manager of the Baltimore and Ohio Railroad and John Andrews, from the engineering department of the Crosley Manufacturing Company, who installed and operated the Model X equipment.

Many prominent men and women, including officials of the Baltimore and Ohio Railroad were present on the trip: George W. Squiggins, General Passenger Agent; F. B. Dickison, City Passenger Agent; W. A. Radspinner, Representative; Thomas J. West, Division Passenger Agent; E. F. Schlottman, Chief Clerk to the General Passenger Agent; F. J. Parmalee, District Passenger Agent at Louisville; R. P. J. Moran, Supervisor of Car Lighting; E. M. Robertson, Electrical Supervisor; Steve Rogers, Road Foreman of Engines; J. W. Coles, Conductor; Peter Adrick, Engineer; A. M. Jackson and T. O. Plummer, Trainmen; J. B. Perkheiser, Trainmaster, St. Louis Division. Robert F. Stayman, John Andrews and Alvin R. Plough represented the Crosley Manufacturing Company.

Radio plays an important part in the Preferred Pictures production, "Thorns and Orange Blossoms." The players are Kenneth Harlan and Edith Roberts standing before the Kennedy receiver.

Louisville Paper Co-operated

Fred Smith, studio director at Crosley Radio WLW, Cincinnati, prepared a special program of music beginning at 8 a. m. and at intervals of fifteen minutes thereafter. At 9 a. m., C. M. Ritchie, lecturer of the Baltimore and Ohio Railroad, told about the history of railroading from 1827 until 1923. Radio Station WHAS of the Louisville Courier-Journal, co-operated in broadcasting organ music from 10:45 a. m. until the arrival of the train at Louisville.

The return trip was just as successful as the one to Louisville, and music, addresses and singing was received from many stations, including WLW of Cincinnati, WHAS of Louisville who had a special Rotary Club program, WWJ of Detroit, and other stations.

To Radio Dealers

IT is a mistake to curtail your stock of parts because summer is approaching. Last year it was proven that old man Static played but a feeble part in curtailing the interest in radio. Reception was good throughout the summer months, and the dealer who practices conservatism too far in the wrong direction is standing in his own light. Boost radio, and it will boost your sales.

Russia Develops the Radio

In radio research, as in other respects, Russia was almost completely cut off from the outside world from 1918 to 1921, according to the English Wireless World. Unusual interest, therefore, attaches to a report received dealing with the researches of the Russian radio engineers during this period, when they had to rely exclusively on their own creative genius.

Wireless engineers in Russia are linked together in a private society known as the Institute of Russian Radio Engineers, founded in 1918. This society then possessed thirty-four members and this number has now increased to 200. The headquarters are in Moscow, and there are branches in Petrograd, Nijni-Novgorod, Kieff and Odessa.

Three Electrode Waves

One of the objects of research has been the three-electrode valve. Numerous constructive improvements are claimed to have been evolved and subsequent knowledge has shown that these improvements have followed very closely the principles of English and German developments.

Wireless telephonic transmission has been improved and speech has been clearly heard in Christiania and Berlin. Several improvements have been introduced in modulators and microphones.

An interesting musical instrument producing varying oscillations by means of cathode tubes has been invented by Engineer L. S. Terman, and concerts have been given with this device in Moscow and Petrograd. Progress has been made in the domain of high frequency machines. The Poulsen ray generator has been widely used for wireless telegraphy in Russia during the last four years, and a station of 100 kilowatt, embodying the principle, was erected at Moscow (Shabolovka) in 1919, communication being effected with England, Italy and elsewhere.

Odd Antenna

Attention has been given to receiving antennæ, particularly the frame variety, which has been employed extensively for direction finding. In regard to transmission antennæ a theoretical improvement is claimed in the Alexanderson system. The principle embodies the use of only one mast, and it is hoped that practical tests will soon be possible.

Improvements are also recorded in amplifiers, wavemeters and other measuring instruments, resistance, cathode tubes for wire transmission and wireless transmission of photographs.

It is significant that, in spite of difficulties encountered during the last years, popular interest in Russia has permitted the continuous publication of two periodicals specializing in radio.

Show This to Your Landlord

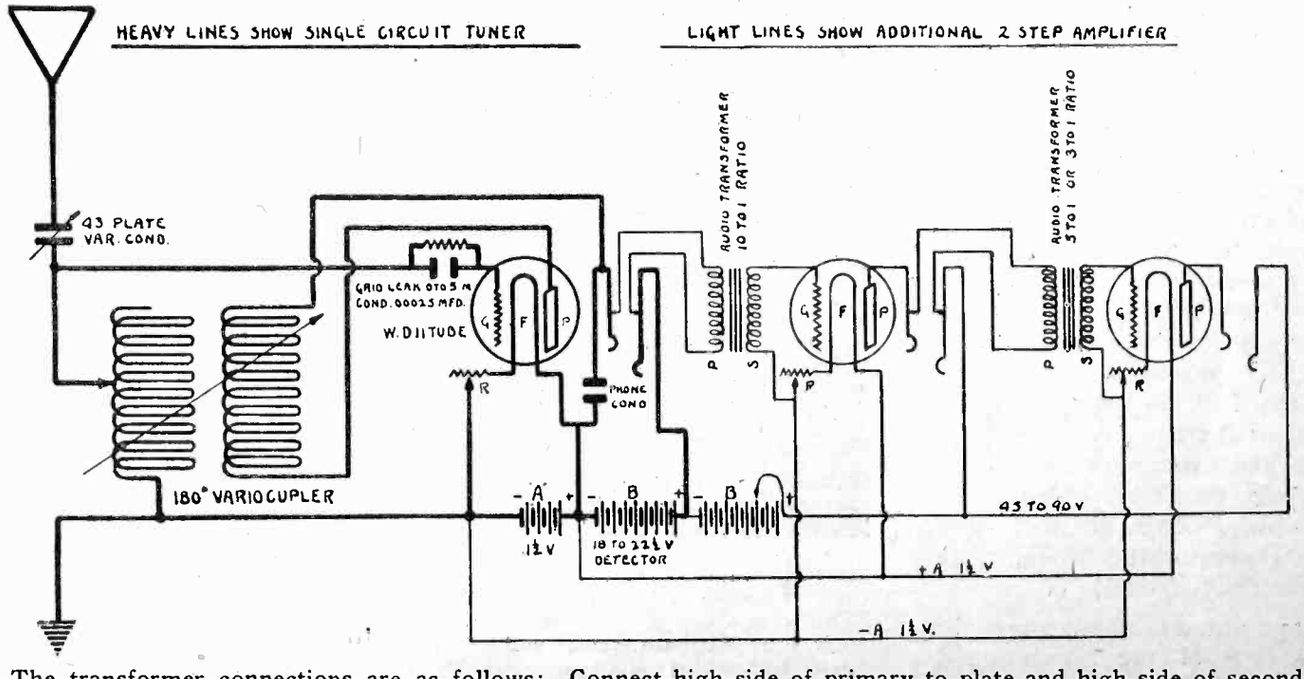
If an antenna 50 feet high is directly under an electrified cloud, it will have a potential to ground of 50,000 volts. If the antenna is well grounded it will lower the potential in nearby structures by this amount which is equivalent to elevating the earth immediately beneath to the height of 50 feet or to the plane of the antenna. Thus, as a matter of fact, the well grounded antenna actually offers protection to the building upon which it is erected. Its function, therefore, is the same as the lightning rod.

Jazz Music to Be Restored

THROUGH an agreement reached between the music publishers and the radio people, it was arranged to broadcast popular music again, commencing May 23. This is the first time since the American Society of Composers, Authors and Publishers called a halt on the broadcasting of copyrighted music and demanded the tax of from $250 to $5,000 a year from the broadcasting stations.

Harold Rossiter, chairman of the musical program committee, announced that the agreement between the National Broadcasters' League and the Independent Music Publishers was perfected, and jazz music and popular numbers will be restored on above date. The agreement applies to twenty states.

A REGENERATIVE CIRCUIT WITH OPTIONAL TWO-STEP AMPLIFIER



The transformer connections are as follows: Connect high side of primary to plate and high side of secondary to grid. Low side to + "B" on primary and — "A" on secondary.

Practical Hints on Designing Regenerating Receiver

By PAUL A. PERRY

AS everyone knows, the advent of the regenerative type of receiving set was one of the greatest forward steps made in the development of radio. It has become the standard against which all other types of radio receivers are judged and is without question the most efficient of them all. However, because of the principles involved in the operation of this type of receiver, it must be intelligently built and operated or else the time will come when, like England, our use of the regenerative type of receiver will be prohibited.

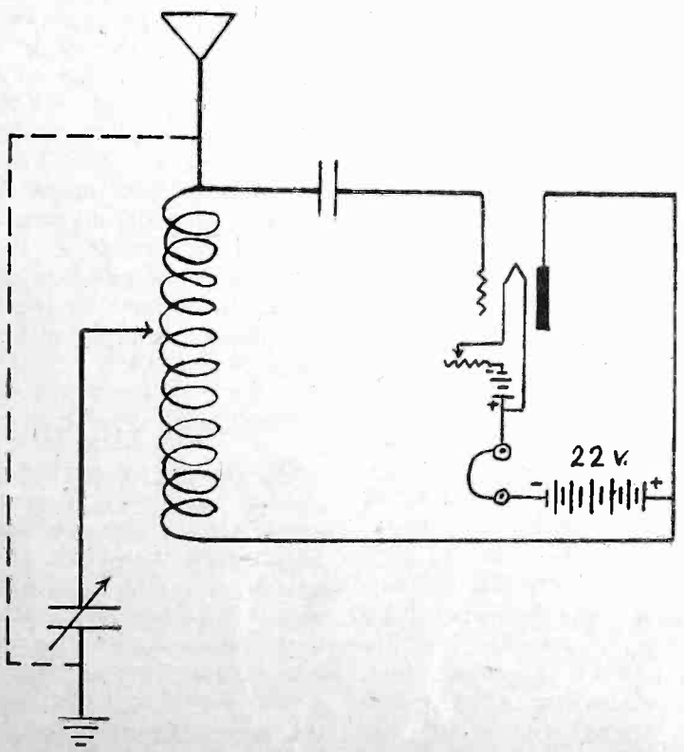
This statement not only applies to the amateur who builds his own instruments, but also to the unscrupulous manufacturer, even though he be licensed, who does not take the time or money to develop a type of instrument which will give the least amount of re-radiation interference, if any, to the neighboring receivers that are in operation.

There are two distinctive undesirable noises that can be received through most regenerative sets. One, a low, faint moaning that does not drown out the speech of the station being received, and the other, a very loud, harsh, unbearable screech that almost, if not entirely, drowns out the station being received. The first sound is caused, most usually, by the hetrodyning caused by the different carrier waves of the transmitting stations and, at present, impossible to overcome at the receiving station.

However, this moaning may also be caused by some nearby regenerative set that is not in proper operation or, in other words, a set that is giving off the second described sound.

This re-radiation of regenerative sets can be overcome to a great extent by the proper designing and placing of the units in the circuit.

If the radio-frequency oscillations generated by the detector are fully used within the set or are kept from hetrodyning themselves, the undesirable re-radiation can be greatly overcome without decreasing the efficiency of the set.



Hook-up for regenerative receiver described in accompanying article by Paul A. Perry.

Simplest to Build

The Ultra-Audion is the simplest and, it seems, the most abused of all the regenerative circuits. This circuit consists only of a variable or fixed tuning inductance, with a series variable tuning condenser, and the necessary tube controls. When correctly connected, this circuit will often outdo many of its more complicated brothers in the reception of distant stations. The feeding back of the radio-frequency currents that are generated in the plate circuit by the detector tube directly into the grid circuit of the tube and thereby adding to the incoming signal strength, is the function of this circuit.

In order to accomplish this object, the plate is usually connected directly to the antenna side of the inductance with the antenna, and the headphones placed in the plate-to-filament circuit between the "A" and "B" batteries with the variable condenser placed in series with the ground and the inductance and also in series in the grid-to-filament circuit.

In this manner the plate oscillations are forced back through the inductance and into the grid circuit.

The variable condenser, in this particular combination, controls the wavelength tuning and at the same time the oscillations of the tube. At first thought, this combining of controls would seem to be a great advantage, but after a little study its disadvantages, not only to the operator, but also to the neighboring receivers, will readily be seen.

The variable condenser, in this particular position, at best can only control either the wavelength or the oscillations of the tube and most certainly not both with any degree of satisfaction. This is the reason that in most of the above described circuits a

vernier variable condenser is necessary in order to obtain only fairly satisfactory results.

Trying to Stop Whistling

Because of the critical control of the condenser, the tube often starts hetrodyning when a station is tuned in. In trying to stop the hetrodyne action, the station is usually lost because of the condenser also controlling the wavelength.

The average operator, rather than lose his station, is willing to put up with a little whistling, and after losing stations several times in endeavoring to stop the whistling, no longer tries to put a stop to it. This whistling of his set does not bother him only. It bothers all receiving stations within a radius of a half to one mile that are endeavoring to receive stations on the same wavelength. Thus it is that an incorrectly designed or operated regenerative set may ruin the evening's entertainment for all within a fairly large radius.

Another objection to the above described circuit is the very noticeable body capacity effect whenever the hand is brought near the condenser for tuning. The cause of this is again traced to the position of the condenser in the oscillatory control circuit. In any circuit in which the plate currents of a tube are put under control, the body capacity effect is very difficult to overcome and the combining of the condenser controls, such as in the described circuit, renders the elimination of body capacity practically impossible. In many such outfits, stations may be tuned in and out by just shifting the position of the hand. However, by a simple modification of the above circuit all of these objections, even to that of body capacity, may be easily overcome without the need of any other or more elaborate apparatus than required before.

The accompanying diagram gives the hook-up of the circuit. In this circuit the plate is connected to that side of the inductance away from the antenna with the headphones in the plate-to-filament circuit, as before, between the "A" and "B" batteries. The variable condenser is placed in series in the ground lead of the inductance where it only controls the wavelength and is free from body capacity. In this combination, the oscillations of the tube are not controlled. The inductance is used as an auto-transformer where the energy generated in the tube is transferred from the plate circuit directly into the grid circuit. The whole coil is used as a fixed plate inductance while parts of the coil are used as a variable wavelength control in the grid circuit.

Ease of Control

The tube will oscillate freely in this circuit but not to the point of self-hetrodyne and forced oscillation. This circuit is much easier to control because it does not require vernier or critical adjustments on any of its units. The distance obtained with it is equal to that of the first described circuit, while the freedom from hetrodyning whistles and distortion is very noticeable. Not only that, the inductance uses practically all of the energy generated by the tube, thereby greatly reducing the re-radiation usually caused by this type of circuit.

This circuit may also be used without an antenna of any description for the reception of signals 10 to 30 miles distant. This is accomplished by simply disconnecting the antenna and connecting the otherwise antenna lead of the inductance directly to the ground as indicated by the dotted line in the diagram. It may be that some of the readers are so located that greater distances will be obtained without the use of the antenna.

Pallophotophone Records Speech

If Governor Alfred E. Smith of New York wants to hear himself as others hear him or if, years later, he wants to hear again the applause and the band music which greeted him at his inauguration recently in Albany, he has only to listen as the Pallophotophone, the new sound recorder of the General Electric Company, which reproduces the sound photographs of his inaugural address.

This record was made from the air. That is, it was received by radio and then photographed, thus demonstrating a new and possibly important use for the Pallophotophone. The instrument had heretofore been used to record or photograph addresses delivered directly into it, later reproducing the addresses by radio from WGY, the Schenectady broadcasting station.

As Governor Smith spoke to the crowd attending his inauguration a little microphone in front of him picked up his words and carried them sixteen miles by telephone or land wires to Schenectady. At WGY, the signals were amplified and modulated and put into the air for all within the radius of the station to hear. These words or electrical impulses were recorded from the air by the Pallophotophone. The record was then developed and now speech, applause and music may be put back into the air when, and as often as desired.

Youngest Radio Fan

BABIES now cry for radio! The new national pastime has invaded the nursery and many mothers are adopting radio waves as pacifiers. A mother of six children, the oldest eleven years old, writes WGY, the Schenectady broadcasting station of the General Electric Company, that her youngest child, aged fourteen months, is already a fan. Mrs. Robert Barber of Rensselaer, N. Y., writes:

"I wonder if it would interest you to know that I think I have the youngest radio listener. My baby is fourteen months old and she walks to the desk where I have my crystal set and points for me to open it. When there is anything she sits with the ear phones just as nice as any person, but as soon as it stops she takes off the phones and starts to scold for more.

"I have six children and they all like to listen. I have two sets of phones and they separate them."

600 Stations

On April first of last year the number of stations in operation in the United States numbered 137. This meant that large areas were left uncovered by a radio broadcast service. Today the situation is entirely different, for there are over 600 stations in actual operation. These are so well distributed over the whole country that there is hardly one section that is not served by a broadcast station.

Why Connections Are Soldered

By DORMAN ISRAEL

Engineer Radio Laboratory, Crosley Mfg. Co.

ANY electrical connection depends for its efficiency on positive contact of the various metallic parts. If this condition does not hold trouble might arise, due to a complete open circuit, in which case no current would flow or the joint might be loose, causing erratic making and breaking of the circuit, with a consequent scratchy and troublesome noise.

There are several ways in which connections can be made. Binding posts or nuts on screws are usually furnished on radio parts, but their purpose is for experimental use where changes are frequent rather than for connection in a permanent outfit. The reason for this is obvious. In the first place, the wires which are fastened to these terminals might not be thoroughly cleaned. Also it is apparent that no matter how well a connection is tightened, there is a possibility of its working loose.

Insures Permanence

After experimental work has been completed and you are satisfied that your radio outfit is working as it should, no time should be lost in making all connections and arrangements of apparatus permanent. The only way to insure a permanent and satisfactory connection is through the use of solder. A soldered joint is composed of three possible sections. In soldering an alloy is formed at one connection point, then there is a possibility of a small amount of actual solder in the joint followed by another alloyed connection on the second conductor. Since it is impossible to form these alloys unless the conductors have been thoroughly cleansed previously, it is apparent that a good connection will be obtained with a properly soldered joint. Furthermore, if the correct flux is used there will be no change in structure of this joint.

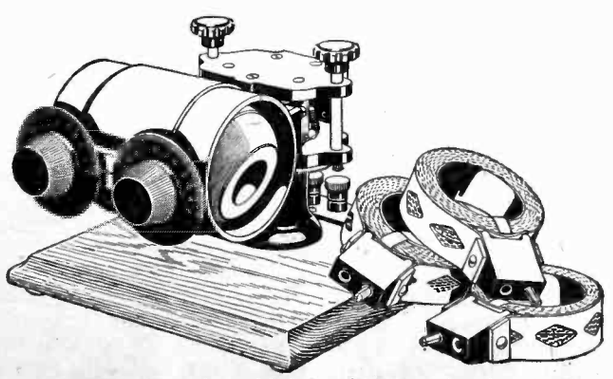
Any number of different kinds of soldering fluxes are available on the market. Do not, under any circumstances, use an acid flux, since it will in time corrode the joint. Soldering pastes have a mild acid reaction of varying degree, depending upon their manufacture. Some of these are satisfactory for radio work. It is important that after the joint has been soldered all paste or flux be cleaned from the surrounding surface. This can be done with a rag and some alcohol or benzol. The best flux used on radio work is rosin, but it requires some skill for its use. However, if both conductors are tinned, that is, covered with a thin coating of solder, before the final sweating or heating of the two conductors in their final position takes place, rosin can be used most effectively.

Use This Device for Selectivity

WE'RE all after selectivity. The manufacturers claim for this little device, called Tunit, surprising results on wave lengths of 600 meters. As is well known honeycomb coils are efficient above 600 meters, a set with a range of 150 to 600 meters is possible with Tunit.

It is a compact arrangement, the close inductive relationships between the rotor coils and the secondary coil which is wound around the formica tube, make for selectivity, with the standard honey-comb three coil mounting plugged in.

It is claimed with the Tunit an amateur in New York City got signals of amateur stations in the first, second, third, fourth, fifth, eighth and ninth districts and Canadian amateur stations. A UV-200 tube was used.



The Tunit unit, which makes a selective tuning instrument with only a UV-200 tube.

Use Lightning Arrester

Now that summer is approaching when we have thunder storms, it is high time to install a lightning arrester or switch if you have not already done so.

A good arrester is preferable, as it is always on the job and requires no adjustment when your receiver is in operation.

There is very little danger from lightning, but it is always best to be safe. Then, too, with a lightning arrester, there is no danger of damage to the set from a stray bolt.

The National Board of Underwriters demand installation of an approved switch or arrester, otherwise insurance will be voided in case of fire or injury to the premises from lightning. The specifications permit installation of either an inside or outside arrester, securely fastened to a suitable ground.

The most preferred type of arrester is the outside connection. It may be installed readily where the lead-in is passed through a window or other port. The underwriters' specifications also demand that the arrester be five inches from the side of the house, and that the ground wire from the arrester be as large as the number of wires used in the antenna.

That means that should a two-wire aerial of No. 12 wire be used, the ground wire should be No. 6.

An excellent ground may be had by driving a piece of water pipe four or five feet into the ground. Then the ground wire should be securely soldered to the pipe.

The biting of wires with the teeth instead of using pliers is bad practice, as the teeth marks show sometimes and it doesn't make a good job.

ODE TO DX

Backward! Turn backward,
Oh Time, in thy flight!
Give me New Mexico
Just for tonight.
—N. Y. Evening Mail.

The man who got the scheme to use radio for campaign speeches and income tax duns must have been selling radio supply company stock short, says James J. Montague in the Chicago News.

Film Studios Use the Radio

More and more uses are being found for the radio. Recently, according to Camera Magazine, a radio device whereby a motion picture director may personally page his actors or the members of his staff over an entire studio was tested before Goldwyn officials at Culver City, Calif.

Known as the "public address system," it carries the voice over any area desired up to a radius of three-quarters of a mile.

Thus its use could be confined to the one set on which the company is working, or the director's voice may be broadcasted widely over the studio grounds.

Should the radio device prove practical Goldwyn officials will install it as part of the regular equipment at the Culver City studio.

The tests were supervised by A. L. Santee of the Western Electric Company.

The instrument would save much time and money if successful. It would supplant the call-boy system of sending messages from stages and sets often half a mile from the dressing room tiers.

The invention would also prove of great value in directing mob scenes in which hundreds of persons appear, it is believed. Heretofore directors have had to depend on a corps of assistants to direct large mobs from sidelines or within the mob. This direction can be handled by the director without raising his voice by means of the public address radio.

The instrument amplified the voice 9,000,000,000 times.

It was installed on a large set Marshall Neilan is using for "The Eternal Three," and Neilan directed a scene with its aid.

"Topics" on Radio

Realizing that humor is an essential part of entertainment and having made an exhaustive search for honest-to-goodness funny material, several of the large radio broadcasting stations prevailed upon the producers of "Topics of the Day" to select some special gems of humor for transmitting through the ether.

At first the radio stations were provided with one five-minute program per week. The short program was so successful and popular that now Timely Films, Inc., the producers of "Topics of the Day," are providing three special ten-minute programs weekly.

The humor provided for the radio fans is of narrative style. This material does not lend itself to being condensed for the screen program, which is composed of short, snappy, quickly read paragraphs.

A man buys a radio set, not so much to hear a great orchestra, but to tune that orchestra in and out and thereby show the musicians that they have nothing on him when it comes to bringing out harmony.—N. Y. Evening Mail.

New and Novel Radio Patents

UNIDIRECTIONAL RECEIVING SYSTEM

(Patent No. 1,449,253, issued to Morris Sperry Strock, of Washington, D. C., under date of March 20, 1923.)

The invention provides a radio receiving system.

Figures 1 and 2 show the necessary circuits to produce the effects herein described.

They consist of two radiant energy absorbing means A and B. At 1 is shown a coil of one or more turns of wire commonly called a loop aerial, rotatable about a vertical axis, and 2 is a variable condenser forming a circuit with said loop aerial as shown. Means for inductively coupling radiant energy absorbing means A to radiant energy absorbing means B, are indicated by a coil 3.

The circuit including condenser 10, inductor 9, and coil 8, comprising the radiant energy absorbing means B is considered as having the effect of an open antenna impressing a voltage upon grid 7 which is due to the electrostatic component of the wave.

In Figure 1 a single connection is used between a terminal of the condenser 2 and the filament 4 of a three-element electron tube, said electron tube being a part of a detector-amplifier of electrical oscillations. In Figure 2 a single connection is used between a terminal of the condenser 2 and a terminal

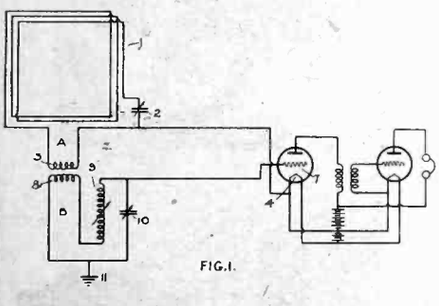


FIG.1.

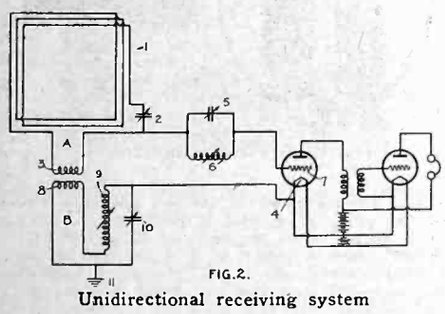


FIG.2.

Unidirectional receiving system

of a variable condenser 5, said condenser being in circuit with a variable inductor 6. The other terminal of condenser 5 is connected to the grid 7 of a three-element electron tube, said electron tube being a part of a detector-amplifier of electrical oscillations.

In Figure 1 a single connection is used from the radiant energy absorbing means B to the grid 7 of a three-element electron tube, said electron tube being part of a detector-amplifier of electrical oscillations, and in Figure 2, a single connection is used from radiant energy absorbing means B to the filament 4 of said electron tube. A coil 8 is used for coupling radiant energy absorbing means B to radiant energy absorbing means A (Figures 1 and 2) or this coil may be a part of the variable inductor 9 forming a circuit with a variable condenser 10 and an earth connection 11.

Radiant energy absorbing means A and B in Figures 1 and 2 are tuned to the frequency of the incoming wave, and the loop aerial is rotated so that its plane is perpendicular to the plane of the incoming wave front. In Figure 2, the circuit consisting of condenser 5 and inductor 6 must be properly adjusted so that a maximum voltage will be impressed upon the grid 7. An alternating voltage of the frequency of the incoming wave is impressed upon the filament 4 (Figures 1 and 2); likewise, an alternating voltage of the frequency of the incoming wave is impressed upon the grid 7. By means of the coupling coils 3 and 8, the electrical energy in radiant energy absorbing means A may be made to aid or oppose the electrical energy in radiant energy absorbing means B. When the loop aerial is in position and the voltages associated with the two radiant energy absorbing means A and B are in phase with each other, the received signal will be of maximum intensity. If the loop aerial 1 now be rotated through 180 degrees, the voltage associated with the radiant energy absorbing means A falls to zero and then appears again but in a different sense, i. e., its phase has shifted 180 degrees. On the other hand, the voltage associated with radiant energy absorbing means B remains unchanged. Hence when the coil is rotated into the new position, the voltages in the two circuits will be out of phase by 180 degrees, so that they will oppose and cancel each other. Thus as the loop aerial is rotated about a vertical axis through 360 degrees, a single position will be found where the signal is of maximum intensity. Mechanical means may be readily adopted to indicate the angular position of the station giving this maximum signal.

VACUUM ELECTRIC DISCHARGE

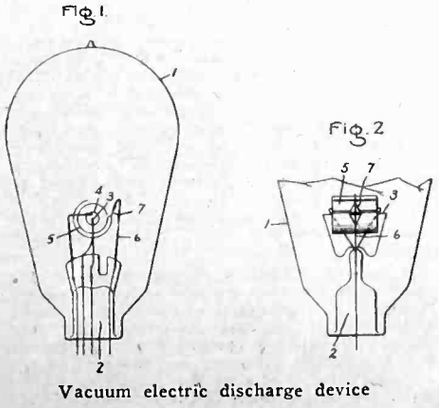
(Patent No. 1,450,413, issued to Herbert W. Edmundson and William T. Munro, of Rugby, England, under date of April 3, 1923.)

This invention relates to vacuum electric discharge devices of the kind known as valves, rectifiers or the like such as are used in wireless telegraphy and for other purposes in which a heated cathode is employed.

The object of our invention is to provide an improved discharge device in which the destructive effects resulting from the heat produced in the anode by the bombardment of the electrons from the cathode are eliminated as far as possible.

According to our invention a shield preferably of metal is mounted within the device in such a position as to cut off the heat radiated from the anode during operation of the device. This shield may be of different shape according to the construction of the discharge device, and is separated from the anode so that the vacuous space between it and the latter serves to prevent it from becoming heated to any considerable extent.

In the drawing, 1 represents an evacuated receptacle provided with the glass stem 2 into which the supporting wires and the conductors through which current is supplied to the various parts are sealed. 3 is a filament adapted to operate as a hot cathode, and 4 is the anode which receives the bombardment of electrons given off by the cathode. Surrounding this anode we provide a shield 5, which is held in place by a support 6 sealed into the stem 2. In the modification illustrated the shield is formed by doubling a sheet of thin metal and bending it into the form of a cylinder, the two portions of the plate being spaced apart so that they form substantially two concentric cylinders concentric with the anode 4, which in this case is shown as a cylinder. The shield 5 may be secured to the supporting wire 6 in any convenient manner, for example, a tongue 7 may be stamped from the sheet in proximity to the bend and bent upwards. This tongue



Vacuum electric discharge device

may be soldered or welded to the end of the supporting wire in any well-known suitable manner.

The shield also prevents conductive material due to the disintegration of the anode or cathode from being deposited on the stem and seals where it is usually largely deposited and where it may act as a conductive bridge between the leading-in wires and impairs the efficiency of the device.

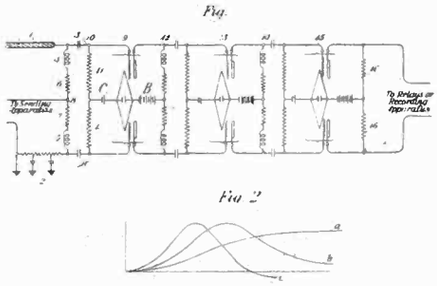
RECEIVING CIRCUITS FOR WEAK SIGNALS

(Patent No. 1,450,969, issued to John R. Carson, of New York, N. Y., under date of April 10, 1923.)

This invention relates to signal transmitting systems and is concerned especially with the receiving end of transmission lines in which there is a considerable amount of distortion and attenuation, as in long submarine cables.

It is well known that in signaling over lines of the character mentioned, the speed is very limited because of the characteristics of the line and many efforts have been made to overcome this difficulty. It has recently been proposed to combine with circuits of this sort correcting networks which restore, to a considerable extent, the original form of the current impulses though adding to the attenuation, and then to amplify the faint but corrected impulses by an amplifier of the thermionic type.

Referring to Figure 1, the main line circuit, here shown as a cable, is indicated at 1 and the balancing artificial line, used for duplex operation is shown at 2. Between the main line and the artificial line is connected the first stage 3 of the correcting network, consisting essentially of inductance elements 4 and 5 and resistance elements 6 and 7. These are symmetrically arranged to provide a central or neutral point 8, to which the sending branch of the duplex set may conveniently be connected as shown on the drawing. The cor-



Receiving circuits for weak signal currents

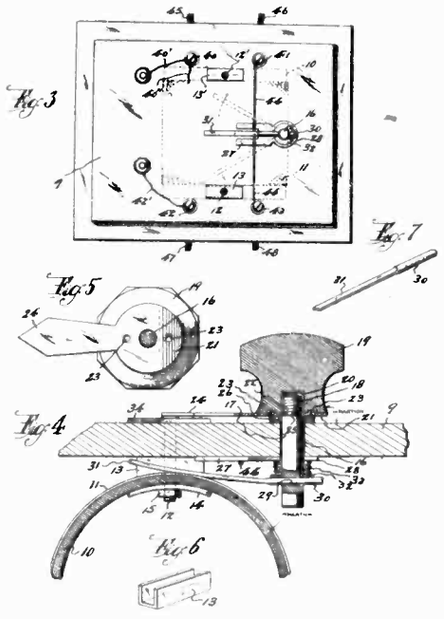
recting network is connected to the first stage of the amplifier 9 through condensers 10, which, for telegraph purposes, should be of large capacity. The circuits from the condensers run to the grids of the first stage of the amplifier, here shown as a duplex thermionic amplifier. It will be understood that any arrangement of amplifier elements, which is symmetrical with respect to the opposite sides of the circuit, will serve the purpose. As shown, each duplex amplifier has two plates, two grids and two filaments, one of each on each side of the neutral conductor.

A single C battery on the input side of the amplifier may be used as indicated and should be connected to the grids through very high resistances 11 to prevent short circuiting the amplifier.

The output circuit from each side of the duplex amplifier runs to one extremity of the next succeeding correcting network 12 and the B battery is connected between the mid point of the network 12 and the filament. The network 12 and succeeding stages of networks and amplifiers shown at 13, 14 and 15 resemble in all particulars the corresponding elements already described. The neutral point for the connection of the B battery of the last amplifier may be conveniently obtained by connecting two equal resistances 16 of high value across the circuit as indicated.

If the circuit at the transmitting end of the line is closed and held closed, the arrival current over the line of the kind under consideration will be represented roughly by curve "a"

in Figure 2. The effect of the inductances 4 and 5 in the first network will be to give a first derivative of this current which may be represented by the curve "b" in Figure 2. The resistances 6 and 7 preserve the arrival curve itself as a component. The combined effect of these components will be to give a current having a sharper rise than the arrival current alone.



Wireless Telephone Receiver

GEHRIG'S RECEIVING APPARATUS

(Patent No. 1,448,207, Issued to W. F. Gehrig, Newark, N. J., under date of March 13, 1923.)

This invention relates, generally, to improvements in wireless telephone apparatus; and, more particularly, to a novel arrangement and mounting of tuning coil and detector devices for wireless telephone receiving sets.

The invention has for its principal object to provide a novel and simple arrangement and mounting of cylindrical tuning coil together with a novel rotary slider switch for co-operation therewith; and the invention has for a further object to provide a neat, simple, cheap and efficient arrangement and mounting of said tuning coil devices together with suitable detector devices for association therewith.

Figure 1 is a side elevation of the apparatus made according to and embodying the principles of this invention, a part of the casing being shown in vertical section to disclose the parts enclosed within the same.

Figure 2 is a plan view of the apparatus.

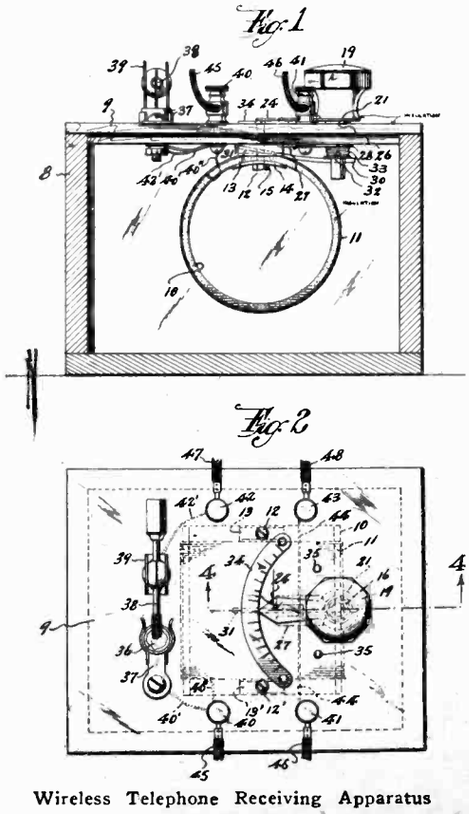
Figure 3 is a bottom plan view of the casing top or cover upon which the apparatus is mounted.

Figure 4 is a detail fragmentary vertical longitudinal section, taken on line 4—4 in Figure 2, the same being drawn on an enlarged scale.

Figure 5 is a bottom plan view of the rotary slider switch handle and its pointer member.

Figure 6 is a perspective view of a spacer block used in connection with the means for fastening the tuning coil element to the underside of the casing top or cover.

Figure 7 is a perspective view of the switch or contact arm of the rotary slider switch element.



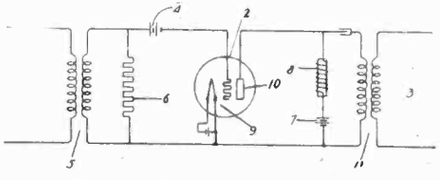
Wireless Telephone Receiving Apparatus

THERMIONIC AMPLIFIER CIRCUIT

(Patent No. 1,448,550. Issued to Harold D. Arnold of Maplewood, N. J., under date of March 13, 1923.)

The invention relates to repeater circuits wherein an electron-discharge device is employed for receiving comparatively weak incoming pulses and for transmitting them in the same form or in a modified form but with amplified energy. Such an amplifier which has a cathode, an anode and a control member usually in the form of a grid electrode, has a very high impedance between control member and cathode which are the usual input electrodes. This impedance is of the order of 25,000 ohms or more being in the nature of a space discharge path between electrodes in a vacuum.

An object of the present invention is to modify the effect of this high input impedance so that it may have any desired finite value.



Thermionic Amplifier Circuits

This is accomplished by connecting the incoming line to the repeater through a transformer, the secondary coil of which is shunted by a high impedance preferably a resistance of the order of 500,000 ohms, and may, for instance, range from approximately 100,000 ohms to 1,000,000 ohms. This resistance is also in shunt to the input electrodes. The impedance between the input electrodes may be made much higher than 500,000 ohms by a battery or other source which maintains the grid negative. The impedance at the secondary side of the transformer is practically that of the 500,000 ohm resistance, as the higher impedance path between the input electrodes takes practically no current or at least a negligible current.

By this arrangement the same amplification can be secured with amplifier tubes having different input impedances, and it is feasible to substitute one such tube for another in a given circuit arrangement.

More uniform amplification may also be secured by this arrangement with varying input power. In the use of amplifier circuits heretofore designed it has been found that there is a tendency for small input voltages to be amplified proportionately more than large input voltages, for the reason that the input impedance of the tube is greater for small voltages than for large voltages, especially when no means is employed for maintaining the control electrode negative with respect to the cathode. By the use of a shunt path of constant resistance less than that between the input electrodes this tendency is substantially eliminated.

It has the advantage, regardless of the function of the vacuum tube or of the circuit in which it is connected, of preventing singing of the repeater in case the output and input circuits thereof are coupled either designedly by an inductive coupling for instance, or accidentally by reason of the proximity of the input and output leads of the repeater.

VARIABLE INDUCTANCE

(Patent No. 1,445,896. Issued to Marvin C. M. Lane, Roselle Park, N. J., under date of Feb. 20, 1923.)

Special objects of the present invention are to combine in a simple, compact structure all the functions of a variometer, variocoupler and variable inductance, which will be capable of a fine degree of tuning throughout a comparatively wide range, including the longer as well as the usual short wave lengths.

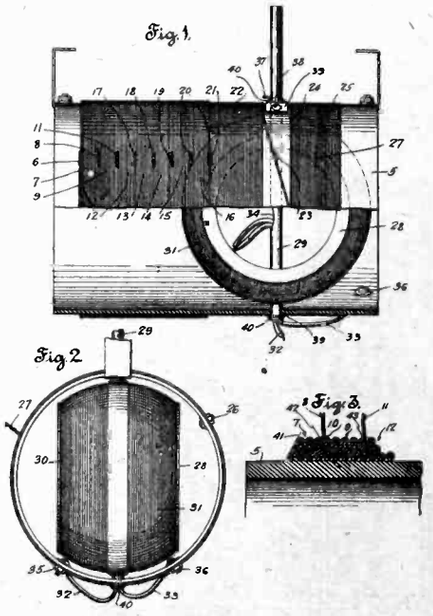
A single tubular core upon which there is placed a bank-wound coil is provided with taps and as a continuation of that a straight wound coil, within which is journaled a rotor so positioned that it can be turned to carry its windings partly beneath the bank-wound coil.

Figure 1 in the drawing referred to is a side elevation and part sectional view of the device.

Figure 2 is an end view of the same.

Figure 3 is an enlarged fragmentary sectional view showing a portion of the bank-winding.

The core or support consists of a tube 5 of insulating material such as bakelite, formica or the like, which may be relatively light, but should be of comparatively large diameter and of a length sufficient to hold the bank-wound and the straight-wound coils.



The Lane Variable Inductance

The bank-winding is started near one end of the core, at 6, and is continued, usually in a three layer winding to form the first section until a point at 8 is reached where a tap is taken off, as by twisting a loop in the wire and then another section 9 is started by carrying the final turn of the first section down onto the core, as shown at 10 in Figure 3. At the end of the second section another tap 11 is taken off, the winding being thus continued section by section, as indicated at 12, 13, 14, 15 and 16, with taps at the end of each section, as shown at 17, 18, 19, 20 and 21.

In the present disclosure the stator winding is also sectionalized and is made as a single layer coil started at the end of the bank-winding. The first section of this single layer stator coil is indicated at 22 extending from the end of the bank-winding to approximately the axis of the rotor, terminating at a tap 23 and having its first terminal at 21 in common with the last section of the bank-winding. The second and third sections 24, 25 of the stator winding are disposed at the opposite side of the rotor axis, the first of these starting at the tap 23, the second ending at the binding screw 26 (Figure 2), and there being an intermediate tap 27 between these two sections. If found desirable, the stator winding may be bank-wound or made as a multiple layer winding.

The rotor is made in the form of a partly spherical core 28 secured on a tubular shaft 29 and carrying at opposite sides of its pivotal axis, coils 30fi 31, connected together and having the end leads 32, 33 passed through an opening 34 in the tubular shaft and brought out the end of the shaft to binding screws 35, 36.

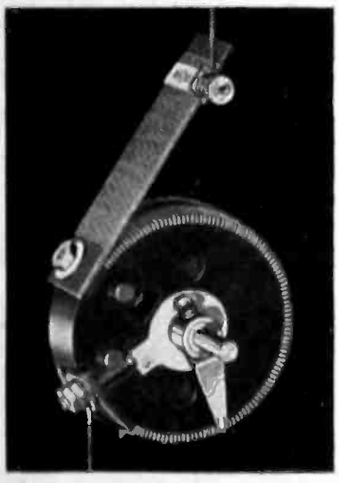
New Rheostat Appliance

WITH the advent of the new one-quarter ampere receiving tube, there has arisen the need of a rheostat of larger resistance than the four to six ohm types now on the market.

When using a fully charged six-volt storage battery, it is necessary to insert a rheostat of about 30 ohms resistance in the circuit to handle the new tube.

To meet this condition, the Cutler-Hammer Mfg. Co. of Milwaukee, Wis., has developed a variable condenser of 25 ohms to be used with the standard rheostats now on existing apparatus.

It is not necessary to remove the rheostat now on your set. Simply unscrew the binding nut from one terminal of the rheostat,



New Radio resistance unit attached to rheostat

remove the wire and slip eyelet of C-H resistance unit over the binding post. Replace nut, tighten, and fasten loose wire to binding post on slider of C-H unit.

Switch on the "A" battery, move the slider to the best operating point and use rheostat in the usual way. By the use of these additional units it is a simple matter to adapt the rheostats on your set to the use of the new amplifying tubes. This change-over is well worth while, as the one-quarter ampere tube not only takes one-fourth of the current as compared to the older tubes, but increases the volume and clearness of reception to a remarkable degree.

Vacationing With Radio

(continued from page 10)

young man and boy and new genius will be fostered which may discover the way to entirely overcome atmospheric disturbances. At present it constitutes a challenge to the inventive abilities of those interested in radio and some day it will be conquered.

While many vacationists are making use of radio as a summer playmate, the hundreds of thousands of fans throughout the nation will continue to find radio a true friend, ever ready to provide a song, dance music, band music, a lecture or a play or other form of entertainment when the day's work is done. One reason for this is that the broadcasting stations are rapidly developing the art of broadcasting, are making their programs more attractive each day and are elevating the standard of entertainment that is being furnished.

You can write in red letters across the months June, July and August: "This is a radio summer!"

Pacific Steamship Picks Up WGY

WGY was recently picked up by the Steamship Ebro of the Pacific Steam Navigation Company when one day out from the Juan Fernandez Island, west of Valparaiso, Chile, about 5,400 miles from Schenectady, N. Y., the home of the General Electric Company broadcasting station.

Information of the long distance reception was contained in a letter from W. F. Robertson of Cincinnati, Ohio, who was a passenger on the boat. Mr. Robertson stated that the ship's radio operators were using his set, and that the WGY concert was heard on the night of February 16.

WGY has been heard greater distances than Mr. Robertson reports, but reception has never been reported so far south as the Juan Fernandez Islands. The distance is remarkable because of the heavy static customarily encountered by operators when 10 to 20 degrees north or south of the equator.

The boy at the seaside now chirps (as he slaps on his headset) "What are the damp waves saying?"

The Mississippi River is now the dividing line between the K calls on the west and the W calls of the east. All new calls issued to stations east of the Mississippi will begin with W hereafter.

The boy that sits at home at night with his radio set trying to tune in Troy, Denver or Davenport, isn't apt to be mixed up in a pool room brawl or overhear a lot of cigar store scandal, so don't discourage him.

Speaking of the fitness of things, the Detroit police department's radio station is known as "KOP."

DON'T FAIL TO READ RADIO TOPICS' WONDERFUL OFFERS ON PAGES 40 AND 42.

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MORE THAN A LOUD SPEAKER, the AUDIOPHONE is a real reproducer of the original broadcasting. It is easy to listen to the Audiophone reproduction because it is so perfect. The speech, songs and instrumental music are not blurred or disguised by mechanical distortion. You get all the fine shadings and every inflection. In fact, the very personality of the artist seems to be present as you listen.

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The Cat's Whiskers

By

AUNT ENNA

I SEE they are going to chase icebergs this summer. The International Ice Patrol Service, which begins work this month, has its cutter, Tampa, all equipped with a radio outfit and will report the location of dangerous ice near the transatlantic steamship lane. It works on 600 meters, so if you get a call from KFOG don't think some one is kidding you, but hurry out and give them all the assistance you can.

No, James, a peanut tube is not made out of a peanut. You can get quite a few peanuts for the price of one peanut tube.

The University of Pennsylvania is going to study radio. They have quite a few pupils already familiar with the grid, so the rest of it ought to be easy sailing.

By the way, there's a former saloon in Chicago now occupied by a radio supply store, and on Saturday afternoon when business is good they stand four deep along the counter where the old bar used to be. Some folks go on a regular radio jag when they go out to buy parts and I suppose this is responsible for it.

Ain't Science Wonderful

(*From Chicago Herald-Examiner*)

Little Willie Weems of Sudbury, Mass., aged 4 years, has recently made a radio broadcasting machine out of a cigar box, an old birdcage and a discarded battery out of his father's automobile.

Last week he performed the miraculous stunt of sending a message to Honolulu and receiving a reply from the chief of police of that city.

This is believed to be the longest distance ever covered by a machine made by a 4-year-old boy.

A western genius has hooked a radio machine up with a washing machine, and the energy expended in radio programs is transformed into power to run the machine, which enables his wife to take in twice as many washings as heretofore.

The trouble is that the wife has to do most of the washings at night, when radio programs are rampant, and so she has to sleep in the day time, forcing the genius to get his own meals.

Ford Runs 57 Miles on Gallon of Gasoline

A new automatic and self-regulating device has been invented by John A. Stransky, 12 Fourth St., Pukwana, South Dakota, with which automobiles have made from 40 to 57 miles on a gallon of gasoline. It removes all carbon and prevents spark plug trouble and overheating. It can be installed by anyone in five minutes. Mr. Stransky wants agents and is willing to send a sample at his own risk. Write him today.—Adv.

ELEMENTARY ELECTRICAL PRINCIPLES

(Continued from page 16)

one what would otherwise require three different meters. It saves in this way additional expense.

Now we will say a few words in regard to ammeters. The ammeter is another device which is so necessary to the electrician and radio man. Unless we have an ammeter in the circuit we do not know what current is flowing. This ammeter is, therefore, our compass for pointing out current values. It tells us just what speed the current is taking.

Certain wires, as specified in the National Electrical Code, are limited as to their current-carrying capacities. For instance, a No. 14 copper wire, if rubber covered, is allowed but 15 amperes; if any other insulation is on this No. 14 wire the wire is allowed to carry 20 amperes. This is because the rubber is a poor radiator of heat, poorer than any other insulation which is used for covering wires. But we need not necessarily confine our attention to No. 14 wire; we may think of any other type.

Heat is developed whenever current is flowing over a conductor. The amount of this heat depends upon the amount of current. In this day of "safety first" all people who handle electricity must be aware of the consequences incurred through the overloading of conductors. Fires are started which result in millions of dollars' worth of damage each year, simply by the carelessness of wiring installations and forcing greater current over wires than they are able to carry in safety. How do we know just what the speed of the current is if we do not have an ammeter which will guide us in our work? With the ammeter we are not lost; we know exactly where we are.

* * *

The general make-up of the ammeter is quite similar to the voltmeter as far as the electromagnetic principle is concerned. There is one decided difference, however, which is explained as follows: The ammeter is placed in series with the line instead of across the line as in the case of the voltmeter. Electromagnetism is the operating principle here also.

Let us take a 10 ampere instrument. Let us say that out of this 10 amperes, 9.95 amperes flow directly across the shunt; the remaining 0.05 will flow up and around the winding of the movable coil. The scale is marked to read, however, the full 10 amperes and the needle will deflect over the entire scale when in reality the movable coil itself is only passing the 0.05 ampere. That is, the instrument is calibrated to read the entire current flowing over the two paths in parallel. It is apparent that the little movable coil could not be delicately constructed with the large wire necessary to carry the entire 10 amperes, so this divided path method is used. You must remember that sensitiveness is required and nothing clumsy can enter into the construction of a meter where accurate readings are required, hence the finer the wire on the movable coil, the greater delicacy at which the coil swings back and forth between the permanent magnetic poles.

Here also, we may speak of the overloading of the ammeter. If we take this instrument which is designed for 10 amperes and send 20 amperes through it, since the relation of the shunt and movable coil winding remains constant, the current will be doubled which passes through the little coil. This means that the coil winding which was designed to carry the 0.05 ampere will now have to carry 0.1 ampere and this will burn out the coil winding.

* * *

There is really no need to elaborate on the "why" of the ammeter being across the line. The fact is obvious that since the shunt is of rather low resistance, to place the ammeter directly across the line simply means a short-circuit at which time either the line fuses will be blown or the instrument will be burned out. It would be just the same as laying a heavy iron bar smack across the line wires. Yet some uninformed persons do this very trick and suffer the consequences. A great rush of current will flow over the shunt and also a proportionately great rush through the coil winding in parallel with it.

You have just been told what will happen if the ammeter is connected improperly; a word might be added as to the improper connection of the voltmeter. Since the voltmeter's resistance is very high, if it is inserted in the line wires as is the ammeter, you can plainly see here what the result will be. If we take a voltmeter of several thousand ohms resistance and place this resistance in series with the line, we only add to the resistance of the line. Suppose the line is feeding an incandescent lamp, the lamp cannot receive its proper current because this current is held back due to the extremely high voltmeter resistance.

There should be no use of any one underestimating the value of electricity measuring instruments. They are as important to the radio and electrical man as the compass is to the pilot at sea. We should experiment along the proper lines and we must bear in mind all the time that measurements are imperative under all conditions. Without the meters we go around blindfolded and never know where we stand or what we are doing. It is well worth while to invest in these meters, for they mean worlds to one who is endeavoring to study electricity systematically and make progress in electrical science. With them there is no "hit and miss." Since power is measured in watts, it is easy to use the voltmeter and ammeter, multiplying the two readings and thereby determining the power being used.

The second series will be devoted to discussions and problems dealing with Elementary Alternating Currents, and will include the following subjects: principles of single phase A. C.; inductance; capacity; reactance; impedance; power-factor; alternating current calculations; transformers, and other subjects of fundamental value to all radio men. The students in this course are urged to continue with their good work during the following issues of RADIO TOPICS and derive much wholesome information through study of the next six lessons, beginning with the September number. It is not the intention of the writer to "go over the heads" of the men, but to deal with big principles in an elementary manner understandable to all his students and void of extremely technical and mathematical details.

Students are requested to work the following problems and submit answers at once. This is the last lesson of the series.

Problems

1. A certain voltmeter has a scale designed for 110 volts. The current through the movable coil is limited to 0.002 ampere. What is the resistance of the entire internal winding? If the coil winding itself has a resistance of 1,000 ohms, what must be the ohm value of the additional resistance coil inside of the instrument case?

2. An amateur is designed to operate at a maximum of 50 amperes. The resistance of the shunt is 0.005 ohm. Suppose the instrument is improperly connected, that is, across the line instead of in series with it. If the line voltage is 120, how much current will pass through the ammeter? What will be the result?

3. An incandescent lamp of 220 ohms resistance is connected to a 110 volt circuit. How much current will the lamp receive? Now if you connect a voltmeter incorrectly, that is, in series withe the line instead of across the line, how much current will the lamp receive if the voltmeter resistance is 6,000 ohms? What will be the candle-power effect of the lamp? Will the voltmeter be injured? Supposing such a thing were possible that the voltmeter movable coil would actually carry the full lamp current, what voltage would be necessary to give the lamp this current?

4. A voltmeter having a resistance of 25,000 ohms is left on a 110 circuit continuously for one year of 365 days and 24 hours per day. If the cost per kilowatt-hour of electricity is 5 cents, what will be the total bill for the year? Voltmeters in power plants are treated in this manner. Do you consider it an undue expense to maintain this continuous operation? If not, why not?

5. Suppose you wish to determine the voltage of an electric line and you have no voltmeter obtainable. Just how would you get your information as to how much pressure the line was carrying? Apply this also to the amount of current flowing in the line. How might you determine this?

(Mail your answers to RADIO TOPICS, Oak Park, Ill., not later than June 15, 1923.)

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Highest grade made. Brilliant black composition. Figures inlaid in white enamel. For ¼" or 3/16" shaft.

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2, 3/16" high, ¼" dia., 6/32" thread, doz. ..... .35
3, 3/16"x3/16", 4-36 thread, doz... .35
4, ¼" dia., ⅛" thick; shank 6/32" doz. ..... .40
5, ¼" dia., 3/16" thick; shank 4-36, doz. .40
6, 3/16" dia., 3/16" thick; shank 4-36, doz. .40
7, 3/16" dia., ⅛" thick; shank 4-36, doz. .40
75, Switch Stop ⅞" long, 4-36 thread, complete with nut, each ..... .04
76, New style Switch Point, to be pressed into bakelite panels with forced fit. Wire is soldered to pin end. Head ¼" dia., 1/16" thick, doz. ..... .40
77, same as above, but head is ¼" dia. x 3/16" thick, doz. ..... .40

SOCKETTES

Substitute for Vacuum Tube Socket. Four of these take one Vacuum Tube. Grasp tube firmly. Best contact possible. Take less room. Are better.

R-1550, Sockettes, nickeled, set of 4 .....$.25

R-1551 Sockettes, nickeled, set of 4 (to take WD-11 Tube) ..... .25

Note: Set of 4 sufficient to hold 1 Tube.

VACUUM TUBE FUSES

Insure your tubes against blow outs.

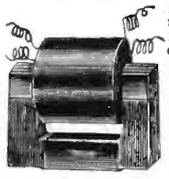
R-2575, Fuse, 1 ampere.....$.15
R-2576, Fuse, 1½ ampere ..... .15
R-2577, Fuse, 2 ampere ..... .15

UNIVERSAL BEARING

THE bearing to hold variometer and variocoupler rotors. Total length of bearing 2¼". Outside shaft, 1¼". Length of thread 1". Length of threaded sleeve, ¾".

R-1375, Bearing .....$.25

AUDIO FREQUENCY TRANSFORMERS



No better Transformer on the market. Highest class materials. Impregnated coils. Silicon steel stampings used. Save 50 per cent by assembling it yourself.

R-1100, A.F. Transformer, ratio 4¼ to 1 .....$2.65
R-1150, A.F. Transformer, ratio 6½ to 1 ..... 2.65

HONEYCOMB COILS

No better coils on the market. Too well known for lengthy description. Firm impregnation. Range given is in meters when varied with a .001 Variable Condenser:

No.	Turns	Range	Price
R-5000	25	120- 250	$ .40
R-5001	35	175- 450	.45
R-5002	50	240- 720	.50
R-5003	75	390- 910	.55
R-5004	100	500- 1150	.60
R-5005	150	600- 2000	.65
R-5006	200	900- 2500	.75
R-5007	250	1200- 3500	.80
R-5008	300	1500- 4500	.85
R-5009	400	2000- 5000	1.00
R-5010	500	2800- 6100	1.15
R-5011	600	4000-10000	1.30
R-5012	750	5000-12000	1.45
R-5013	1000	7900-15000	1.70
R-5014	1250	9750-19500	1.95
R-5015	1500	14500-26500	2.20

CORD TIP JACKS

Take the place of binding posts on instruments or panel. Cord tip firmly gripped by jack. Made of brass, highly nickel-plated and polished. Screw to attach lead wire. No soldering necessary.

R-1500, Cord Tip Jack, each.....$.15

CARDBOARD TUBING

Only seamless tubing made in United States. Perfectly seasoned. Heavy wall. (I.D.—Inside Diameter. O.D.—Outside Diameter. L.—Length).

R-6600, 3" I.D., 3¼" O.D. x 7" L. .....$.30
R-6601, 3½" I.D., 3¾" O.D. x 7" L..... .35
R-6602, 3¼" I.D., 3½" O.D. x 5" L.... .25
R-6603, 3¾" I.D., 4" O.D. x 5" L..... .27
R-6604, 4" I.D., 4¼" O.D. x 5" L..... .35
R-6605, 2¾" I.D. 3" O.D. x 2⅜" L..... .15

MICANITE TUBING

Especially suitable for CW work Nothing better made. Natural color.

R-250, Micanite Tubing, 4" dia., 6" long $1.20
R-251, Micanite Tubing, 6" dia., 6" long 1.60

JACKS AND PLUGS

Best material. Only pure silver contacts used. Factory that makes Postal Telegraph jacks makes these. This is your guarantee.

R-1000, Jack, 4-springs double circuit .....$ .75
R-1001, Jack, 3-springs .80
R-1002, Automatic 5-spring Jack..... 1.00
R-1003, Plug ..... .65

BUS BAR WIRE

This wire is square, measuring 1/16" by 1/16". Easy to solder as it is already tinned. Used on all up-to-date instruments. Sold in 2-foot lengths only.

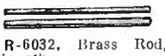
R-6400 Bus Bar Wire, per 2-foot length..$.05

NON-INDUCTIVE RESISTANCE

Made of special graphite copper-plated at the ends. Round rods 1¾" long, ¼" diameter. Resistance accurate within 20 per cent.

R-5300 Resistance 12,000 ohms.....$.65
R-5301, Resistance 70,000 ohms..... .65

BRASS RODS



Sold in 6" lengths only

R-8032, Brass Rod, 8/32" thread, per length .....$.08
R-6032, Brass Rod, 6/32" thread, per length ..... .06
R-1425, Brass Rod, plain ¼" round, per length ..... .10
R-3616 Brass Rod, plain 3/16" round, per length ..... .06

"RASCO" BABY DETECTOR

Base is solid black composition; mounted on same is nickel holder and binding post, which holds the fluted hard rubber knob with its sliding rod member. Patent nickel detector cup and binding post. Patent cup holds crystal.

R-1898, Baby Detector, with Galena .....$.50

"RASCO" LUBRICATED PANEL SWITCH

Our patent spring fork holds the switch handle always at a uniform tension. At the same time it insures best contact possible. New wiping contact covers every portion of the switch point. Double leaf blades used.

R-1921, "Rasco" Switch .....$.40

PANEL SWITCH LEVER

Imposible for this lever not to make positive contact. Leg radius 1¼". Nickel-plated and polished. Lock fork holds the screw (in which it rotates) securely. Loose contact impossible.

R-200. Switch Lever .....$.30

"RASCO" NAME PLATES

The circular plate is our new Binding Post Name Plate. Diameter, ¾". These denominations: "PHONES, GROUND, —, OUTPUT, "A" BATTERY—, "B" BATTERY—, LOUD SPEAKER, GRID, LOAD, "C" BATTERY—, AERIAL, +, INPUT, "A" BATTERY+ "B" BATTERY +, LOOP, TICKLER, PLATE, "C" BATTERY +, FILAMENT.

R-6000 to 6019. Binding Post Name Plates, each denomination .....$.03
Dozen ..... .30

Square Name Plates

Same denominations as above also these: SERIES 1st STEP, 2nd STEP, 3rd STEP, SECONDARY CONDENSER, TELEPHONE, SECONDARY, DETECTOR, TRANSMIT, GRID VARIOMETER, PARALLEL, COUPLING, PRIMARY, LOADING COIL, RECEIVE, ANTENNA, PLATE VARIOMTER, "BLANK", AUDION, ON, OFF.

R-834 to 866. Square Name Plates, each..$.04
Dozen ..... .40
R-839 "INCREASE CURRENT" (Right)
R-840 "INCREASE CURRENT" (Left)
Each ..... .10

VERNIER

Cleverest vernier made. Can be used with any dial. Soft rubber ring engages dial. Does away with vernier condenser. We guarantee results. All metal parts moulded in best black composition. Nothing to come apart. Biggest hit of the season.

R-1450, Vernier .....$.30

"RASCO" CONDENSERS

R-5050, Phone Condensers, each.....$.20
R-5056, Grid Condensers, each..... .20
R-5059, Grid Leak Condensers, each ..... .30

COPPER FOIL

Thinnest copper foil made, .001" thick. Comes 4" wide.

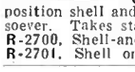
R-5025, Coper Foil, per ft. $.10
10-ft. length ..... .80

RADIO CEMENT

Weather resisting. Used particularly for cementing covered wires. Coils covered with this cement require no form. Wires hold together solely with this cement.

R-1750, Cement, 2-oz. bottle $.50

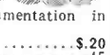
TELEPHONE SHELL AND CAP



For the experimenter we list this composition shell and cap. No holes in shell whatsoever. Takes standard 2⅛" diaphragm.

R-2700, Shell-and-Cap, complete .....$.65
R-2701, Shell only ..... .40

MICA DIAPHRAGMS



Made of special India mica in two sizes, 2⅛" diameter and 1-13/16" diameter. Excellent for experimentation in telephone work.

R-2550, Diaphragm, 2⅛" .....$.20
R-2551, Diaphragm, 1-13/16" ..... .15

RHEOSTAT WINDINGS

These windings, with the switch arm shown below, constitute a complete rheostat for the experimenter. Resistance wound on flexible black fibre. Carries 1½ amperes, resistance 6 ohms.

R-4300, Rheostat Resistance each .....$.20
R-4301, Potentiometer Resistance, each (200 ohms) 35

BLADE WITH COLLAR
Fits above.
R-1675, each .....$.10

MAGNET WIRE

We list only best qualities. "DCC" means Double Cotton Covered. "GS" means Green Silk. "E" stands for Enameled. The following come on 8-ounce spools:

R-2500, DCC No. 18 .....$ .50
R-2501, DCC No. 20 ..... .60
R-2502, DCC No. 22 ..... .75
R-2503, DCC No. 24 ..... .85
R-2504, DCC No. 26 ..... .95
R-2505, DCC No. 28 ..... 1.15
R-2506, DCC No. 30 ..... 1.65

The following come on 4-ounce spools:

R-2507, GS No. 20 .....$ .50
R-2508, GS No. 22 ..... .55
R-2509, GS No. 24 ..... .60
R-2510, GS No. 26 ..... .65
R-2511, GS No. 30 ..... 1.05
R-2512, GS No. 32 ..... 1.30
R-2513 GS No. 36 ..... 1.85

The following come on 8-ounce spools:

R-2514, E No. 20 .....$ .45
R-2515, E No. 22 ..... .55
R-2516, E No. 24 ..... .60
R-2517, E No. 26 ..... .65
R-2518, E No. 30 ..... .70
R-2519, E No. 32 ..... .80
R-2520, E No. 36 ..... 1.00

LITZ WIRE

R-323, equals No. 25 B&S, per foot .....$.02
R-890, equals No. 28 B&S, per foot ..... .01
R-891, equals No. 21 B&S, per foot ..... .03
R-892, equals No. 20 B&S per foot ..... .04
R-893, equals No. 14 B&S, per foot ..... .12

Discounts of 10 per cent in 100-foot lots.

The "Rasco" Catalog

CONTAINS 75 VACUUM TUBE HOOK-UPS, 300 ILLUSTRATIONS
500 ARTICLES, 68 PAGES

All Armstrong Circuits: These important circuits are explained clearly, all values having been given leaving out nothing that could puzzle you.

Just to name a few of the Vacuum Tube circuits: The V.T as a detector and one-step amplifier; Armstrong circuits; one-step radio frequency amplifier and detector; three stage audio - frequency amplifier; short wave regenerative circuits; 4-stage radio frequency amplifiers; radio and audio frequency amplifier; inductively coupled amplifier; Armstrong superautodyne; radio frequency amplifier and crystal detector; combination V.T. detector one stage amplifier; two stage radio frequency amplifier and detector with feedback coupling (regenerative); regenerative receiver, using single spider web coil; Armstrong super-regenerative circuit; two stage radio frequency amplifier coupled to a two-circuit tuner, using two-slide tuner regenerative receiver; two stage audio-frequency amplifier, using crystal or V.T.; one stage radio frequency detector, two stages audio-frequency with feed-back coupling to first tube; power amplifier with loud speaker; regenerative receiver and one stage amplifier for DX work; one stage radio frequency detector with feed-back coupling; three stages radio frequency, two stages audio-frequency loop reception; crystal detector with rectification; one tube super-regenerative receiver; short wave regenerative receiver with two variocouplers, capacity-coupled tuner; trap circuit to eliminate interference; selective circuit to eliminate interference The catalog contains 300 illustrations. On account of its great cost, it cannot be distributed free of charge. Mailed only upon receipt of

15 Cents in Stamps or Coin.

This business was originated with the sole idea in mind to cater to the radio amateur who has small orders. ALL OF OUR ORDERS ARE SMALL. THAT IS WHY YOUR SMALL ORDER CAN NEVER BE SIDE-TRACKED BY US. A trial order will make you a life customer. Order from the above illustrations. 24-hour service guaranteed. "WE CAN ONLY DISAPPOINT YOU ONCE." Try us with a 50c. order and make us prove what we say. Prices include delivery to your door.

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96B Park Place, New York City

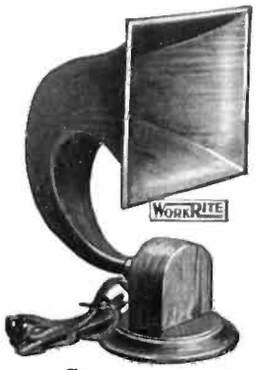
Oldest and Original Exclusive Radio Parts House in U. S.

Factories: Brooklyn, N. Y. — Elkridge, Md.

DEALERS
Get Our Special Proposition

WorkRite Reduces Prices

Good News for Radio Fans



Concertola, Jr.

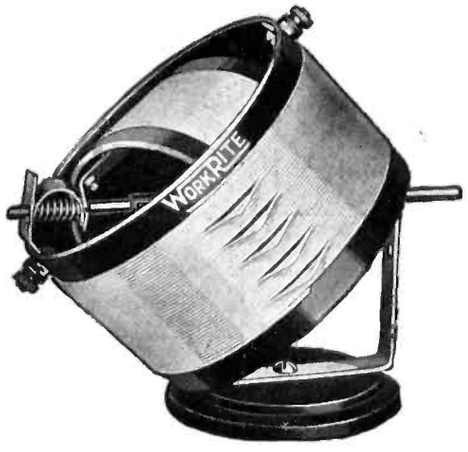
Here is the opportunity for you to get WorkRite Variometers and Variocouplers at prices less than those asked for inferior unknown instruments. The new WorkRite Super Variometer and WorkRite Super 180° Variocoupler, with 12 taps and wound with green silk are now $3.50 each. Last spring they sold for $6.00.

Don't wait any longer. Equip your set with WorkRite parts at once. Remember the prices.

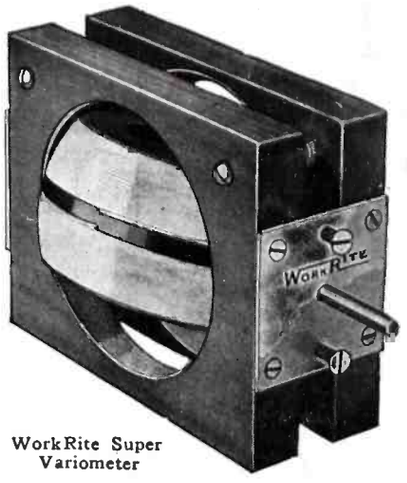
WorkRite Super Variometer, each.....$3.50
WorkRite 180° Super Variocoupler, each.....$3.50

Faith in You

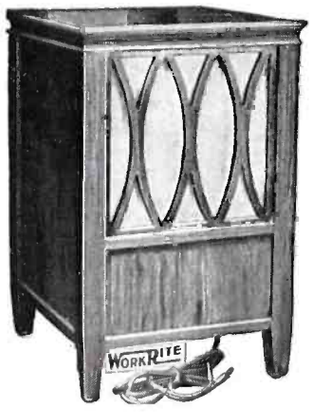
is what caused us to make this big reduction in prices. In order to maintain it we must increase our sales largely. We must sell 10 instruments where we previously sold one. But we know that you will justify us in this faith.



WorkRite 180° Super-Variocoupler



WorkRite Super Variometer



Concertola, Sr.

WorkRite Concertolas

These Loud Speakers are becoming more popular every day. And no wonder when you consider that they have no metal except in the phone units and therefore do away with that "tin-panny" tone entirely.

READ WHAT ONE OF THE THOUSANDS OF CONCERTOLA FANS WRITES US:

Regarding the WorkRite Concertola received some time ago, I wish to advise that it is the best $12.00 worth I have ever bought. Stations in the following cities have all come in very QSA, even on warm nights, with the Concertola: St. Louis, Louisville, Pittsburgh, Detroit, Schenectady, Dallas, Texas, Fort Worth, Texas, Atlanta, Ga., Havana, Cuba, Charlotte, N. C., Chicago, Cleveland and many others. These stations can be heard all over the room with ease on warm nights, and all over the house on colder nights. With every good word for the Concertola, I am, EARL E. DAESCH,

1103 Columbia Terrace, Parkersburg, W. Va.

Complete List of WorkRite Products

Three Day Trial! If after you have tried the Concertola on your set you find that it does not work satisfactorily return it and we will refund your money.

These instruments are designed for use with vacuum tube sets having two-stage amplification.

WorkRite Concertola, Jr., with Cord and Phone Unit.....$12.00
WorkRite Concertola, Sr., with Cord and Phone Unit.....$24.00
WorkRite Super Variometer. Very sensitive and sharp to tune. Price $3.50
WorkRite 180° Super Variocoupler. Range 180 to 800 meters. Price $3.50
WorkRite Concert Headset. Try a WorkRite side by side with any on the market. Price.....$8.50
WorkRite E-Z-Tune Dial. Has a grip on the rim where you can grasp it for fine adjustments. Price 75c
WorkRite Super Vernier Rheostat. Has 50,000 possible adjustments. Price $1.50
WorkRite Type "A" Hydrometer. You need one to keep your "A" Battery in condition. Price.....75c

WorkRite Concertolas.
Loud Speakers of Quality.

WorkRite Concertola, Jr.....$12.00
WorkRite Concertola, Sr.....$24.00

THE WORKRITE MFG. CO.

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CLEVELAND, OHIO

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