

Radio Digest

EVERY
WEEK

Illustrated

TEN
CENTS

TRADE-MARK

Vol. III

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CHICAGO, ILL., SATURDAY, OCTOBER 21, 1922

No. 2

VOICE CROSSES OCEAN

INVENTS SIMPLEST CIRCUIT—ONE TUBE

EASTERN ENGINEER'S DE-
VICE SUCCESS IN TESTS

Massachusetts Experimenter Gets Su-
per-Regenerative Effect Using No
Large Inductances

(By Special Correspondent)

WAKEFIELD, MASS. — What is claimed to be the simplest circuit yet for obtaining super-regeneration yet devised, has been invented by Edmund T. Flewelling of Hart's Hill Park, Wakefield, an electrical engineer. Dozens of tests of this new circuit have been made by Mr. Flewelling, some of them in the laboratory of Dr. Greenleaf W. Pickard, and none of them has yet failed to do what was desired.

Many letters have been received by Mr. Flewelling from those who have tried out his circuit and from Radio engineers, who declare that it is not a modification of the Armstrong super-regenerative circuit that he has obtained, but an entirely new form of hook-up. As to whether this is so remains to be proved through the United States Patent Office, for Mr. Flewelling has filed a caveat, preparatory to applying for a patent. The matter is now up to the Radio experts of the United States Patent Office.

Secures Super Effect Simply

Authorities on the subject express the opinion that anyway, Mr. Flewelling's method is the simplest possible arrangement for obtaining super-regenerative results with one tube.

The Flewelling circuit does away with all large inductances, such as are found with the Armstrong circuits, fixed capacities being used instead, which are not at all critical as to values. Where an inductance is required in the plate circuit, the inductance of the telephone receivers has been made use of.

Two Adjustments Tune Circuit

Only two adjustments are required in the circuit. The first is the tuning of the grid circuit through a small variable capacity, and second, an electromagnetic feed-back to the grid circuit from the plate circuit, which he gets by the coupling together of the two circuits with a variocoupler or other similar means, such as a honeycomb coil mounting.

There are added to the ordinary apparatus called for by the regenerative receiver, three small fixed condensers and a resistance unit. Only one tube is used. This handles the various functions neces-

(Continued on page 4)

FAIR SEX JUDGE TO TELL 'EM BY PHONE

CLEVELAND, O.—Judge Florence E. Allen, first woman common pleas judge in the country and an independent candidate for the Ohio supreme court, is planning to do part of her campaigning this year by Radio. A committee is negotiating with broadcasting stations to get messages from Judge Allen's headquarters distributed throughout the state.



Sir Thomas Lipton can't seem to take a certain yachting cup back to England with him, but he succeeded in his second trial at sending his voice from Station WOR at Newark, N. J., across the broad Atlantic Ocean to London. Sir Thomas is shown here at the WOR microphone, famous for the beautiful lady announcer who uses it daily. © K. & H.

LIPTON, IN U. S., TALKS TO LONDON

Second Trial from Station
WOR, Newark, Is Complete
Success

Only 500 Watts Used

Famous English Yachtsman Agrees
to Duplicate Feat at Class
"B" Plant

(By Special Correspondent)

NEWARK, N. J.—Sir Thomas Lipton, the internationally known yachtsman, succeeded in his second attempt October 5 to Radiophone from Station WOR, of L. Bamberger and Co., in Newark, N. J., to his friend, the English merchant Selfridge, in London, England. This was the second attempt by this same station to get the voice of Sir Lipton across the Atlantic and one of the first times the Atlantic has been bridged by the voice with so low a power. The first tests, which were conducted Sunday morning, October 1st, at 1 A. M., were not altogether successful, although a woman's voice had been received in London.

The second tests were very successful. Mr. Selfridge, of London, who was on the receiving end, sent a cable to the Station WOR, the morning following the broadcast. This cablegram read as follows: "Tests more successful. Shelbourne Society and other experts agree voice heard 8:10 and 8:50 your time, also steady carrier wave during test. Difficulty in breaking. Great interest shown on this side. Will make more tests. (Signed) Selfridge."

Lipton Guest of Honor

The tests were conducted on this side on October 6th, from 8 to 9 P. M., Eastern Standard Time, which corresponded to 1 and 2 o'clock A. M. in England. Sir Thomas Lipton, who was the guest of honor of Station WOR, spoke very interestingly on the possibilities of Radio broadcasting.

"I hope the time will soon come," said Sir Lipton, addressing the big Radio au-

(Continued on page 2)

KDKA and WLB Furnish Range Study Material

Nearly 1,000 Reports Received in
Test

MINNEAPOLIS, MINN.—Nearly 1,000 reports have been received on the signals transmitted from stations KDKA and WLB. A preliminary analysis of 500 reports on transmissions from the former station has been made using a sorting and counting machine loaned by the census bureau.

A report has been prepared describing this study entitled "A Preliminary Statistical Study of the Range of Radio Transmitting Stations." Brief attention has been given to the application of the theory of probability to the results of this transmission test. Plans have been made to continue the test through the assistance of the Department of Agriculture, a representative of that department carrying out his work in this city as a member of the staff of the Bureau of Standards.

BOOST CAPITAL DAILY AS CONVENTION CENTER

Publicity Spread by Noon-day
Broadcasts

WASHINGTON.—Messages are to be broadcast throughout the United States every day at noon, Eastern time, concerning Washington's advantages as a convention site.

The Imperial Council meeting of the Shrine, which is to be held in this city next June, is the immediate vehicle for this publicity. The following message is now being broadcast:

"Almas Temple of the Mystic Shrine invites you to come home the first week of next June to the Imperial Council and bring all the folks. Eats, fireworks and everything."

BERLIN, GERMANY.—An electric concern of this city has applied for a patent on a clock which is to be corrected, set and wound by Radio.

FIRST TEXANS WED BY ETHER WAVE GET SET

SAN ANTONIO, TEX.—Miss Clemie G. Crow and Edmund C. Schleyer are the first Texas couple to be wed by Radio. Dr. E. Gates, pastor of the First Baptist Church, performed the ceremony at Station WOAI. More than \$500 worth of electrical appliances, including a handsome Radio receiving set, were given to the lucky pair by local dealers.

RADIO GETS CREDIT IN C-2'S RECORD FLIGHT



VOICE CROSSES OCEAN

(Continued from page 1)

dience in this country and in England as well, "when England will be able to hear the results of the American World Series, as sent out from the polo grounds. I'm thinking also how nice it would be if the races of the Shamrock against its many competitors could be sent home as the winner passes the line. That would be interesting indeed."

Station WOR is a Class "B" license, and transmits on 400 meters. Only 500 watts of energy were used for the transatlantic tests. WOR has been heard 2,400 miles overland.

Will Duplicate Feat

Sir Thomas Lipton has become an ardent Radio fan. He has agreed to come to Station WOR again, and will speak as many times as are necessary until everyone is convinced that his voice has carried clearly over to his home country.

Sir Lipton's humor has been one of his main characteristics. Recently, at the Newark Radio Show, held in the Robert Treat Hotel in Newark, he was called upon to present a cup to an amateur winner in a contest, Burnies Johnson. In presenting the cup to the winner, he said, "Tell me how you do it! I've been trying to win one for 12 years!"

The WOR management is very enthusiastic about the success of the tests. It was said that no further public tests would go on with Europe. Perhaps English Radio fans will succeed in developing better apparatus which will be able to receive music and other items from American stations.

GERMAN P. O. RENTS OUTFITS TO PUBLIC

Ban on People's Radio Lifted—Subscribers in 140 Cities Supplied with Phones

BERLIN, GERMANY.—September opened a new era in the history of Radiophony in Germany. Hitherto the general public have not been allowed to have Radio installations. They can now hire a Radio telephone from the postoffice.

It has been arranged to supply subscribers in 140 cities with a service of business news by Radiophone. At the central office of the express service in this city important items of news received from all parts of the world will be spoken into a microphone connected with the chief Radio station at the Imperial posts at Konigs Wusterhausen, from where the news will be broadcast throughout Germany.

The subscribers to the service will be provided with apparatus by the postoffice, the annual payment for which will be not less than 4,000 marks.

Later in the autumn it is intended to broadcast instructive and entertaining lectures and concerts every evening. It is planned to have receivers in the smallest villages, so that at a certain hour every evening there will be instruction and entertainment for people in the remote districts.

PLANE'S SET AIDS AS CROSS-NATION GUIDE

Radio Plays Big Part in Record-Smashing Flight Across Country

SAN ANTONIO, TEX.—Radio aided the Army Airship C-2 greatly on the westward leg of her famous one stop transcontinental trip. During the 20 hours' cruise, hundreds of miles of which were traversed by Pilot James H. Doolittle in darkness, Radio was always available to lend a guiding hand when any doubt as to the position of the airship existed on this, the first transcontinental airship cruise.

The giant station, SZAK, at Kelly Field, near here, played a big part in the record-breaking flight of Elliot Doolittle. The single stop was made at Kelly Field after flying from Neptune Beach, Fla., in ten hours.

Kisses Wife and Babes

As soon as the pilot had kissed his wife and two babes, a group of Radio experts gave him a complete weather map showing high and low pressure areas and probable weather conditions along the 1,100 miles yet to cover after the flyer left Kelly Field. Doolittle was assured a clear sky—the all important factor in his record-breaking flight.

But for the Radio weather reports, the flyer probably would not have been allowed to attempt the treacherous journey over miles and miles of desert sands in Arizona and New Mexico where a fall meal long suffering and possibly death from starvation amid the sand dunes.

Radio Reports Valuable

Tornadoes also are a menace to such a journey, but with weather reports flashed almost instantaneously from a dozen points along the route, the flyer was assured a safe journey—which he completed in a total of less than 20 hours from coast to coast.

ACT TO MAKE ARMY NET PLANTS HIGHEST GRADE

U. S. Inspects Stations to Determine Needed Improvements

WASHINGTON.—Maj. Louis B. Bender, of the signal corps, in charge of the engineering and research section of the office of the chief signal officer of the army, has been ordered to make inspections of the army Radio net stations at Columbus, Chicago and Omaha, with a view of reporting the additional installations and improvements necessary to bring the system to the highest state of development.

Establishment of the Radio net by the signal corps already has reached such a state that it is expected soon to be able to carry the major portion of the army telegraph business in this country.

The Radio equipment of the C-2 consists of a modified SCR-67-A Radio telephone and telegraph vacuum tube set, with a sending radius of about ten miles for the phone circuit and forty miles for the telegraph. The transmitting wave used was 480 meters but messages on nearly all wave lengths were receivable. In the present installation batteries are used in sending, but the engineers of the Army Air Service have been experimenting with a generator geared to one of the driving engines, which will give these Radio sets more power. The antenna is a single wire about 100 feet in length trailed below the airship.

MARCH SET FOR SHOW BY EXECUTIVE COUNCIL

Clubs of Second District Announce Meeting

NEW YORK.—The Executive Radio Council of the Second District, an organization made up of recognized Radio clubs of the second government Radio inspection district, has announced that it will hold the annual convention and Radio show in New York City, during the first week in March of 1923.

Last year, the Radio show of the council was so eminently successful that the exhibition hall selected was hopelessly small for the large crowds which stormed the place. On this account it may be necessary to hold the show in a much larger place this year. Several places are under consideration, and it may be possible that the show will be held at one of the large armories, such as the 71st, where the manufacturers' show was held last December.

Chairman Renville H. McMann of the Council will make public the plans of the committee as soon as arrangements are made.

U. S. Lists Radio References

WASHINGTON.—A list of references to the important articles of professional interest to the Radio engineer appearing in current periodicals is now published monthly by the Bureau of Navigation in the Radio Service Bulletin.

For about two years this list has been prepared as a semi-monthly report of the Bureau of Standards, but the number of copies has been limited. Recently, owing to the greatly increased demand for these lists, the new plan of publication was decided upon.

Radio Digest Illustrated

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

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

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

Vol. III Chicago, October 21, 1922 No. 2

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Looking Ahead

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

Panel Units for Your Receiving Sets. Details of panel construction will continue. This popular feature has been requested by many readers and is being written by Thomas W. Benson.

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

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

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

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WGI REUNITES TWO PALS OF ARMY DAYS

ONE HEARS OTHER TALK OVER RADIOPHONE

As Result \$100 Debt Is Paid, and Ex-soldier Wins Auto for Story of Incident

MEDFORD HILLSIDE, MASS.—Still another remarkable incident was credited to Radio when two old army pals were united and an old debt "paid in full" by means of WGI, the broadcasting station of the American Radio and Research Corporation located here. Incidentally, the story of the unique occurrence, in which two friends were united after a separation of three years, won a real Ford touring car for the wife of one of the pals in a contest conducted by one of the large newspapers of the country for the best work of reporting done by a reader.

The true story of the Radio exploit which won the automobile was as follows:

Submitted by Radio

"When Professor Connor of Emerson College, Boston, gave his readings by Radio from Station WGI at Medford Hillside, Mass., last Wednesday evening, he was not aware that among his audience was a man whom he had been seeking for over three years, a pal of his army days. They had parted at the great army hospital on Staten Island and had gone their separate ways without having had an opportunity to shake hands in parting. Neither had heard of the other until Sergeant Kepple, listening in at Wilkingsburg, Pa., to the Radio programme from WGI, Wednesday evening, August 30, heard the voice of his army chum with the result that the following night letter was received by Mr. Connor the next morning:

Professor Joseph E. Connor,

Mansfield, Massachusetts.

Been trying to locate you since discharged from Army. Last night heard your Radio readings. Am sending postal order amount one hundred dollars paying your kind loan at Army Hospital, Staten Island. Many thanks, old son-of-a-gun. Didn't know you were professor. Would have borrowed two hundred.

Your erstwhile Sergeant,

Kepple.

"Mr. Connor says he is going to use the one hundred dollars for railroad fare to Wilkingsburg in a visit to Sergeant Kepple.

Mrs. Marguerite P. Connor, Mansfield, Mass."

Mrs. Connor feels well satisfied with the compensation which her husband secured as the result of his participation in a Radio programme, being richer by one hundred dollars, a Ford touring car, a lost friend found and the gratification of the general public.

Fans in Atlanta Get Offer of Free Course

Training Qualifies for U. S. Commercial License

ATLANTA, GA.—The National Radio Engineering Company of this city, is offering free of charge a complete course in Radio. This course is given by one of the oldest instructors in the country who has trained operators many years for service with the U. S. Shipping Board. The training will qualify the student for a government commercial license. Code instruction will be received daily from various stations throughout the United States. The idea of the free course is to prove to the novice that telegraph signals are of as much interest as broadcasting concerts, and that interfering amateurs are not trying to drive the broadcast programs out.

The government believes that one of the great values of Radio is keeping boys on the farms.

JULIUS CAESAR DOES TURN FOR RADIO FANS

BOSTON, MASS.—Shakespeare went out on the "Radio circuit" October 4, when President Henry Lawrence Southwick of Emerson College read the Forum Scene from Julius Caesar at the Station WGI, Medford Hillside. This is the first time that Shakespearean readings have ever been given by Radio. They will be continued.

'LISTEN IN' AS 'BABE' BLOWS UP IN SERIES

COLUMBUS, O.—Through the courtesy of Erner & Hopkins company of this city, baseball fans were enabled to follow the play of the World's series, play by play, at their homes. They used their own receiving sets and a baseball score board furnished by the Erner & Hopkins company, who operate station WBAV.

CLARA KIMBALL YOUNG RECITES



As a special treat for Pacific coast "bugs" the Los Angeles Examiner's station arranged for Clara Kimball Young, of screen fame, to read James Whitcomb Riley's poem, "An Old Sweetheart of Mine," into the microphone.

NEW ENGLAND GETS FIRST RELAY TASTE

BROADCAST CHURCH SERVICE IN INITIAL TEST

Entire Program Goes Over Seven Miles of Telephone Wires to Station WGI

BOSTON, MASS.—Residents of New England had their first taste of relayed broadcasting when the Sunday morning exercises of the South Congregational Society of Boston were sent out from Station WGI at Medford Hillside, Mass.

Relayed broadcasting has been done with marked success in other parts of the country, notably Pittsburgh and New York. Broadcasting of church services in Boston has also been accomplished, but on Sunday morning, October 8, was inaugurated an entirely new schedule in the Radio Program of the northeastern states.

The entire church service of the South Congregational Church, familiarly known as Dr. Hale's Church, were fed through seven miles of telephone wire to WGI where they were amplified and broadcasted all over New England and heard in every one of the states.

How Relay Is Accomplished

Three sensitive microphones especially designed were used in the church to pick up the speaking and singing. One was located on the minister's reading desk, another at the echo organ, and the third at the rear of the choir loft. The speech and music received by the microphone is amplified, then carried seven miles to Medford Hillside by land telephone wire where it is further amplified to make up for any loss of energy in passage over the telephone wires, enters the transmitting set through the oscillator and modulator tubes, and is led into the high antenna of the station.

The Church Services of the Congregational Society will be broadcasted every other Sunday morning, alternating with Station WNAC, which broadcasts the services of the Cathedral Church of St. Paul, Boston. LAMM

TRACTOR SET MAKES CROWD STOP TO HEAR

Texan Equips Farmer's Aid with "Music Catcher"

SAN ANTONIO, TEX.—Radio-equipped tractors for Southwest Texas farms may not be practical, but they are successful, according to H. F. Mansfield of Seguin, Texas. Mansfield equipped a tractor with a small antenna, a three-step amplifier receiving set and a loud speaker and entertained more visitors at the Guadalupe County Fair at Seguin recently than any other exhibitor. The market reports broadcast four times daily from WOAI Radio studio at San Antonio and the musical entertainments from Fort Worth, Dallas, Houston and San Antonio, were heard every minute during the four-day celebration. The tractor later was placed on display at the town square at Seguin, where scores of farmers marvelled at seeing and hearing their first Radio concerts.

Radio Corporation to Rig \$432,500 Swedish Plant

STOCKHOLM, SWEDEN.—The Radio Corporation of America will erect a large Radio station near Goteborg, Sweden, at a cost of \$432,500, according to a report from Consul Shoes. Sweden, therefore, will be no longer dependent upon England, France and Norway for facilities for overseas communication. British cables and the Norwegian Radio station at Stavangerfjord have carried the bulk of Swedish communications with the United States heretofore. The station will be open for business by the end of 1933, it is reported.

NEWS 'WIRES' OBSOLETE LABOR DEPT. TELLS WORK

Radio Beats Telegraph in Reporting Sporting Events

LONDON, O.—Radio has nearly put out of business the old telegraph wire system of receiving baseball and football results in advance of the extra editions put out by the city newspapers. The reports of the World's Series in New York, in place of being received play by play at the town telegraph office, were given to the public by the receiving set of the London Radio Club. Reports from other small cities and towns in this section state that the results of the game were known before the final play had been completed five minutes.

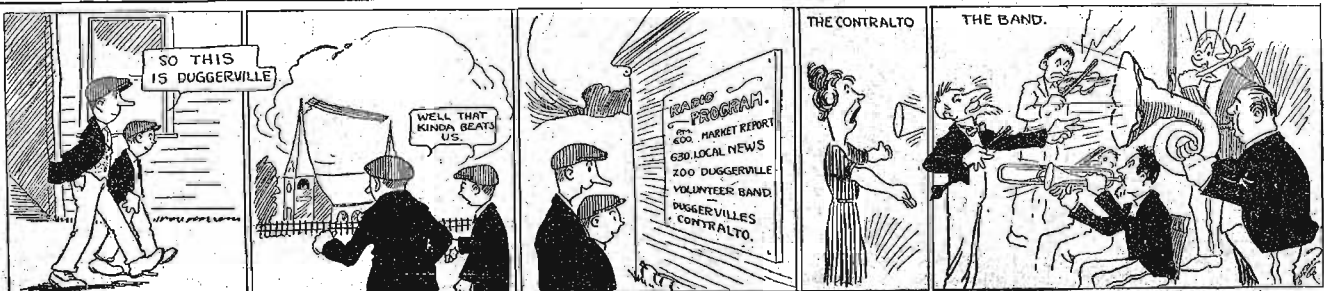
NOF Broadcasts Three Government Lectures Each Week

Special to RADIO DIGEST
WASHINGTON.—A series of lectures on the Department of Labor and its activities are now broadcasted from NOF, of the naval air station at Anacostia, on Monday, Tuesday and Thursday evenings. On Monday evening the lectures will be on the status of immigration quotas, by the naturalization bureau; on Tuesday evenings on the care of children, by the children's bureau, and on Thursday evenings on the safeguarding of women in industry, by the women's bureau.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Reasons for the 400-Meter Length



SUPER-REGENERATOR

(Continued from page 1)

nary for super-regeneration. Signals and broadcasts are brought in better than with a two-tube set. For local broadcasts and listening in, the set is used entirely without loop, aerial or even electric light socket connection. Merely grounding on a radiator is sufficient. The sounds are entirely too loud with this circuit if loop or aerial are used. However, for long-distance listening they can be used, but have to be graduated down, as the reception is very strong for a considerable distance.

Has Set in Automobile

Mr. Flewelling carries a small set around with him in his "flyer" and gets the Shepard Stores and Amrad stations easily while running his car at an ordinary speed and with the headset on. He can even hear with the headset off, although the sound is clearer and mellow with it on, because of the outside noises and the wind-striking the cars. He has another set on his desk in his office of the Edison Electric Illuminating Company. He frequently uses his office set at night when not busy with his work.

He has been besieged by amateurs to sell them circuits already made up, but until he knows where he stands on the patent question the matter of commercial production is unsettled. He is, however, protected by means of his caveat until the Patent Office decides on the matter.

Diagram and Statement

By permission of Mr. Flewelling a diagram is given herewith, together with a statement from the inventor. He says:

"I have been able finally to settle the question as to how the low frequency oscillations, on which operation of the super-regeneration depends, can be secured without using large coils or inductance, which are objectionable in many ways, being both bulky and expensive.

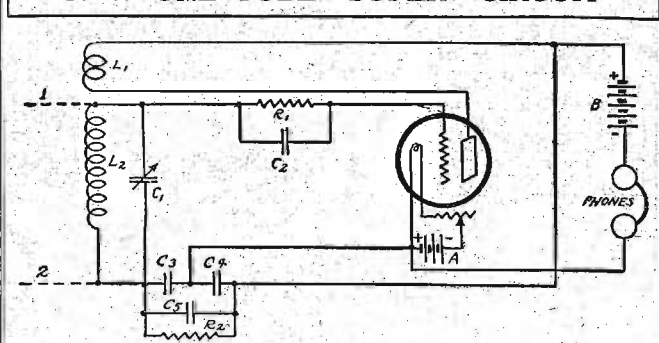
"As long as one handles the oscillations properly, it doesn't matter so much how they are obtained, but a simple method is, of course, better than a complicated one.

"My circuit maintains these oscillations, but doesn't use any coils (for inductance) except those ordinarily used for tuning and securing regeneration. The inductance is provided by the telephone receivers, which with the coils for tuning and ordinary regeneration give all the amplification that can be obtained from one tube.

Condensers Used and Values

"The circuit depends for its action upon the condensers, tuning coils and the 'impedance' that the windings of the telephone receivers contain. It is possible, as many radio fans know, to set up a super-regenerative circuit if the proper capacity value is used in the filament end of the in-

NEW ONE TUBE "SUPER" CIRCUIT



In the Flewelling modified super-regenerative circuit the following are the values of the constants: C₁, C₂, and C₃ approximately .006 mfd., not critical; R₂ 1 to 1½ megohms, critical; R₃ very low; solid conductor can replace R₃ and C₅ using amplification; B battery, 18 to 250 volts using UV-201 tube (118 volts found very good); L₂ is 50-turn coil or equivalent; L₁ is 75 turn coil or equivalent; C₄ is .0005 mfd.; C₅ is .00025 mfd. The two dotted leads, 1 and 2, are used in various ways. Using both ground and aerial, connect these to 1 and 2. Using either aerial or ground alone, or one side of loop, connect to 1, leaving 2 free. Using both sides of loop, connect to 1 and 2.

ductance, but this proves generally unsatisfactory.

"But by so arranging the correct condenser values in their proper places one can get the circuit I have obtained. The diagram practically suffices to tell the story.

"The three fixed condensers in a group are C₃, C₄ and C₅. Values of the three are not critical. In other words, it is not necessary to draw their values down to the point of fine measurement. I have found in some cases that I could use .006 mfd. capacity. In the diagram will be seen two leaks. The grid leak (R₁) is critical and of the relatively high value of perhaps 1 to 1½ megohms. This value, however, will vary according to various other constants of the circuit. The grid condenser value is .00025 mfd.

Leak Resistance Controls Frequency

"Variation of the low frequency whistle noticeable in super-regenerative sets can be made by changing the resistance of the leak in the new circuit. If the tone proves too low or prominent, increase the resistance value; if too high, decrease the resistance value.

"Across the condenser C₅ is the second leak, which is not critical, and the value is very low. A solid conductor can replace this in amplification with but a small loss.

omitting condenser C₆ at the same time. "Power tubes give a shade better amplification than Radiotrons UV-201. There is a rather wide range of plate voltage over which I have found the circuits will operate. The set has operated on from 18 to 250 volts potential with a UV-201 tube. Amplification directly increased with increasing voltage, being fair at 60 volts. Approximately 110 volts on the plate seems to be giving about the best results.

Possible Uses and Applications

"You will not get as much amplification as with the Armstrong super-regenerative 2-tube circuit, but it is much greater than can be obtained with ordinary straight regenerative circuits.

"Applications are many and varied, from using without a ground on an aerial, without an aerial on a ground, on a closed loop aerial on one side of a loop, or used with nothing but the wires connecting the apparatus for an antenna—all depends upon the distance of the station desired for reception.

"Local stations may be tuned using nothing but the set itself, although perhaps four or five feet of wire can be used for an antenna. Best reception, I have found, is, as with the Armstrong 2-tube set, obtained by use of the regular aerial outdoors, but with no ground. But whatever method is used, it should be connected with

the grid side of the inductance, whether loop, antenna or ground method.

Tuning Inductance Values

"Any type of tuning can be used, providing that it conforms to the wave length desired for reception. Frequently, close coupling is necessary. If the condensers and tuning inductance have sufficient range to compensate for the difference in inductance values and capacity of the different methods of energy reception, aerial, loop or ground, the grid leak can easily be rearranged until the proper value is found. Then the set will function regardless of the type of energy reception employed.

"For broadcast reception I have found a 50-turn coil for grid inductance and a 75-turn coil for the plate or tickler inductance give good results. The addition of a vernier condenser is a big help in tuning, although I have shown a .0005 mfd. variable condenser in the diagram.

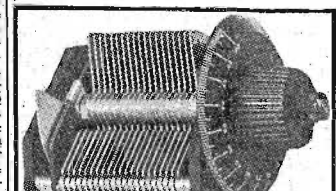
Filter and Radio Frequency Amplification

"If the customary filter is used to keep low frequency oscillations from the amplifier tube, Radio frequency amplification can be added. This circuit also gives good results on continuous wave reception.

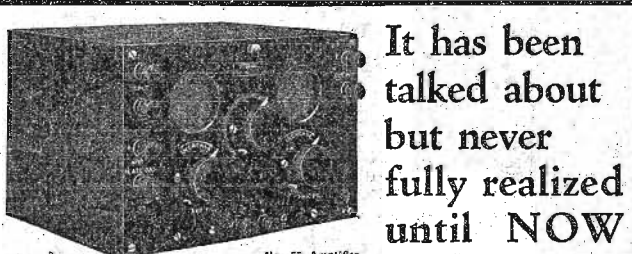
"On one occasion at home in my cellar, using about three feet of wire attached to a coal hod, used as antenna, I found no difficulty in tuning in Springfield, Newark and other places. I could hear, at a distance of twenty feet from the phones, second distinct continuous wave stations. This set cost about \$60."

A.R.R.L. Manager Resigns

BOSTON, MASS.—Philip F. Robinson, Station 10K, has resigned as manager for the New England division of the American Radio Relay League. He is succeeded by Irving Vermilya, Station 12E. L. G. Cumming, Station, 1PB is assistant manager.



The B-T Vernier Condenser has no equal .0005—.001—.0015—.002 with DIAL. Ask your dealer—or write us direct. BREMER-TULLY RADIO CO., Manufacturers 632-836 SOUTH CANAL ST., CHICAGO



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 - No. 57 Federal Radio Receiver 98.00 (One stage Radio Frequency, Detector and two stages Audio Frequency)
 - No. 58 Federal D. X. Radio Receiver 116.00 (One stage Radio Frequency, Detector and two stages Audio Frequency)
 - No. 8 Federal AUDIO FREQUENCY Amplifier and Detector 52.00 (One stage Audio Frequency and Detector)
 - No. 9 Federal AUDIO FREQUENCY Amplifier 58.00 (Two stages Audio Frequency)

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CROSLLEY PARTS represent the greatest value for your money on the market today. Made of the best materials and workmanship our large production permits us to sell them at a phenomenally low cost. Amateurs have found CROSLLEY PARTS the cheapest and the best in making their own sets.

Crosley Receiving Sets from \$25 up are—"Better—Cost Less"

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CROSLLEY MANUFACTURING CO.
Department RDI 13
CINCINNATI, O.

KGB, Pacific Coast Station, Broadcasts Wedding from Bridal March to Final Kiss

No Details Omitted by Tacoma; Washington Plant—Miss Borghild Sivertson Becomes Mrs. A. O. Stenso, Wife of Popular Western Announcer and War Veteran—Friends: "Attend" Ceremony Electromagnetically



Top, left, shows Mrs. James Eyre Macpherson singing "O Promise Me," accompanied by Miss Pauline Endres at the organ. Top, right, is a photo taken as the ceremony was being read, and in the circle below is the aerially wedded couple, Mr. and Mrs. Alvin O. Stenso

TACOMA, WASH.—The Pacific Northwest's first Radio wedding and one of the most unique on record was staged recently by KGB, the Tacoma Ledger-William A. Mullins Electric Company broadcasting station of this city. The wedding differed from the usual sort which have been staged from time to time in various parts of the country in that not alone the ceremony was performed via Radio but that the entire wedding, music, ceremony, vows, benediction and even the bridal kiss, were broadcast.

The principals of the marriage were Alvin O. Stenso, chief announcer at KGB, and Miss Borghild Sivertson. Mr. Stenso, besides being a world war veteran, is one of the best known Radio engineers in the Pacific Northwest.

Completeness Unique

KGB's was the first wedding on record where just the form followed by The Ledger station was used. The ceremony was performed in the broadcasting studio, the bride, groom, their attendants, the minister and close friends of the family alone being in attendance. The greater part of the friends of the young couple gathered at Mr. Stenso's home, where he had installed a receiving set equipped with a loud speaker, and thus heard the ceremony. Rev. E. C. Bloomquist, pastor of one of the leading churches of the city, read the double ring ceremony.

Large Audience "Hears" Wedding
Interest in the affair all over the Northwest was keen and consequently the event,

heralded for weeks before in the papers, brought many on the air that evening. It is estimated that one of the largest Radio audiences ever assembled "heard" the wedding.

A trio of some of Tacoma's clever musicians, an organist, a cellist and a violinist, furnished the bridal music. The transmitting of the ceremony began by a number from this trio, the "Barcarolle" from the "Tales of Hoffman." A special soloist then sang "Oh Promise Me," following which a violin solo, "Old Love Song," was played by one of the members of the trio.

Lohengrin Precedes Ceremony

Then the magnificent strains of "Bridal Chorus" from "Lohengrin," played by the trio, floated out over the ether, the final notes of this sound. Rev. Bloomquist began reading the ceremony. The word of it was audible to the biggest wedding party, perhaps the United States has even known. The admonitions of the pastor, his questions, the responses of the couple, their vows and the final benediction and even their kiss was audible to the Radio auditors at a radius upward from a hundred miles.

At the conclusion of the service the trio played Mendelssohn's "Wedding March" and a big event in the Northwest's Radio history was over.

Prospectors in the deserts of the southwest now take along Radio outfits so that they can communicate with the nearest stations in case help is needed.

Regulate Reception at Exhibit in Boston

Officials Plan to Avoid Confusion of Last Show

BOSTON, MASS.—Indiscriminate demonstration of broadcast reception by exhibitors at the Second Boston Radio Show, such as prevailed at the first one, held here last spring, will not be permitted. They caused so much confusion and annoyance that they hurt rather than helped Radio. All reception will be controlled from a central station, and only one demonstration will be permitted at a time, to insure the best possible results. Each exhibitor will be plugged in on the central antenna and ground connection and each demonstration will be given at a specified time, according to a schedule to be arranged. The time and place of each demonstration will be posted on the bulletin board.

Space has been reserved by all the larger manufacturers, distributors and dealers. Some interesting educational exhibits are planned by dealers who specialize in Radio equipment. The Signal Corps of the Army will co-operate. The Navy and the Department of Commerce are arranging special exhibits.

One of the speakers at the banquet will be Paul F. Godley, of Upper Montclair, N. J., the amateur who went to Androssan, Scotland, and "logged" more than 70 American stations using one-thousandth of the power used by the commercial transatlantic stations.

It is said that the Radio business in the last two years has grown something like 66,000 per cent.

EVERY STATE IN UNION RADIOPHONE EQUIPPED

Wyoming Last State to Be Represented by Plant

CHICAGO.—With the issuance of a license in Laramie, Wyoming, every state in the Union has one or more broadcasting stations. As has been the case since the industry got a fair start, California still leads having today 66 stations, Ohio follows with 35 and New York is third having 30. There were eleven licenses issued during the past week, as follows:

KFDA, Adler's Music Store, Baker, Oregon; WMAV, Alabama Polytechnic Inst., Auburn, Alabama; WFAU, Amarillo Daily News, Amarillo, Texas; WMAU, Louisiana State Fair Assn., Shreveport, La.; KFEC, Meier & Frank Co., Portland, Oregon; WMAT, Paramount Radio Corp., Duluth, Minn.; WNAG, Rathert Radio & Elec. Co., Cresco, Iowa; WMAQ, The Fair Corporation & The Chicago Daily News, Chicago, Ill.; KFBU, Bishop N. S. Thomas, Laramie, Wyoming; WMAE, Waterloo Electrical Supply Company, Waterloo, Iowa; WQAQ, West Texas Radio Co., Abilene, Texas.

Virgin Island Wants Plant

WASHINGTON.—Very soon the Virgin island, newest island possession of the United States, will install a station for broadcasting information and entertainment to the people of the islands. Adolph Sixto, delegate from St. Thomas, visited Washington officially a few days ago and called at the White House, where he told reporters he plans to introduce Radio broadcasting in the islands.



"THE real fault," says Confucius, "is to have faults and not try to amend them."

If you are one of the three people who never heard of Grebe Radio—visit the Chicago Coliseum this week!

Doctor Wu

AIR CARRIES SPORT NEWS OVER NATION

SERVICE GIVEN BY NEWS-PAPER, WESTINGHOUSE

Broadcasting of Leonard-Tendler Fight Results Leads to Plans for World's Series

NEW YORK.—Every play of every World's Series game in New York was broadcast successfully all over America by Radiophone. In each of a score of cities the results were heard by crowds in front of newspaper offices and other distributing points. Papers in various parts of the country which received the service were:

WCAU—The (Philadelphia) Record-Philadelphia Radiophone Company.
WHAB—Ensenada News, Yauco, Porto Rico.

WDAT—Kansas City (Mo.) Star.
WPA—Dallas (Tex.) News-Journal.
KSD—St. Louis (Mo.) Post-Dispatch.
WOH—Indianapolis Star.
CFCA—Toronto Star.
WDAL—Jacksonville Times Union.
KMO—Tacoma (Wash.) Times.
KUC—San Francisco Examiner.
KWH—Los Angeles Examiner.
KDY'S—Great Falls (Mont.) Tribune.
CJNC—Winnipeg Tribune.
WFAT—Sioux Falls Argus-Leader.
WKY—Oklahoma City Oklahoman.
WPO—Memphis (Tenn.) News-Scimitar.
WWJ—Detroit News.
WSB—Atlanta Journal.
WBZ—Richmond (Va.) Times-Dispatch.

Result of Leonard-Tendler Fight

The great plan was worked out and organized by the General Radio Service Company of Philadelphia, in conjunction with the Westinghouse Electric and Manufacturing Company.

Curiously enough this whole gigantic operation was a result of the broadcasting of the news of the Leonard-Tendler fight by Station WCAU which operation was worked out by the General Radio Service Company and Durham & Co., Radio engineers for WCAU. The news was heard first from WCAU over half of the United States, and so great was the success that forthwith plans were laid for the World's Series.

In Montana Radio is furnishing entertainment to the oil well drillers.

Book Reviews

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

Armstrong's New Super-Regenerative Receiver. By Kenneth Harkness. This is an eight-page leaflet which gives six diagrams and seven half-tones of the famous receiving sets and hook-up. It tells how to make and operate it. Price 50c.

How to Make a Commercial Type Radio Apparatus. By M. B. Sleeper. This book is well illustrated and it makes excellent instruction for the person who wants to make his own equipment like those of the commercial type. Price, 75c.

Lafax Radio Handbook. A loose-leaf handbook. This book never grows old or out of date. All of the latest apparatus and hook-ups are added as time goes on. Anything that grows old is taken out and new leaves substituted. Price, \$3.50.

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

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

Elements of Radio Telephony. By William C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony.

and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

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

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money order or check. Book Department, Radio Digest Illustrated, 122 W. Madison St., Chicago, Ill.

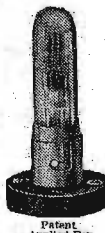
Sheet music publishers declare that broadcasting is a big asset to them in introducing new compositions.

'JOHN BULL' LAYS RADIO CABLE AS HARBOR GUIDE

Action Taken Despite Reports Against U.S. Line Installation

NEW YORK.—Apparently undeterred by reports from America that the "Radio guiding cable" used for guiding U. S. navy ships into New York harbor is disturbed by dragging anchors, the British Admiralty has just laid a similar cable. The wire is laid in the English channel off Southampton, where the fogs are frequent, and is expected to speed transatlantic travel. Radio currents are sent through the cable, and by means of antennae hung on each side of the ship, the helmsman is able to keep his vessel directly over the cable, steering so that the signals are heard with equal intensity from both sides.

NATIONAL "Ultra-Sensitive" Crystal Detectors



NATIONAL Crystal Detectors are the only detectors made with three points of contact which insures getting the most sensitive spots on the mineral. It has the advantages over the cat whisker type of being semi-fixed as well as adjustable. All detectors are tested to Radio Broadcasting before being shipped and are covered with a glass cap which excludes moisture and dust from the mineral. They are made in both base and panel types. The base type is shown in the illustration. One of the outstanding features of the panel type is that when in use the detector bulb is turned to the right in the socket and when not in use should be turned to the extreme left, thereby disconnecting the detector from the circuit and preventing the using or burning up of the mineral. PRICE, EITHER TYPE, \$1.00

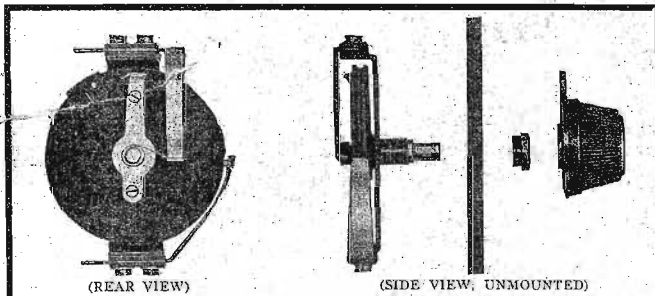
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NATIONAL RADIO WORKS, Inc.
NEWARK, NEW JERSEY
DEALERS WRITE FOR PROPOSITION

TRADE THE
"Q-R" Vernier Adjuster
MARK Pat. Pending
PRICE \$1.50 Type 100

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

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Write for Our Unusually Liberal Discounts
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22 WALNUT STREET, KEYPORT, N. J.



Announcing—THE NEW CARTER RHEOSTAT

VERNIER CONTROL NON-INTRUSING
PATENT APPLIED FOR

THE NEW CARTER RHEOSTAT has 6-ohm resistance. Small coil of NICHROME wire on a disc revolves past a stationary contact. Steps consist of only 1/8 inch of wire. Knob turns easily. No scraping nor jerking. No friction-bearing connection. Ready November 15.

Also—

THE NEW CARTER CONTROL UNIT

THE NEW CARTER CONTROL UNIT consists of rheostat, socket and jack (all Carter products), in single combination mounting. Ready November 30.

These items have the distinctive originality of design and tested excellence of workmanship and operation, always found in Carter products.

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209 South State St., CHICAGO

MAKERS OF THE WELL KNOWN
CARTER TU-WAY PLUGS and CARTER HOLD-TITE JACKS

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To be sure of obtaining the greatest value for the money and GUARANTEED RELIABILITY. A good

RADIO RECEIVING SET

will keep you in touch with the world's news and amusements—write, for full information—"Radio Recommendations"—and prices DIRECT to RADIO HEADQUARTERS

RAY-DI-CO ORGANIZATION, Inc.

Designers and Constructors of only High-Class Radio Equipment

GENERAL OFFICES, LABORATORY AND SALES ROOM

1215-1217 Leland Avenue, Chicago

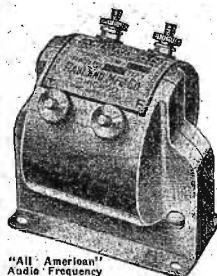
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SPECIAL We are ready now to make arrangements with dealers throughout Illinois, Iowa and Wisconsin. Write for information.

"All-American" Transformers Radio and Audio Frequency

Radio and Audio frequency are day by day becoming more and more important. The days of sets with detector only, are gone.

To get the best results you must use the best transformers. "All-American" Radio and Audio Frequency Transformers have given the best results to thousands of radio fans in all parts of the country and will give you the same results as soon as you try them.

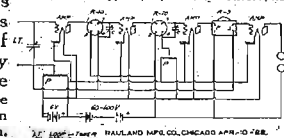


ASK YOUR DEALER

"All American" Audio Frequency
Type R12—Ratio 3 to 1.....\$4.50
Type R13—Ratio 10 to 1.....4.75
Type R21—Ratio 5 to 1.....4.75



"All-American" Radio Frequency Type R. 10, 150-550 Meters. \$4.50



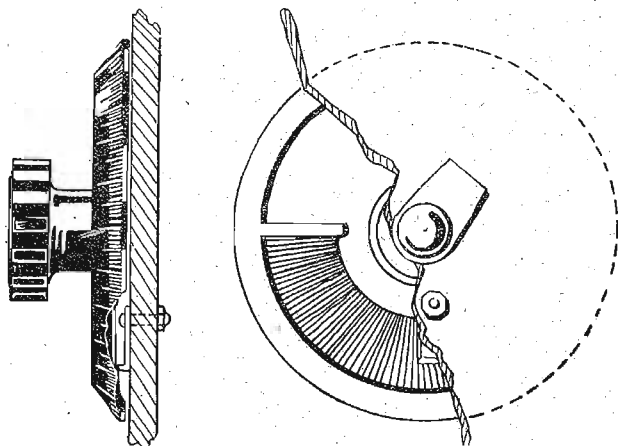
Try the hook-up illustrated above, but be sure to use "All-American" Transformers or you will not be satisfied.

RAULAND MFG. CO.

35 South Dearborn Street, Chicago, Ill.

The Radiophonist's Mart

Rheostat Dial Contains Resistance



THE DIAL type rheostat shown in the illustration, manufactured and patented by the Parkin Mfg. Company of San Rafael, Cal., carries the resistance element in a recess groove in the back of a three-inch molded bakelite dial. This combination on a dial and rheostat in a single more cabinet space, and eliminates resistance feeding from inside the cabinet. An off position is provided and a stop on the dial engages the stationary contact at the extreme position.

The dial is molded of black bakelite, highly polished and graduated from 0 to 180 degrees. Graduations are from the right to left for clockwise rotation, and are filled with brilliant white enamel for easy reading. The knob, likewise, is of molded bakelite.

The resistance element consists of a flat semi-circular cord wound radially with non-corrosive resistance wire. Adjacent turns are slightly spaced to allow single turn adjustment. The resistance is five ohms and has a safe carrying capacity of 1 1/2 amperes.

Mounting this rheostat is extremely easy as only two small holes need be drilled in the panel; a 1/8-inch hole for the shaft, and 3/16-inch directly below this is drilled a 3/8-inch hole for the screw which fastens the stationary contact to the panel. This stationary contact is fastened by means of the screw and nut furnished with the unit. The set screw in the knob of the dial is then loosened, the shaft removed and inserted through the hole in the panel, the dial replaced on the shaft, and the set screw tightened. The one illustrated is designed as type 100.

A VERY neat form of mica condenser is being put out by the Chas. Freshman Company, of New York City, under the trade name of "Micon." The design of these condensers is such that con-



Micon Assembled Under Pressure

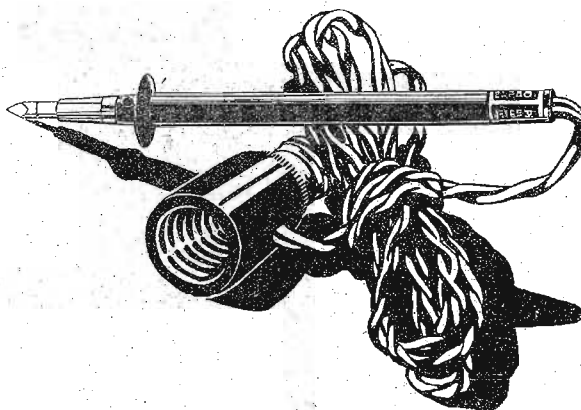
stant equal pressure is exerted on the condenser plates over the entire area.

The average paper wound condenser, due to the inability to exert even tension throughout the entire wrapping and to the variation in the thickness of the paper with humidity changes, has a constant alteration in the distance between the tin-foil layers. For this reason its capacity can never be accurately measured or relied on. In the "Micon" condenser the constant equal pressure avoids noises and guarantees accurate values. An extra layer of brass around the outside acts as a metal case, protects the plates, and reduces hysteresis losses to a minimum. Mica is the dielectric used.

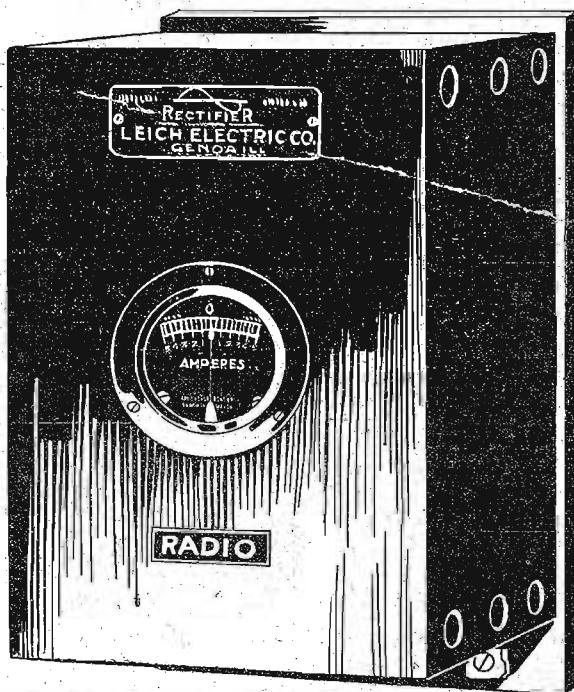
The condensers are tested with a 500-cycle, 2,000-volt alternating current, and can be obtained in sizes from .0001 mfd. to .005 mfd. In sufficient graduated sizes so that any practical value of capacity can be obtained directly or by the addition of one or more condensers either in series or parallel.

Y. M. C. A. boys camping in Montana found enough specimens of Galena near their camp site to keep their cat whiskers busy all winter.

Electric Soldering Iron Like Pen



Rectifier Has "Non-Tune" Feature



ANOTHER battery charger operating from the lighting circuit is shown in the illustration. It is being marketed under the name of the Leich Non-Tune Radio Rectifier and is manufactured by the Leich Electric Company, Genoa, Illinois.

It obtains its name from the operation of the vibrating unit. This unit has no natural period of vibration since it is shaft mounted rather than spring mounted. When the vibrating unit is spring mounted, it has an inherent pitch or rate at which it will vibrate when set in motion and is hence called a "tune vibrator." For proper operation of a mechanical rectifier, the vibrating unit which carries the contacts must make and break the alternating current at the proper time to have the current flow in one direction only. If the natural period of the unit is not sixty cycles per second, it will not respond to the impulses of the alternating current readily, and therefore the time of breaking the contacts may not be correct. This fault will cause considerable arcing. Weakening of the springs, due to continuous vibration, changes the natural pitch of such a unit, and results in unsatisfactory operation. Alternating current systems do not always operate exactly at their rated frequencies and a slight varia-

tion is apt to effect a too closely tuned vibrating unit.

The non-tune rectifier is free from such natural pitch characteristics and will respond to any possible variations that will be found in a sixty-cycle alternating current.

The rectifying unit and associated transformer are mounted on a heavy backboard of fireproof insulating material and the whole is enclosed in a black enameled steel case. Supporting legs are rigidly attached to the backboard and are designed for mounting the rectifier against a wall or post. The rectifier has but two contact elements, a No. 3621 vibrating unit and a No. 2513 contact screw.

Attached to the rectifier unit is a relay lock. This lock is an important feature of the rectifier and is patented. When power fails, it locks the vibrating unit in a neutral position away from the contacts and prevents storage battery current from flowing back into the machine. This safety device on the non-tune rectifier makes it unnecessary to pay particular attention to the machine in case of failure of the supply current while charging.

The transformer is wound with properly insulated wire and the coils are fully impregnated to drive all moisture and

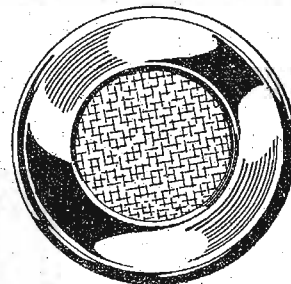
ALTHOUGH not a piece of Radio apparatus, yet a good soldering iron is one of the most important necessities to the amateur who constructs his own set. The ordinary soldering iron as a rule, is too clumsy for soldering wiring and requires outside application of heat. In these days of the electrical age, the electric soldering iron has become extremely popular. The sturdiness of the one illustrated enables its use for the most delicate type of work. Its size is appreciated in soldering the numerous wires in the crowded corners of any receiving set.

It attaches to any socket using the ordinary lighting current and is ready for use in a few seconds' time. In size it resembles a large fountain pen. The flange at the tip end acts as a guard and prevents the fingers from being burned by the tip. The soldering tip is removable and can be replaced. Flexible cord permits the iron's use with a considerable range of movement.

The device is manufactured by the Post Electric Company of New York City.

THE use of metallic screens for windows in panels to observe the vacuum tubes has become so general that the amateur constructor rather looks forward to adding a neat and attractive bezel, as such a window is known, to his set. Contrary to expectations such windows are not very difficult to add and are not very expensive.

The one shown in the illustration is manufactured by Stevens of Oakland, Cal. Both the mesh and the metal flange have



Bezel Adjusts to Any Size Panel

a very highly polished nickel plated finish which catches the eye immediately. The flange is quite large, heavy, and substantial. The mesh itself is well fastened and not apt to come loose. A split ring in the back permits adjustment for any thickness of panel.

raise the insulation resistance. Only the best of transformer iron is used for the laminated core. The proportions are such that the rise in temperature will not be excessive regardless of length of time the machine is in operation. The charging leads are fused for protection against accidental short circuits and are wired through the indicating ammeter in the lid of the case.

The cord with plug attached connects to any convenient light socket and the switch in the socket is used to turn on the power current for charging.

State, City, Call	State, City, Call	State, City, Call	State, City, Call	State, City, Call	State, City, Call	
Alabama: Auburn, WMAV Birmingham, WLAG, WSY Mobile, WREP Montgomery, WKAN Arizona: Phoenix, KDW, KFAD, KTBC Prescott, KPBC Tucson, KDZA Arkansas: Fort Smith, WCAAC, WGAR Little Rock, WCAV, WEAX, WSV California: Pine Bluff, WOK Altadena, KGO Bakersfield, KDZB, KYI Berkeley, KQI, KRE Del Monte, KLN El Monte, KUY Eureka, KNI Fresno, KDZB, KMF Glendale, KPAC Hanford, KPBD Hollywood, KFAR, KGC Long Beach, KSS Los Altos, KLF Los Angeles, KDZD, KDZP, KDF, KFI, KHI, KUC, KIS, KNN, KNTV, KOC, KON, KUS, RWH, KXS, KYJ Modesto, KOQ, KKD Oakland, KPBN, KLS, KLN, KZM Pasadena, KDYR, KLB Pomona, KGF Redley, KMC Sacramento, KPBC, KVO San Diego, KDPT, KBYM, KDYO, KPBC, KYF San Francisco, AGI, KDN, KDZC, KDZV, KDZK, KDFB, KFO, KSL, KUO, KZY San Jose, KFAQ, KQW, San Luis Obispo, KPBB Santa Ana, KFAP Stockton, KJQ, KWG Sunnyvale, KJJ Venice, KFAY Colorado: Boulder, KFBJ Colorado Springs, KHD Denver, DDE, DNE, KWB, KDZQ, KPAP, KLZ Connecticut: Bridgeport, WKAX Greenwich, WAAQ Hartford, WDAK New Haven, WCJ, WGAH Delaware: Wilmington, WHAV District of Columbia: Anacostia, NOP Washington, WDM WEAS, WBAQ, WIL, WLAJ, WH, WMU, WPN, WXX, 3YN Florida: Jacksonville, WCAN, WDAI Miami, WFAW, WYAZ Pensacola, WGAN, WLAJ Tampa, WDAE, WBAT, WHA-W West Palm Beach, WKAH	Georgia: Atlanta, WAAS, WDAW, WBS, ACD, WDAJ College Park, WDAJ Janesville, WKAY Savannah, WGAU, WHAO Spartanburg, WYB Tulsa, KFAU, KFBJ Leviston, KPBA Moscow, KPAN Wallace, KFCC Illinois: Chicago, KYW, WAAF, WBB, WDAE, WGAS, WJAZ, WMAQ, WQX Decatur, WBO, WCAP, WJAN Peoria, WBAB, WFAP, WJAB Quincy, WCAW, WCAZ Rockford, WLAB, WJAH Springfield, WDAQ Tuscola, WDM Urbana, WRM Indiana: Anderson, WMA Fort Wayne, WFPAS Frankfort, WKAT Greencastle, WLAX Huntington, WBAJ Indianapolis, WLK, WOH Marion, WIAQ Muncie, WIAQ Richmond, WOF South Bend, WBAQ, WGAZ Terre Haute, WEAC West Lafayette, WBAA Iowa: Ames, WOI Burlington, WLAS, WLAT Cedar Rapids, WJAM, WKAA Centerville, WDAX Cresco, WNAQ Davenport, WHAL, WOE Des Moines, WGF, WHX Fort Dodge, WEAB Iowa City, WEA Le Mars, WIAT Marshalltown, WLAR Shenandoah, WIAH Sioux City, WBAJ, WHAB Vinton, WIAE Waterloo, WEAB, WHAC, WMAH Kansas: Anthony, WBL Edward, WEAD Atwood, WAH Emporia, WAAZ Hutchinson, WLAS Independence, WFAY Liberal, WMAQ Lindsborg, WDAJ Manhattan, WTG Salina, WFAJ Topeka, WJAO Wichita, WAAF, WBAH, WEL, WHAN Kentucky: Bowling Green, WNAJ Louisville, WHAS, WKAG, WLAJ, SARU Paducah, WIAR	Louisiana: New Orleans, WAAB, WVAC, WBBM, WCAQ, WGT, WIAP, WWL Shreveport, WAAG, WDAN, WGAQ, WMAU Maine: Auburn, WMB Houlton, WJAN Portland, WJAL Sauter, WPAR Maryland: Baltimore, WCAO, WBAF, WKQ Massachusetts: Boston, WAAJ, WFAU, WNAC Dartmouth, WMAF Holyoke, WIAK Medford Hills, WGI New Bedford, WDAU Springfield, WBB, WIAP Worcester, WCN, WDAJ Michigan: Bay City, WTP Dearborn, WVI Detroit, KOP, WCM, WWS East Lansing, WHW, WKAJ Flint, WEA Kalamazoo, WLAQ Lansing, WHAL Saginaw, WJAB Minnesota: Duluth, WJAP, WMAT Hutchinson, WPAJ Minneapolis, WBAH, WCAS, WLAG, WLB Northfield, WCAJ St. Cloud, WFAM St. Paul, WAAH Mississippi: Corinth, WHAU Missouri: Cameron, WPAQ Carrollton, WLAB Columbia, WAAN Jefferson City, WOS Joplin, WEAH Kansas City, WDAF, WBB, WMAJ, WQQ, WPE Marshall, WJAT Rockport, WNAJ St. Joseph, WBAK St. Louis, KSD, WAAE, WCK, WEB, WBW Springfield, WIAT, WKAS Tarkenton, WIAT Montana: Butte, KFAP, KFBB Great Falls, KDYS Havre, KPBB Nebraska: Fremont, WOAE Hastings, WKAJ, WLAD Lincoln, WCAJ, WFAV, WGAT, WLAJ, WJAB, WKAC, WLAJ, WMAH Norfolk, WJAC Omaha, WLAJ, WIAK Winnac, WOH, WOV Rushville, WBAV University Place, WJAC	Nevada: Reno, KDZK, KFAS, New Hampshire: Berlin, WBAQ Laconia, WKAV New Jersey: Atlantic City, WHAR Camden, WBP Deal Beach, 2XJ Jersey City, WJAT Newport, WBAF Newark, WAAJ, WBS NJ, WJZ, WOF, 2XAI N. Plainfield, WEAJ Ocean City, WIAD Paterson, WBAN Trenton, WMAL New Mexico: Roswell, KNJ State College, KOB New York: Albany, WNJ Binghamton, WFAX, WVNY Buffalo, WGR, WWT Canton, WCAD Cazenovia, WNAJ Elmira, WEAJ Lockport, WMAK Newburgh, WCAJ New York, KDOW, WBAJ, Warytown, WBAF, WLAJ, WVP, WVV Poughkeepsie, WFAF Rochester, WHEM Ridgewood, WBN Seneca, WGY, WRL Syracuse, WBAJ, WDAJ, WFAE, WLAH Tarrytown, WRW Troy, WHAG Utica, WSL Watertown, WPAJ North Carolina: Asheville, WFAJ Charlotte, WBT Raleigh, WLAJ Wilmington, WNCN Fargo, WDAY, WKAJ Ohio: Akron, WOB Athens, WAB Cincinnati, WLV Cincinnati, WZL, WHAG, WIZ, WLW, WMI Cleveland, WBR, WJAX Columbus, WBAJ, WCAH, WEO Dayton, WAI, WFO, Defiance, WCAQ Fairfield, WL-2 Granville, WJD Hannoy, WBAU, WRK Lebanon, WPG Marietta, WBAW Springfield, WLAJ Stockdale, WIAK Toledo, WBAJ, WHU, WJK Warren, WLAJ Wesley, WGO, WGAX Wooster, WGAU Youngstown, WAAJ, WMC Zanesville, WPL	Oregon: Astoria, KFEM Baker, KFBA Central Point, KFAY Eugene, KDZJ, KPAT Hood River, KQJ Klamath Falls, KDYU Marshfield, KPFB Portland, KDYG, KPAB, KPBC, KGS, KGN, KGW, KQY, KYG Salem, KFCD Pennsylvania: Allentown, WJAN Altoona, WGAJ Bridgeport, WBAQ Brownsville, WDAQ Clearfield, WBAJ Easton, WMAP Erie, WJE, WSK Harrisburg, WBAK Lancaster, WGL McKeesport, WIK Parkersburg, 3XW Philadelphia, WCAJ WDAJ, WFL, WGL, WIB, WOC Pittsburgh, KDKA, KQV, WAX, WCAE, WHAF, WJAS Scranton, WLAQ Villanova, WCAJ Wilkes-Barre, WBAX, WKAZ, WNAH Rhode Island: Cranston, WPAJ Edgewood, WEAG East Providence, WKAD Pawtucket, IOJ, LXAD Providence, WBAJ, WJAR South Carolina: Charleston, WFAZ Orangeburg, WGAM South Dakota: Rapid City, WCAT Sioux Falls, WFAT Yankton, WJAU Tennessee: Memphis, WKN, WPO Nashville, WDAJ Texas: Abilene, WQAO Amarillo, WDAJ, WRAU Austin, WMAJ Beaumont, WMAJ Dallas, WDAQ, WFAJ El Paso, WDAH Fort Worth, WBAJ, WPA Galveston, WHAB, WIAC Houston, WCAK, WBAJ, WVNY, WPAJ, WBAJ, WPAJ Orange, WKAL Paris, WTK	Oklahoma: Ardmore, WOOA Enid, WNAJ Muskogee, WDAY Norman, WNAJ Okemah, WKAK Oklahoma City, WKY, WMAJ, 5XT Tulsa, WBAJ, WLAL Yale, WHAT Oregon: Astoria, KFEM Baker, KFBA Central Point, KFAY Eugene, KDZJ, KPAT Hood River, KQJ Klamath Falls, KDYU Marshfield, KPFB Portland, KDYG, KPAB, KPBC, KGS, KGN, KGW, KQY, KYG Salem, KFCD Pennsylvania: Allentown, WJAN Altoona, WGAJ Bridgeport, WBAQ Brownsville, WDAQ Clearfield, WBAJ Easton, WMAP Erie, WJE, WSK Harrisburg, WBAK Lancaster, WGL McKeesport, WIK Parkersburg, 3XW Philadelphia, WCAJ WDAJ, WFL, WGL, WIB, WOC Pittsburgh, KDKA, KQV, WAX, WCAE, WHAF, WJAS Scranton, WLAQ Villanova, WCAJ Wilkes-Barre, WBAX, WKAZ, WNAH Rhode Island: Cranston, WPAJ Edgewood, WEAG East Providence, WKAD Pawtucket, IOJ, LXAD Providence, WBAJ, WJAR South Carolina: Charleston, WFAZ Orangeburg, WGAM South Dakota: Rapid City, WCAT Sioux Falls, WFAT Yankton, WJAU Tennessee: Memphis, WKN, WPO Nashville, WDAJ Texas: Abilene, WQAO Amarillo, WDAJ, WRAU Austin, WMAJ Beaumont, WMAJ Dallas, WDAQ, WFAJ El Paso, WDAH Fort Worth, WBAJ, WPA Galveston, WHAB, WIAC Houston, WCAK, WBAJ, WVNY, WPAJ, WBAJ, WPAJ Orange, WKAL Paris, WTK	State, City, Call Port Arthur, WPAH San Antonio, AS6, DM7, WCAJ, WJAB, WQAI, WGO, WIAD, WLAJ Wichita Falls, WKAF Utah: Ogden, KDZL Salt Lake City, KDYL, KQZV, KZJ Vermont: Bellows Falls, WLAB Burlington, WCAJ Virginia: Richmond, WBAZ/ Washington: Aberdeen, KNT Bellingham, KDZB Centralia, KDZM Everett, KDZJ, KPBL Lacey, KGY Pullman, KPAB Seattle, KDZB, KDZT, KFC, KHQ, KJR, KTW, KZC Spokane, KFZ, KOE Tacoma, KFBB, KEG, KMT Wenatchee, KDZJ, KZV Yakima, KFV, KQT West Virginia: Bluefield, WHAJ Charleston, WCAO Clarksburg, WHAK Huntington, WHAR Morgantown, WHD Wisconsin: Beloit, WKAW Madison, WGAJ, WHA Milwaukee, WAAK, WCAJ, WHAD, WIAO Neenah, WIAT Superior, WFAC Waupaca, WIAA Wyming: Laramie, KFBU Alaska: Fairbanks, WLAY Hawaii: Honolulu, KDXY, KGU Porto Rico: San Juan, WBAQ Canada: Calgary, CHBC, CHCC, CFAC, CFCA Edmonton, CJCA Fort Erie, CFPC Halifax, CFBC, CJCS Hamilton, CKOC Kitchener, CJCF London, CHCS, CJGC, CKQC Montreal, CFCE, CHYC, CJBC, CKAC, CKKS Nelson, CFI Ottawa, CHX Regina, CKCK St. John, CJCB, CKCR Toronto, CFTO, CHBC, CHCZ, CHYC, CJOD, CJCN, CJSC, CKCE Vancouver, CFBC, CFYC, CJNC, CKZC Winnipeg, CHCF, CFJC, CHCA, CKCD

How to Make Uniset Panel Receiver

By Thomas W. Benson

THE DETECTOR panel described in this article is designed to match the tuner panel described in the October 11 issue and can be connected to the

mount the filament rheostat while the hole at the lower right mounts a closed circuit double contact jack. It is unusual to include a jack in a simple detector tube panel but in this case where amplifier panels may be added later the jack will be found advisable. The lower pair of holes in the panel are for attaching it to the base.

The terminal panel at the rear is similar to that on the tuner being cut to 2 by 4 inches from 3/16-inch formica or bakelite. The holes for the seven binding posts are laid out and drilled as shown in Figure 4. The proper size drill to use is that which will just pass the screws of the binding posts which are purchased. The lower pair of holes serve to attach the terminal panel to the base. It is well

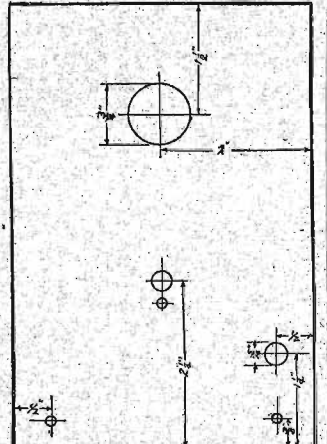


Figure 1

to have the holes rather tight for the screws and to mount the binding posts before the panel is put into place.

Parts Necessary for the Unit
It will be necessary to purchase a rheostat, a V. T. socket and a jack. The grid condenser can also be purchased if

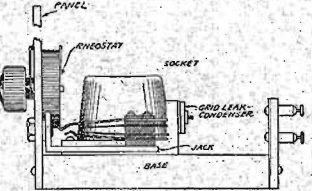


Figure 2

desired but data for the construction of the condenser is given in Figure 5. It is somewhat smaller than the condenser used in the uniset tuner but follows the same method of construction. Two strips of copper foil are cut to the size given and then folded together with oiled linen or paraffin paper between as an insulator of dielectric. The spacing given for the holes makes it possible to mount the condenser on the type of socket employed with the set. This can be seen in the top or side view of the complete detector unit. This style of socket is inexpensive and serves the purpose very well. A strip of fiber 1/16-inch thick is cut just large enough to cover the condenser and holes are punched

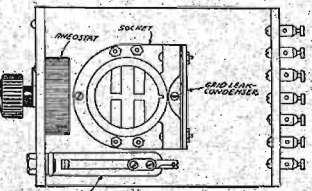


Figure 3

to match those in the condenser. This strip is to be used for the grid leak which is to be described later.

Assembling the Unit
The unit is now ready for assembly. Mount the rheostat and jack of the panel. The socket is mounted on the base as far forward as possible without interfering with the action of the rheostat. Before attaching the panel to the base it is well to make connections to the rheostat and jack. From the wiring diagram in Figure

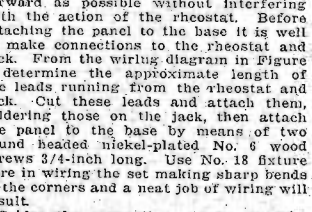


Figure 4

determine the approximate length of the leads running from the rheostat and jack. Cut these leads and attach them, soldering those on the jack, then attach the panel to the base by means of two round headed nickel-plated No. 6 wood screws 3/4-inch long. Use No. 18 fixture wire in wiring the set making sharp bends at the corners and a neat job of wiring will result.

Solder the connections at the binding posts using a non-corrosive soldering paste and a good hot iron for quick work. The condenser is mounted on the V. T. socket by means of two 6-32 brass screws 1 in. long. Slip the condenser over the screws, then attach the two leads, after which the fiber strip can be slipped over the screws. With a soft lead pencil mark around the holes in the fiber then slip a brass washer on each screw finally running the nuts up snug. When completely wired the unit is ready for service.

Attaching Detector to Tuner
It is well to attach the detector to the tuner rigidly. This can be done in the following manner:

From the spring brass strip 3/4-inch wide and 1/32-inch thick, cut two pieces 8 inches long. Punch holes in this as shown in Figure 6. Stand the
(Continued on page 14)

Radio Digest Illustrated

TRADE-MARK
Published by the Radio Digest Publishing Company, Inc.
123 West Madison Street
Chicago, Illinois

E. C. RAYNER, Publisher
Eastern Representative, Jacob Miller, 2125 Broadway, New York
Telephone State 484-4845
Chicago, Illinois
Western Representative, Trade Journals Advertising Agency,
251 Kearny St., San Francisco, Telephone Kearny 1472

58
PUBLISHED WEEKLY

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

Vol. III Chicago, Saturday, October 21, 1932 No. 2

Comeback of the Radiophone

There Is Music in the Air! Let's Get It

Now that the season has fairly begun how about your aerials, and your cat whiskers, and your home-made outfits? You surely have not forgotten all about Radio. A great many of us put aside Radio while it was too hot for extra effort and vacations diverted our minds to rest and recreation, but now the time approaches for indoor entertainment. We may all take out of the air something for entertainment if we have an efficient receiving set. The air is full of it now-a-days.

Improvements are going to come fast. It may be you who will discover that circuit which will eliminate one or more of the troublesome defects of Radio. The whole situation is being studied extensively. Some day Radio truly will be the servant, instead of mere entertainer of man.

Will Crystal Receivers Be the Leader?

Simplicity of the Crystal Detector Has Favor

There is an inborn something in every person that impels him to outdo his brother, that is, to go him one better. The Radio amateur is not immune. He will do his utmost in receiving to pick up the long distance stations in order to make a record. Although he takes pride in his set or special hook-up when it does long distance work, yet there may be the very best kind of entertainment broadcasted from a nearby station which can be heard with the simplest kind of set.

Not all of us care to do the marathon work. We are content with just being entertained. The simple crystal set does not require an extensive knowledge of Radio for the few adjustments can be made without trouble. Its reception is good on short distances. Then, too, the price of such an outfit is within the reach of all.

A crystal is the only detecting device that does not distort during its action. Whatever the sounds, vocal or instrumental, subdued or crashing, the crystal is not paralyzed. Once set, a good crystal detector works along unaided by any devices. Storage batteries and B batteries are not present and so will not fail in the middle of an interesting program. The only drawback is that the range is short.

Standard Parts in Demand

Fans Find Satisfaction in Good Goods.

There are certain necessary parts used in the reception of broadcasts. These parts when made properly function in a set to give the best possible results. Last spring retailers without a knowledge of Radio apparatus stocked up with all kinds of devices, things really of no use to the amateur, with the expectation of filling the hysteric demand. They are now learning by a stern process that only real parts needed in a set are the ones that sell the best and are most profitable in the long run. They are beginning to learn that dependable apparatus, bought to meet the varying Radio conditions, is more to be relied upon than unknown apparatus that looks good in the catalogue, but is merely an ornament upon the shelves.

There is a tremendous interest on the part of the public in what Radio apparatus will serve best for receiving the innumerable concerts and entertainments to be broadcasted this winter.

In a general way, this question is answered by saying that Radio regrets will be eliminated and satisfaction obtained, if care is exercised when buying. Extra and necessary assurance of satisfaction also suggests the purchase of set, or part, produced by manufacturers with character, experience, and ample funds to guarantee permanence in business.

With these points ascertained, the purchaser will be assured of obtaining an instrument which will give satisfaction and pleasure. When repairs are necessary or advice desired, the dealer from whom the purchase was made, will be able to supply parts, make repairs and give such operating advice as may be desired.

Another important feature to be considered is the possible development in the art and its effect upon the receiver. It has been the policy of responsible manufacturers, when designing new apparatus, to keep in mind those instruments they already have on the market and design new apparatus in such a manner that they may be used in conjunction with existing instruments without extensive or serious changes being made.

In a nut shell, buying Radio equipment requires only the same common sense exercised in purchasing other things for which buying habits have been formed. Greatest satisfaction will be derived from purchasing the products of solid, substantial manufacturers through dependable merchants.

Condensed

By DIELECTRIC

Still the new ideas come along and if one had nothing else to do except to try out each new thing as it came from the inventor, there would be very little spare time for anything else. About the latest thing in the way of a receiving set is that made by Mr. Priess. Usually a crystal detector looks aске at a tube, and the triode patronizingly condenses to recognize a crystal, but here we have the two on the best of terms—working along together (according to the inventor) quite harmoniously. This reflex receiver may bear watching. Certainly any crystal requires just that.

Ever taken a trip on the Great Lakes, or own any vessels operating thereon? In either case you will appreciate what Radio is doing for that particular region of the country. Take the case of a ship aground, much time and effort is now saved due to the Radio messages bringing to the skipper exact information about the lake in his vicinity. You can as easily run into a storm on these lakes as suddenly find static romping along with the regular broadcast messages. The weather man will have to take his blame as always, when his forecast proves in error, because no one will accuse the hydrogen ions of playing false. However, I fancy most any skipper would be pleased to receive some word from a land station and know he could send them a call when necessary.

Now we will have a try at the first of the class "B" broadcasting stations. KSD is the first one in the country to enter this special list, and from the accounts of what it accomplished during the trying months of summer static we expect to find it continuing to supply concerts on 400 meters to as large a body of listeners this coming winter. Evidently the Post-Dispatch is out to "show us" that they have something worth listening to down in old Missouri. Never mind the QST for we are listening.

I understand the banks are becoming vitally interested in the use of Radiophony for the special benefit of their patrons. Farmers are getting information from their banks as to the market values of produce, quotations on stocks and bonds, Liberty Bonds etc. This could be made quite a convenience for farmers living some little distance from town. They need not congregate in front of the distant grocery store to exchange confidences (?) regarding their respective financial statuses. Simply have the bank broadcast daily the standing of each farmer in the community, so that a few minutes taken from work to don the headset will bring all the news any man could want—and then some.

According to E. B. Myers it takes six tubes to replace a detector tube. At least he has made a set to fit in a cigar box, using no detector tube whatever, and having only one knob to operate. It has been further said for this set that the breathing of the announcer could be distinctly heard. No harm in that at all. But suppose instead of hearing one's breath you could catch faint traces of a bouquet of some forbidden fruit juice, then all the attentive audience would be deluging the announcer with requests for a part of his precious juice (and labor). Fortunately for all, Radiophony is concerned only with sounds, not odors; for that reason it is possible to sit and listen for hours with consummate pleasure to a broadcasting singer who has heartily indulged in garlic.

Pioneers in the Radio industry have had an opportunity such as comes to few in other lines. To see the tremendous strides it is making, almost daily, and to know that they have had some hand in shaping its course, surely here is just cause for pride. It seems to me, fellow fans, to be our privilege to acknowledge the good these pioneers have done for our hobby. Of course the real big fellows are getting their acclaim every other day or so, but don't let's forget the men who plugged along adding their bit to some phase or other and whom we sort of take for granted. Colonel John Firth can look back over twenty years of association with the Radio industry with pride in its achievements, and with fitting satisfaction for his own part therein. When I can tune out tonight, wake up tomorrow to find a wonderful new idea presented in the science of Radio and before sundown a super-idea, then its time we gave a little consideration to the pioneers maintaining a great faith in the future of the industry back near its inception.

It will be very interesting to watch results from these B stations after they get into running form. The regulations as prescribed by the Department of Commerce are such as to seem to insure the best in broadcasting. These stations will have to toe the mark all the time, or lose the special license. That will keep them up to snuff. Where four or five little fellows are sending along on the 360 range, with small satisfaction to you seated at your sets, whirl her up to 400 and get the "class" programs.

You sure can get some delightful ideas from KDKA, when they send out those storm warnings about wearing apparel. No owner of a receiving set capable of getting this station need to worry about wearing the wrong color of suspenders or width of belt. Just listen for their latest hints. Maybe you will be one step ahead of your neighbor in classy togs.

RADIO INDI-GEST

"Zeke Scroggins Says"

This Broadcastin' stunt is gettin' tu be all day long, 'twouldn't spriso me tu see some feller try tu broadcast uh a-larm clock.

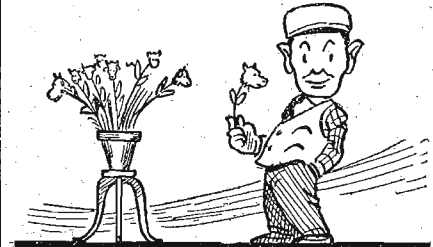
Thin we won't have a darn thing tu do, but set and listin' an thin they'll wake yu up tu listen again.

—Bon Nyeel.

Let's Have'm Broadcast the Coal, Too

How about opening the damper in the furnace by Radio these cold winter mornings?

Electrocutionary Elocution



"Flowers of oratory" naturally come from a Radio broadcasting plant.

They Shrink After the Showers

The experience of one broadcasting station is that its waves are extended during a rainy spell. When we have tried to get home in a shower, we have noticed that the length of the blocks has been more than doubled.

But Don't Let the Stockyards Broadcast

"Motion pictures on the human voice" was a paper read at the international Radio congress.

An eastern paper asks: "Will Radio also extend other senses, notably the sense of smell? Will the man in a city office be able by Radio to smell the fragrance

VOT A SCHMELL!



of meadows and woods?" And how about the farmer in the field; will he be able to know that dinner is ready by the fragrance of corned beef and cabbage, wafted on a Radio wave?

Oh for the Crying Out Loud!

Here lies the body of young Charlie Crouse, Who had ten thousand volts near his house. He threw a wire 'cross that voltage, it's said, The result was quite shocking; poor Charlio is dead.

It All Comes Out in the Wash

When Mr. Billee Crenshaw sent in a question he requested that we print his call letters 8 BVD to attract his attention. We fear, however, that it may attract too much attention. Someone might take it for an advertisement.

Do Ground Wires Promote Angle Worms?

A news item says that the government experts have found that vegetation growing near broadcasting stations takes on a larger growth and reaches maturity



sooner than under ordinary conditions. How about those cabbage heads in the back yard garden? Everything's great! Now we can cut the H. C. of L. next spring.

He'll Have a Lasting Impression

In a row which arose over the installation of a Radio set in Brooklyn, one man assaulted another with an axe. Radio is making a hit everywhere.

P. S.—Brooklyn is just East of the United States.

Use of the Radio Receiving Set in the Home

Part VII—Audio Amplification Using Loud Speaker

By H. M. Towne

IT WAS stated in the preceding installment that two stages of audio frequency amplification was about correct for the average home broadcast receiver. This is particularly true if telephone receivers are used since there is a limit to the amount of energy which they can handle without producing a distortion in the signals or a rattle of the diaphragms. There is a definite limit to the vibration amplitude of the receiver diaphragms, below which quality will be preserved.

This limit is probably different for various types and designs of receivers, but with the possible exception of the types using armature actuated diaphragms, the limit is quite liable to be approached with a two-stage amplifier unless the signals are received over several hundred miles. Most receivers operate very well at moderate intensities but with very strong signals applied to them the diaphragms may vibrate so violently that it will hit the magnet pole pieces and produce harsh and distorted sounds.

Voltage for the Plates

To get the maximum results from two stages, the plate voltage may be increased somewhat above the normal rating. We commonly find 40 or 45 volts regarded as the highest safe voltage for plate potential on amplifier tubes, and but seldom

the tone arm of a talking machine, so that the signals from a two-stage amplifier can be heard with pleasing intensity throughout a small room. Where more volume is desired, it is preferable to install some type of loud speaker which is designed to handle greater energy than can be carried by the telephone receivers.

In considering loud speakers it should be remembered that those employing standard receivers for reproducing the sound into a horn are subject to the same limitation in diaphragm vibration as mentioned for the head receivers. To have the proper amount of energy, the construction of a loud speaker must be such that reasonably strong vibrations of the diaphragm will not cause it to reach its limit of travel.

The material and shape of the diaphragm has considerable to do with the tone qualities, and second to this is the size, shape and material of the horn. If the diaphragm or horn has a definite natural period of vibration it will tend to accentuate any signals or musical tones corresponding to their natural frequency of vibration. The horn should best be made of some material which will not vibrate readily.

Two-Stage Amplifier Required

A two-stage amplifier generally provide sufficient energy to operate a loud

speaker to a suitable intensity for an ordinary living room, but in some cases the third step of audio amplification is desirable in order to obtain signal intensities loud enough for dancing or concerts in a relatively large room or hall. The third stage amplifier tube may be a small power tube such as is used for amateur transmitting, it may be the standard amplifier tube, or two of the latter in parallel.

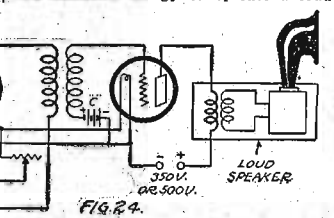


FIG. 24

is advantage taken of the much higher voltage that can be used to produce a greater output. The results from a two-stage amplifier with phones are considerably improved if higher voltage is used, particularly on the second amplifier tube.

About 90 or 100 volts on this tube with proper negative bias (C battery) on the grid will usually give a marked improvement. The biasing of the grid is absolutely essential to success when using high plate voltage, and the amount of negative bias should best be determined experimentally in every case.

With the average UV-201 amplifier tube a plate voltage of 40 will usually require about 1 volt negative bias, and for 100 volts on the plate about 3 or 4 volts bias. This negative bias keeps the plate current down to a normal value and causes the tube to operate on the straight portion of its characteristic curve. The C battery for such a bias may consist of one or more small flashlight cells connected in series. These should be inserted between the filament primary secondary and the filament circuit, with the negative side of the battery to the transformer which carries the negative bias to the grid.

Proper Grid Biasing

If the positive pole of the C battery should be connected to the grid it would render the amplifier tube inoperative. For

speaking to a suitable intensity for an ordinary living room, but in some cases the third step of audio amplification is desirable in order to obtain signal intensities loud enough for dancing or concerts in a relatively large room or hall. The third stage amplifier tube may be a small power tube such as is used for amateur transmitting, it may be the standard amplifier tube, or two of the latter in parallel.

Most of the loud speakers for handling an appreciable energy have an intermediate transformer inherent in the loud speaker. One winding of this transformer connects in the output or plate circuit of the last amplifier tube and the other winding connects to the input coils of the loud speaker. This keeps the plate current out of the loud speaker winding and will prevent any possible polarizing effect which the plate current might have on the diaphragm.

Maximum Results from a Loud Speaker

To get the maximum results from a loud speaker, it is necessary to get the greatest possible energy out of the last amplifier tube, and to do this we must apply a very high plate voltage. If a power tube is employed, the applied plate voltage should be as high or perhaps higher than its normal plate voltage rating. For instance, a Radio Corporation UV-202 5-watt power tube has a rated plate voltage of 350 volts. This tube will operate nicely as an amplifier using as high as 500 volts

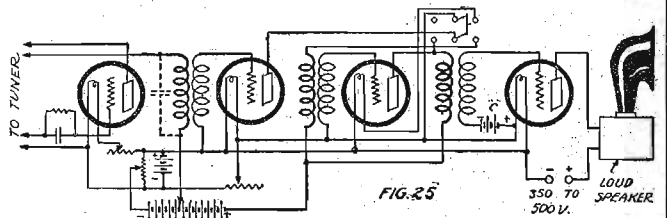


FIG. 25

plate voltages of 50 or more it is advisable to start the C battery at 1½ volts and gradually increase this, taking careful observation at each charge to find the best value, which will be indicated by clearest and loudest signals. The current consumed from a C battery is practically zero and thus the life of the C battery will be the normal shelf life, that is, the life of the battery if it were to deteriorate by age without current consumption.

On account of the negligible current consumption, the C battery may be made up of the smallest type of dry cells. The very small cylindrical type of flashlight cells are very satisfactory. These are rated about 1½ volts each. Care should be exercised that these cells are not overheated when soldering connections to them. The soldering operation must be done quickly and a minimum of heat applied so as not to injure the cells or materially shorten their life.

Loud Speaker Horn

In many cases the telephone receivers may be attached to a horn, megaphone or

on the plate. Also if the standard amplifier tube (UV-201) is used for supplying the output for the loud speaker, a plate voltage of the same or higher should be applied. This last may seem exaggerated, but who writes has used these standard tubes with as high as 525 volts on the plate. While an occasional tube will be found which will paralyze at this voltage, the majority will function entirely normal. The output of a UV-201 with this high plate voltage will give surprising volume in a loud speaker.

The standard amplifier tube has a marked advantage over the power tube, in requiring no special A battery for the filament. The power tubes are rated 7.5 volts for filament and therefore cannot be lighted from the standard 6-volt A storage battery without the addition of an extra 2-volt storage cell in series to provide for the 7.5 volt filament rating.

Amplifier Tube in Parallel

If one of the standard amplifier tubes does not produce the desired volume from loud speaker, a second standard tube may be connected in parallel with it, thus

doubling the output. This combination will be found about equivalent to one 5-watt power tube.

The use of this high plate voltage on either type of tube will require an appropriate

having a capacity rating of 25 watts or more.

The power tube (UV-202) consumes a filament current of 2.35 amperes, and on account of this excessive current it is gen-

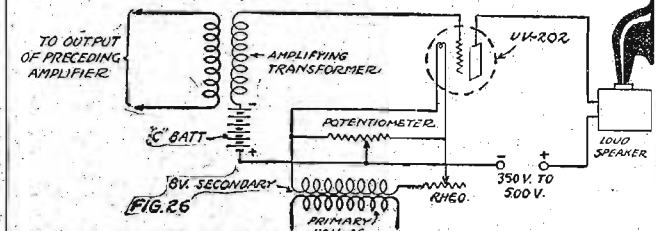


FIG. 26

erable negative bias on the grid. For 350 volts on the plate the required C battery will be of the order of 15 volts, while for 500 volts plate potential the C battery should be in the neighborhood of 20 to 25 volts. Actual trial should always decide the correct value.

Connections for an Amplifier

Figure 24 shows the diagram of connections for a two-stage audio frequency amplifier using a loud speaker and high plate voltage. Figure 25 is the diagram of a similar but more flexible arrangement, using three stages of audio amplification with a double-pole, double-throw switch to change quickly from three to two stages. When the switch is thrown to the left, the filament circuit of the second amplifier tube is opened and the output of the first amplifier tube is connected over to the input of the third tube, which has the high plate voltage with loud speaker in the output circuit.

A. C. on Power Tube Filament

Figure 26 shows the diagram for a power tube in the third stage, using alternating current from the lighting circuit to light the filament. This works out very nicely where the power type of tube is found necessary, and by using the A. C. supply the need for additional storage cell on A battery is eliminated. The transformer for stepping the A. C. voltage down to 8 volts may be an ordinary toy transformer,

generally well to consider the use of A. C. (alternating current) for its filament supply and thus avoid this large load, particularly in the case of a small capacity A battery.

Eliminating Hum

The secondary of the amplifying transformer is connected to the filament through a 200-ohm potentiometer so that any A. C. 60-cycle hum can be adjusted to a minimum. It should be remembered that the rheostat for a power tube must have amperes carrying capacity for the rated filament current of the tube.

One of the important factors in the successful operation of these circuits with loud speakers is a reliable source of high plate voltage. The use of B batteries in series is hardly economical for voltages above say 100, since the energy consumed is much greater at the higher voltages. A reliable source may be a small capacity 500-volt motor-generator set, or preferably a rectifier which may be attached to the A. C. lighting circuit. A simple but efficient rectifier for this purpose will be the subject of the next installment. (Continued in the October 28th Issue)

Radio operators in China receive eight dollars a month, and Radio mechanics two dollars. One of the assistants in a recent Radio installation bore the appropriate name "Bacon Lowe."

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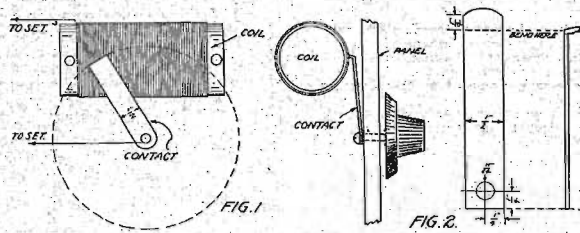
New York

Coil Trick Allows Close Adjustment

Contactors Touches All Wires in Arc of Circle

Tuning may be done on every turn of a coil without the expense of a unit and tens switch, if the coil is mounted as shown in Figure 1. The contactor is a strip of copper 1/2-inch wide and of a length to suit the coil. A hole is drilled 1/2 inch

PLAN OF SWITCH FOR TUNER



WORKSHOP KINKS? EARN A DOLLAR—

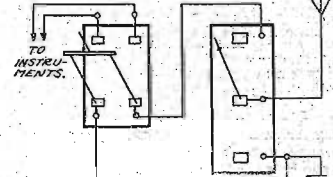
There are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. RADIO DIGEST is very much interested in securing such material.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

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

from one end of the copper strip to take an 8-32 machine screw. The opposite end is bent up for 1/2-inch and the edge rounded, as shown. The indicator may be a knob and dial, or a knob and pointer.—A. C. Piepsorn, Milwaukee, Wis.

Hook-Up for a Single Ground

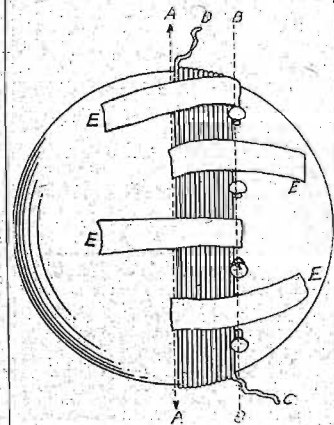
When constructing a receiving set and there is only one ground available, as in the case of using an attic for the amateur laboratory, the hook-up shown in the illustration will help. The receiving



switch must have two clips or poles, one set at the ground and one for the antenna. When the lightning switch is in the receiving position (up), the ground of the receiving switch may be connected to the lightning ground with no possible chance to damage the set. When the lightning switch is down, the receiving switch must be shifted out to keep electrical charges from the antenna passing into the instruments.—C. E. Rust, Phoebus, Va.

Forms for Winding Coils

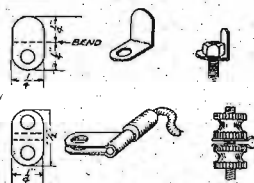
Hollow rubber balls make good forms on which to wind the wire to shape it for variometers and variocouplers. Procure two balls of the right size, one large and one a little smaller, and fill them through



the small hole with plaster of paris. Locate the center line A and drive 8 or 10 brads on the line B. Start winding the coil at C and lay on the first round against the brads and fill the space to the line A, finishing at D. Cut eight pieces of adhesive tape twice as long as the width of the winding and place them across the winding as at EEEE. Pull out the brads, remove the winding and wrap the adhesive tape ends around the winding on the inside. The coil form will remain quite stiff when removed. Use the large ball for the stator or fold windings and the small ball for the rotor windings.

Stops and Phone Connectors

Neat little switch stops may be made in the following manner from thin sheet metal. Cut the metal, as shown in the illustration, and bend it at right angles in the center.



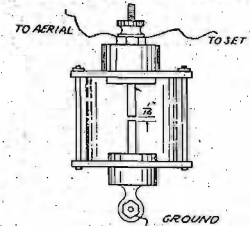
A connector for a phone tip may be made of a binding post and a length of sheet brass. The thin metal is bent over the tip and is bolted down on the binding post.—Norman J. Forsman, Milwaukee, Wis.

Look for Open Circuit

When a steady hum is heard in the receivers after wiring up a set, it may be taken as an indication that there is an open circuit somewhere. Trace out the wiring carefully and some little fault will usually present itself.

Lightning Arrester Made of Switch Body

The base of this arrester is made from an old 250-volt, 15-ampere switch. Secure a round piece of carbon such as is used in street arc lamps and break it in half, making each piece about 1 1/2 inches long.



Remove the lever from the switch and bend the supports slightly smaller so that they will clamp the carbon and hold it securely. Insert the carbon sticks until there is only a 1/8 inch space between the ends.—Joseph Howard, Alliance, O.

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STATION SCHEDULES

(Continued from page 8)
WBZ, Springfield, Mass. 500 mt. Westinghouse Elec. & Mfg. Co. Daily ex Sun. 7:30 am, children's hour; 7:45, markets, weather, lecture; 8-9, concert. Sun. 3 and 8, church services. Central.
WCAB, Newburgh, N. Y. 150 mt. Newburgh Daily News. Daily ex Sun. 1 pm, 2, 3, 7 Mon. Fri. 10:30 pm. Eastern.
WCAC, Fort Smith, Ark. 600 mt. John Fink Jewelry Co. Fri. Sun. 8-10 pm, music, talks, sermon. Central.
WCAD, Canton, N. Y. 200, 450 also 300 mt. St. Lawrence Univ. to regular schedule. Eastern.
WCAG, Pittsburgh, Pa. Kaufman & Baer Co.
WCAN, Columbia, S. C. 100 mt. Eastern Elec. Co. Tues. Fri. 7-9 pm, music. Wed. Thurs. Sat. 7-8 pm, music. Sun. 10-12:30 pm, church services. Central.
WCAJ, Univ. Place, Neb. 485 also 100 mt. Neb. Wesleyan Univ. Daily ex Sun. 11 am, weather, news, Wed. 9 pm, music, lecture. Central.
WCAK, Houston, Tex. 100 mt. Alfred F. Dantel. Daily ex Sun. 7-7:15 pm, music. Wed. 9:15, concert. Sun. 3-4:30 pm, concert. Central.
WCAL, Northland, Minn. 300 mt. St. Olaf College. Thurs. 11 pm, music. Sun. 8:30 pm, music, concert, lecture. Central.
WCAM, Yllanora, Pa. Yllanora College.
WCAN, Jacksonville, Fla. Atlantic Nat'l Bk. Bldg., Southeastern Radio Telephone Co.
WGO, Baltimore, Md. 100 mt. Sanders & Starmer Co. Daily ex Sun. 12:15-2:00 pm, 5-5:20, 10:20, 7:30-8:30 pm. Eastern.
WGOB, Decatur, Ga. Central Radio Service.
WCAQ, DeFiance, O. 200 mt. Tri-State Radio Mfg. Co. Daily, 11:30-12:30 pm, 3, baseball; 6-6:30, baseball, concert, 8, special program. Central.
WCAR, San Antonio, Tex. 500 mt. Alamo Radio Elec. Co. Daily ex Sun and Thurs. 8:40-9:30 pm, music. Thurs. 9:30-10:30 pm, music. Sun. 2:30-3:30 pm, church service. Central.
WCAS, Minneapolis, Minn. 200 mt. Wm. H. Dunwoody Industrial Inst. Mon. 8-8:45 pm, music, lecture. Central.
WCAT, Rapid City, S. Dak. 485 also 300 mt. S. Dak. School of Mines. Daily ex Sun. 9:30-12:30 pm, weather. Mountain.
WCAV, Philadelphia, Pa. Phila. Radiophone Co.
WCAW, Little Rock, Ark. J. C. Dice Elec. Co.
WCAX, Quincy, Ill. 100 mt. Quincy Elec. Sup. Co. (Quincy Herald.) Daily ex Sun. 8:45 am, markets; 11, markets; 1 pm, markets; 6 music, baseball, Ten. Wed. Thurs. Sat. 8:30-9:45 pm, concert. Sun. 7:30-7:50 pm, religious. Central.
WCAY, Burlington, Vt. 200 mt. Vt. Radiophone Co.
WCAY, Milwaukee, Wis. Kasseminn O'Driscoll Co.
WCZ, Quincy, Ill. White-General.
WCE, Minneapolis, Minn. Pioneer Elec. Co.
WCI, New Haven, Conn. 400 mt. A. C. Gilbert Co. Mon. Wed. Thurs. 7:30-8:30 pm, news, music. Eastern.
WCK, St. Louis, Mo. 485 also 50 mt. Stix Baer & Fuller (Overland) 5:45-8 pm, concert, lecture, beautiful store. Central.
WCM, Austin, Tex. Univ. of Tex.
WCN, Worcester, Mass. 485 also 100 mt. Clark Univ.

Daily, 11:15 am, 6:15 pm, weather. Evening program irregular. Eastern.
WXC, Detroit, Mich. Detroit Free Press.
WDAA, Nashville, Tenn. Ward Belmont School.
WDAC, Springfield, Ill. Ill. Watch Co.
WDAD, Jopling, Mo. Wm. L. Harrison.
WDAG, Tampa, Fla. 485 also 750 mt. Tampa Daily Times. Wed. Fri. 8-10 pm, concert, Spanish and English. Eastern.
WDAL, Kansas City, Mo. 485 also 500 mt. Kansas City Star. Daily ex Sun. 3-4 pm, reports, music. Mon. Wed. Fri. 8-10 pm, concert. Sun. 3:30-5:30 pm, music. Central.
WDAS, Amarillo, Tex. K. Lawrence Martin.
WDAP, El Paso, Tex. 485 also 200 mt. Mine & Smelter Supply Co. Thurs. Thurs. Sat. 7:30-8:30 pm, concert. Mountain.
WDAI, College Park, Ga. 485 also 200 mt. Hughes Radio Corp. Daily ex Sun. 12 m. reports. Wed. Sat. evening concert.
WDAJ, Sarasota, N. Y. 485 also 300 mt. A. & W. P. R. R. Co. Daily, 9-10 pm, concert etc. Central.
WDAK, Hartford, Conn. 150 mt. Hartford Courant. Daily ex Sun. 1:30 pm, 2:30, 3:30, 4:30, 6:30. Mon. Wed. Sat. 7:15-8:45 pm, concert. Sun. 8:30 and 7 pm. Eastern.
WDAI, Jacksonville, Fla. 485 also 250 mt. Florida Times Union. Daily, 11 am, time, weather. 3-3:15, 4-4:15, 5-5:15, 8-5:30 pm, music. 10:05-10:20 pm, reports. Eastern.
WDAN, Shreveport, La. Centenary College and Georgetown Radio Corp.
WDAO, Dallas, Tex. Automotive Elec. Co.
WDAP, Chicago, Ill. 485 also 1,900 mt. Midwest Radio. Daily ex Sat and Sun. 9:45 am, 10:15, 11:30, 1:45 pm, 3:15, foreign exchange; 3:17, closing Chicago stocks. Sat. 9:45 am, 11:45, 12:45 pm, foreign exchange; 12:17, closing Chicago stocks. Sun. 8:30-10:20, concert. Central.
WDAQ, Brownsville, Pa. 200 mt. Harwood-Riker Elec. & Mach. Co. Daily ex Sun. 10:30-10:50 am, music; 12:30-1:10 pm, music, news, weather; 5:00-5:50 pm, music. Thurs. Fri. 8-10 pm, concert. Sun. 5 pm, church. Eastern.
WDAE, Philadelphia, Pa. Lit Bros.
WDAF, Worcester, Mass. Samuel A. Watte.
WDAT, Worcester, Mass. Delta Elec. Co.
WDAU, New Bedford, Mass. 50 mt. Bloem & Kilburn. Mon. Wed. 7-9 pm, concert etc. Eastern.
WDAV, Milwaukee, Wis. Daily Phoenix.
WDAW, Atlanta, Ga. 485 also 300 mt. Georgia Ry. & Power Co. Daily ex Sun. 8-7 pm. 9-5:15. Sun. 3:50-4:30 pm. Central.
WDX, Centerville, Iowa. 500 mt. First Nat'l Bank. Daily ex Sun. 11-20 am, reports, news. Mon. Thurs. 7:30-9 pm, concert. Central.
(NOTE.—The second half of the station schedule list will appear next week.)

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Simple Instructions for the Beginner

By Harry J. Marx

Vacuum Tube Tests

GOING on from last week, a few important tube tests will be described. The following instruments will be required for these tests:

One direct current voltmeter reading from 0 to 10 volts, one direct current ammeter reading from 0 to 2 amperes, one direct current voltmeter reading from 0 to 300 volts, one direct current milliammeter reading from 0 to 10 milliamperes, one direct current voltmeter with 0 center reading 10 volts positive and negative, one potentiometer, one rheostat, 120 volts tapped plate batteries, three 6-volt A batteries.

This series of tests was carried out to determine the characteristics and properties of a four-volt vacuum tube, and is divided into a number of tests covering the main characteristics of the tube.

Test Number One

The instruments were hooked up as indicated in Figure 1. The rheostat permitted the voltage adjustment for any setting from

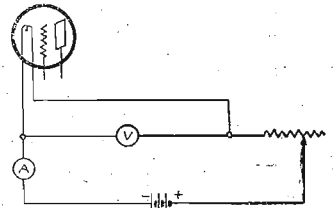


Figure 1

a minimum of about one to a maximum of 6 volts, although readings were not carried further than 5. The rheostat was one of the type operated through the resistance of carbon powder varied by the pressure exerted upon it. This permitted fairly good readings. The battery had a 6-volt capacity, as it was desired to read slightly above the rated value of the tube.

Figure 2 shows the plotted readings of the instruments for the different voltages. For example:

At 4 volts the amperage was .33. At 5 volts it was about .94. By means of Ohm's law the filament resistance can be calculated. The reader must consider, however, that the value of the filament resistance will fluctuate, due to the variation and re-

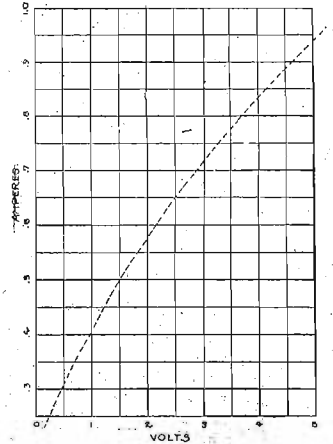


Figure 2

sistance of any filament as the heat of the filament varies.

Test Number Two

For this test the plate milliammeter, voltmeter and B batteries were added as indicated in the hook-up illustrated in Figure 3. The purpose of this test was to illustrate the increase in the electron flow in

the plate circuit as the filament temperature is increased by means of the rheostat control over the filament voltage. The plate voltage was tapped at 100 volts. This voltage was indicated by the plate battery voltmeter.

There will be no perceptible flow in the plate circuit until the filament voltage reaches a value of about 3. From there on the electron flow increases rapidly up to a

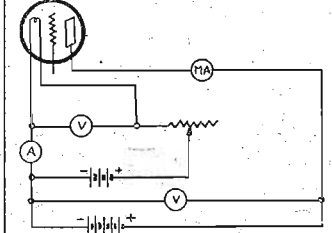


Figure 3

value of 4½ volts, after which very little increase in milliamperes is noted. This would indicate that the best point of operation when the tube is used for amplification would be between 4 and 4½ volts. This comparison of plate flow with filament voltage is pictured in Figure 4.

Test Number Three

In test number 3 the connections are the same as in test number 2. In this case, however, the filament voltage is kept at 4

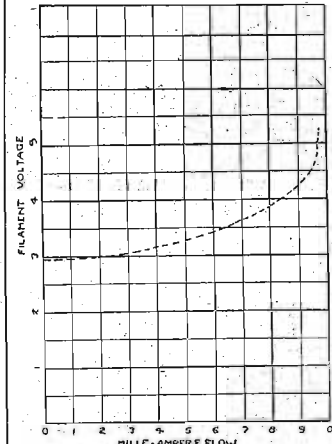


Figure 4

volts and the plate voltage is varied from 20 to 120. The variation from 20 to 45 is very slight, so that these values were not shown in the graphic chart, Figure 5.

With 20 volts on the plate, 9 milliamperes will flow into the plate circuit. At 45 volts 2.5 milliamperes flow in the plate circuit. The increase will be found

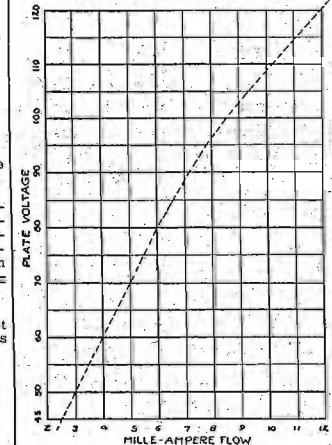


Figure 5

quite rapid up to about 80 volts, above which the increase drops off slightly. At 80 volts there is a 6-milliamperes flow, while at 120 volts there is a 12-milliamperes flow.

If possible, tests should be carried out to higher voltages, as this tube is rated for a voltage of 200 or more.

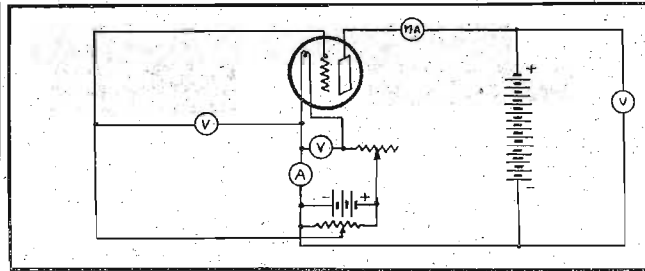


Figure 6

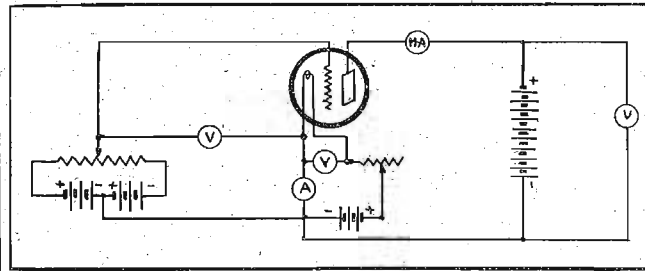


Figure 8

Test Number Four

In this test the instruments were hooked up as in Figure 6. The purpose of the test was to indicate the control of the electron flow by means of the grid and its variations in potential.

If we consider the circuit between the grid and the filament, it will be noted that we have a complete circuit running from the grid through to the slider on the potentiometer to the positive side of the battery, then from the negative side of the battery to the filament. If the slider on the potentiometer is moved to the extreme right, the voltmeter between the filament and grid will indicate 6 volts. Since the potentiometer slider is on the right-hand or positive side of the battery, then the grid is positively charged to a potential of 6 volts. As the slider is moved to the left, the resistance between the positive terminal and the slider reduces the potential down to the point where the slider reaches

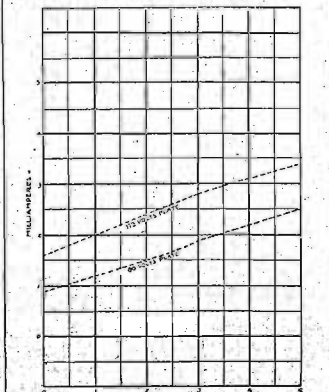


Figure 7

the extreme left position, making direct contact with the negative side of the battery when the potential will be 0. In this way a positive potential is constantly being created in the grid, the amount of which is controlled by the potentiometer.

Shows Plate Control by Grid

The purpose of this test, then, is to find the variation in electron flow in the plate circuit with the change in grid potential.

In Figure 7 are given the curves of milliamperes flow for variation in grid potential. The filament voltage was kept at 4 volts, and readings were taken for both 80 volts and also 113 volts in the plate circuit. This test was made a few days later and different tubes were used. For this reason the values plotted in this and the succeeding test do not apply to the preceding ones. The plate batteries had been used in the interim, and for that reason the voltage did not come up to the 120 as first used.

With 80 volts on the plate with a 0 potential on the grid the milliamperes flow was .9. The flow in the plate circuit increased fairly regularly with the increase in the grid potential and had a very slight drop towards the end. The plate voltage was then changed to 113, for which value

at a 0 grid potential there was a plate flow of 1.6 milliamperes. This increased very regularly up to 3 volts potential, when a reading of 2.8 milliamperes was obtained. From this point on up to 5 volts the increase in the flow dropped off slightly.

This illustrates very clearly the point brought out in the article in the last issue, namely, as the positive charge of the grid is increased it helps draw away the electrons from the filament, thus increasing the flow to the plate.

Test Number Five

In this test the potential on the grid is controlled by separate batteries from that of the filament. Two 6-volt batteries were kept in series and the potentiometer was shunted across both. A connection was made from the wire between the two batteries to the negative side of the filament. The slider of the potentiometer was connected directly to the grid. The voltmeter is connected between the grid lead and the negative side of the filament battery. (See Figure 8.)

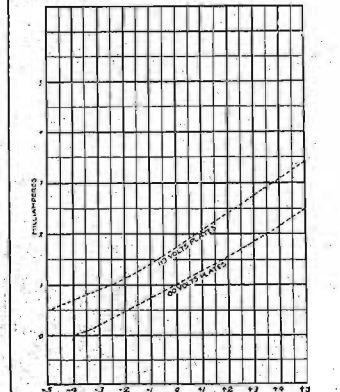


Figure 9

If the slider is on the left-hand side of the potentiometer the current will flow through the least resistance, therefore through the left-hand battery. That would mean that the positive is connected to the grid, giving it a positive charge. When the slider is on the right-hand side, the flow through the least resistance would be through the right-hand battery connecting the negative side of the grid. If the slider is in the center the resistance on the both sides will be approximately the same and there will be no potential imposed on the grid through these two batteries. In this way the actual grid potential is controlled from a negative 6 volts to a positive 6 volts.

Effect of Negative Potential

The filament voltage, as before, was kept at a value of 4, and readings were taken for both 80 and 113 plate volts. Starting out from a 0 potential, it will be found that the plate flow checks closely with that in the previous test. Likewise the increase up until 5 volts also follows the former values fairly close. The purpose of this test, however, is to indicate the effect of (Continued on page 14)

Marx Article Correction

In Mr. Marx's article, on page 13 last week, an error occurred in Figure 4. This

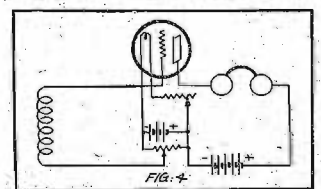


FIG. 4

was noted too late for correction in that issue. The corrected illustration is given here.

TO MAKE UNISETS

(Continued from page 9)

a strip of brass between the panel and the base and replace the screws. The other brass strip is put in the same way between the terminal panel and the base. It will be found that the two units are then bonded together tightly and can be wired readily.

In Figure 8 is given a wiring diagram in which the tube unit is used as a plain detector without regeneration. The upper diagram shows the actual wiring of the posts in all the drawings. The lower diagram shows the resultant circuit. A 6-volt storage battery is connected to posts No. 2 and 4 as shown and a 22½ volt B

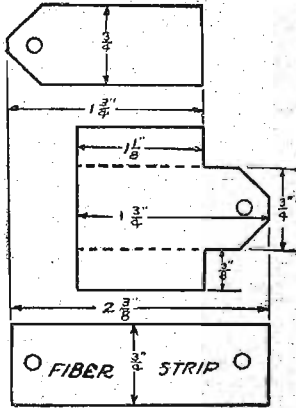


Figure 5

battery has the positive terminal connected to post 6 and the negative to No. 4. Some experimenters prefer the negative of the B connected to the negative of the A. However, there is little difference in the operation. When con-

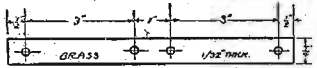


Figure 6

nected to the positive A a higher voltage is impressed on the plate giving a wider range of adjustment. The phones can be fitted with a plug to go into the

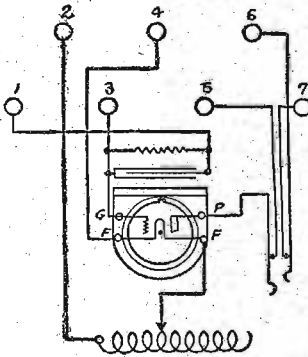


Figure 7

jack or connected to posts 5 and 7 as preferred.

Adjusted Set for Reception
It is not necessary to go into detail regarding the adjustment of the set. After making sure all connections are right light

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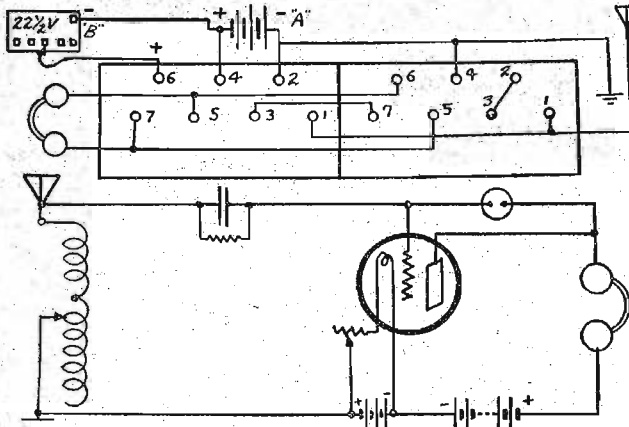


Figure 8

the filament to the point where a hiss is heard in the phone, then turn it down till a signal is heard, then shift the clip on the B battery until it is the loudest. Careful adjustment of the filament may increase the intensity of the signal. A further increase may be obtained from adjusting the grid leak. While a signal is being heard, draw lines on the fiber strip between the two terminals with a soft lead pencil, listening carefully till maximum response is heard and the leak is adjusted. It will not require adjustment unless another tube is used.

Crystal or Tube Detector

Particular attention is drawn to the connecting of the detector and condenser of the tuning unit in this circuit. It will be noted that the condenser is across the phones while the detector socket bridges the phone terminal and the aerial lead to the tuner. With this arrangement it is a simple matter to change from tube to crystal detector. Simply turn off the filament of the tube and plug in the detector. Reversing the operation cuts out the crystal and the tube is brought into operation.

There are, of course, numerous circuits possible with the two units and it will be found that nearly all can be obtained without altering the wiring in the set. It is a simple matter to make the connections necessary to procure a certain circuit. When doing so it is well to make a record of each circuit used and the results obtained.

VACUUM TUBE TESTS

(Continued from page 13)

the negative potential. As the voltage on the negative side is increased, the plate flow is reduced, and at minus 5 volts the

milliamper flow at 113 volts on the plate is only .5. When the plate voltage is reduced to 80, the electron flow is choked out at about minus 4 volts grid potential. This, then, illustrates the effect of the negative charge on the grid in restraining the flow of electrons to the plate. Figure 9 shows the curve obtained.

Variable Condenser in Grid Circuit
Another experiment suggested for the amateur is the addition of a variable condenser in the grid circuit. Also a variable grid leak will show the action and effect when applied to the circuit in any receiv-

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ing set. These connections can also be hooked up to a complete receiving circuit so that variations can be studied under actual operating conditions.

Another use of these tests would be to compare two or more tubes for the selection of those giving the highest plate flow. In this way poor tubes can be eliminated from any set and the highest possible performance can be anticipated as far as the tubes are concerned, merely by the proper selection and elimination of the tubes to be used. This test will be found rather valuable for the retail stores who wish to be assured that the product they are selling will operate satisfactorily.

MYERS TUBES

Hudson-Ross, 123 W. Madison, Chicago

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., OF THE ACT OF CONGRESS OF AUGUST 24, 1912, OF RADIO DIGEST ILLUSTRATED, published weekly at Chicago, Illinois, on October 1, 1922.

State of Illinois, County of Cook, SS.—Before me, a notary public in and for the State and county aforesaid, personally appeared E. C. Rayner, who having been duly sworn according to law, deposes and says that he is the publisher of the RADIO DIGEST ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 21, 1912, embodied in section 445, Postal Laws and Regulations, and printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, E. C. Rayner, 717 Irving Park Blvd., Chicago; editor, Chas. F. Sailer, 427 Lake Park Ave., Chicago; managing editor, E. E. Plummer, 1018 N. State St., Chicago; business managers, none.
 2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) Chicago, Ill., E. C. Rayner, 717 Irving Park Blvd., Chicago, Ill., S. O. Bronstein, 161 Carver Ave., Chicago, Ill., J. Ryan, 123 W. Madison St., Chicago, Ill.; A. R. White, 7015 Elwood Ave., Chicago, Ill.; Joseph Sussman, 200 Fifth Ave., New York, N. Y.; George Seaman, 2250 Parkway W., Chicago, Ill.; Clayton W. Sherman, 5537 Washington Blvd., Chicago, Ill.
 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.
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 5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is:..... (This information is required from daily publications only.)
- E. C. RAYNER, Publisher.
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Questions and Answers

Coil Winding Questions

(1089) BC
Referring to diagram S-8, page 14, in July 22 (Vol. 2, No. 2) issue of RADIO DIGEST, please tell me:

1. What is the diameter of the primary tubing?
2. Diameter of the tickler tubing?
3. How many turns in secondary coil?
4. How many turns in tickler coil?
5. By the way the tickler is drawn (santing), does it mean that the tickler coil is variable in the magnetic field of the primary?
6. How would this be: Have the secondary coil (wound on a smaller tube) in a fixed position in the primary, and the tickler (on tube smaller than primary) variable in the other end of the primary? I am going to use No. 22, D. C. C.

When you answer my questions in your paper put this before it to call my particular attention, 8BVD.

A.—Referring to diagram S-8, page 14, RADIO DIGEST, July 22nd:

Diameter of primary tubing may be three and one-half inches average for 200 to 350 meters wave length.

Diameter of tickler tube should be three inches. Secondary coil should have thirty turns. Tickler coil should have twenty turns.

Position of tickler in diagram signifies that it is variable in the magnetic field of the primary. Your suggested construction is all right. The tickler arrangement is immaterial. Convenience is the only question.

After Midnight

(1019) JJD

The night of the 16th I heard WSB, Atlanta, Ga., and WHLE, Kansas City, Missouri. Last night I heard KSD, St. Louis, Missouri and WOC, Davenport, Iowa. These were heard on a Clapp-Eastman, H. R. regenerative set without amplification. Wouldn't this be considered good? This is the best I've done as I have never tried around 11 p. m. to 1 a. m. before. Is not this because the nearer stations have "signed off"?

WHAM is located here and I cannot get anything outside when he is running as I hear his no matter how I set the tuner. Is there anyway to overcome this?

Would a variometer in the plate or grid circuits (state which) help me to tune closer and hear long distance stations clearer with this set? Could you suggest any improvement outside of amplification?

I am a regular reader of your magazine and use your call lists right along. I enjoy it greatly. I have tried to learn to receive code messages but without success. I know the code letters but can not distinguish them in messages. Can you suggest anything to help me?

I have a B battery testing about 20 1/2 volts. When using this alone I can hear no longer distance stations but with the addition of two wet cells (door bell) I get them, but these seem to be a lot of noise and they are very hard to tune in. Is it possible that this tube requires more plate voltage than some others? Is it all right to use the wet cells in this way?

A.—We take pleasure in congratulating you upon your accomplishment in DX reception, but as the publication of such records are conditional upon number of miles represented your failure to give same precludes publishing. Better luck next time OM!

After midnight is the witching hour for DX. You are right as to the reason. Less interference from nearby stations, etc.

In all probability you are too close to WHAM to tune him out completely.

Variometer in plate circuit will assist in tuning closer and probably also in reception. Of course amplification is always desirable for the ambitious.

Practice and perseverance is the only way to master code reception and transmission. Don't think there is any short cut, unless perhaps the discipline of attending to school.

It is possible that your tube requires more plate voltage. Tubes are not always uniform. It will be O. K. to use the wet cells as you suggest.

Fixed and Variable Inductance

(729) RVW

As a reader of RADIO DIGEST, would like to receive the following information: I am using a fixed inductance coil consisting of a primary of 20 turns and a secondary of 50 turns wound on a 3-inch formica tube, a variometer, 43-plate condenser, and two stages of audio frequency. Diagram of hook-up is enclosed.

Would I get better results by using a variocoupler in place of the fixed inductance coil? If so, would like to have a diagram of the hook-up.

A.—Yes, your primary adjustment being variable would help. Hook-up is same as you have the fixed coupling.

Honeycomb Coils (1041) M. D.

(478) JNR

As a reader of your paper I thought I would ask you a few questions, if you would be so kind as to answer them.

1. Would a spark gap with a fuse in the lead-in act as a lightning arrester?

2. What would the capacity of the fuse need to be?

3. What range of wave lengths will honeycomb coils receive; also variocouplers?

4. Which are the best, honeycomb coils or spider web coils and what would home made ones cost?

A.—Replying to your questions as follows:

1. Your idea of using a spark gap with a fuse in the lead-in to act as a lightning arrester is practical and a good one.

2. In this event you should use about three ampere fuse.

3. The wave length range of honeycomb coils and variocouplers depends entirely upon their size. From anything to anywhere accordingly.

Spider web coils are best for low wave length, honeycomb coils for high wave lengths.

We take pleasure in submitting your suggestion for fastening ground wire, to Editor of "Workshop Kinks" for attention and approval.

Capacity of Condenser

(1049) TFG

I have been reading RADIO DIGEST for some time. In the issue of August 6th, on page 12, I noticed some Radio receiving sets. I have decided to build the one described in Figure 13. What is the Mfd. capacity of the two fixed condensers? Also value of the grid leak is what?

A.—We are pleased at your interest and plans to construct a Radio receiving set, and extend our best wishes for your success.

Mfd. capacity of condensers is: across the phones, .01; grid condenser, .0005. Resistance of grid leak may be about 1 megohm.

Good Crystal Reception

Thinking you might be interested to hear of super-crystal reception I am proceeding to write. I have a crystal set composed of a 700-ohm loose coupler .006 mfd. variable condenser across the secondary circuit, and a very efficient pair of 2000-ohm phones. Most important of all, I use only the best galena mineral obtainable. My home is 1004 N. Locust St., Valparaiso, Ind.

My aerial is a 2-wire T type, 190 feet long and 80 feet high. Two pipes driven about five feet in the ground (which I keep well moistened by continually pouring on water) makes a sure ground connection.

I am hearing the following stations: KYW, WDAP, and WAAF of Chicago; WSB, Atlanta, Ga.; WGY, Schenectady, N. Y.; WJZ, Newark, N. J.; WHAS, Louisville, Ky.; WGS and WTY of Detroit; WOC, Davenport, Ia.; WDAB and WHL of Kansas City, Mo.; KSD, St. Louis, Mo.; KDKA, E. Pittsburgh, Pa. I have heard all these stations very clear there being no guess-work about it. I have proof from friends who have heard some of the stations on my set. I also get commercial stations all over the country. These include NAA, Arlington, Va.; NAR, Key

West, Fla.; WNY, New York City; NUX, Duluth, Minn.

I would like to know if there are any others who can show up crystal reception superior to this. If so, I wish you would let me know through the DIGEST which I take regularly. There sure is a lot of interesting material in RADIO DIGEST and more up-to-the-minute data than in the larger Radio magazines.

Editor's Note—These readers who are interested in this question may write Mr. William S. Schultz at 1004 Locust St., Valparaiso, Ind.

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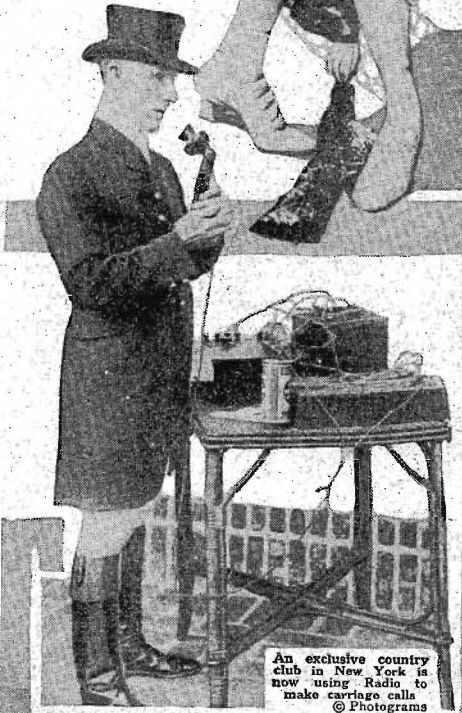
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