October, 1921

25 Cents

The WIRELESS AGE

Volume 9

Number 1

H. O. Peterson operating 9YY, the high power amateur radiophone station at the University of Nebraska; 9YY is equipped with four 50-watt U. V. 203 radiotrons and two 5-watt tubes for speech amplification

D. C. for Amateurs Supplied by the Kenotron

Amateurs Aid Flood Victims — The Manufacture of Modern Vacuum Tubes

And Many Exclusive Features in This Issue

Moulded High Frequency High Tension Insulators

POTENTIALS 1,000 — TO — 1,000,000 VOLTS

Medal and Diploma received at World's Columbian Exposition Chicago, 1893

TRADE ELECTROSE MARK REG. U.S. PAT. OFF. & FOREIGN COUNTRIES.

INSULATION
"MADE IN AMERICA"
Louis Steinberger's Patents

Medal and Diploma received at World's Fair. St. Louis. 1904.

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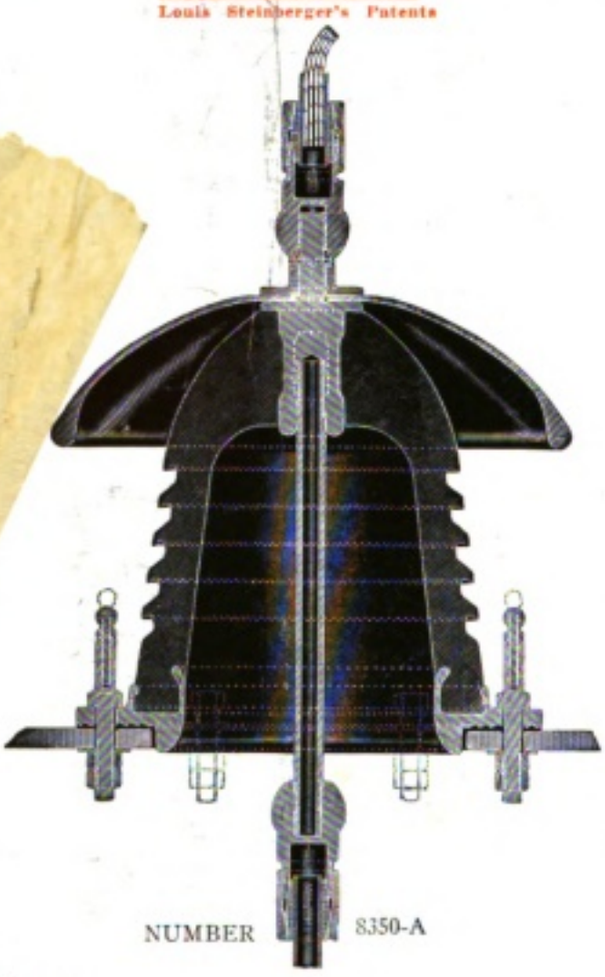
AIR-GAP

Louis Steinberger's Patents

Radio Frequencies
Radio Telegraph
Radio Telephony
X. Ray Apparatus
ed or Sustained
Voltages

Gap
and Upward

ximum Dielectric Strength



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Audio Frequencies
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Sub Station Insulators
Transformer Insulators
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Circuit Breakers, Bus-bars, Supports, Etc., Etc.

Air Gap
1-4" and Upward

Maximum Mechanical Strength

Minimum Dielectric Loss
Minimum Weight

rials so proportioned that:

Minimum Cost
Minimum Physical Dimensions

MAXIMUM ELECTRIC STRESSES FORMED IN AIR

TENSIVE TESTS under sustained radio frequency operation show:

NO HEATING

ARC-OVER ESTABLISHED IN AIR

"ELECTROSE" Insulators are standard with United States Navy and Army and Wireless Telegraph and Telephone Companies

"ELECTROSE" is made in a number of grades for various requirements, each grade possessing special characteristics.

"ELECTROSE" Insulators—Best in the World for High Frequency Currents, Power and Transmission Circuits.

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FADA INSTRUMENTS PRODUCE RESULTS

ANY DETECTOR-AMPLIFIER to produce "results" must be correctly designed, constructed with instrument-making care, and rigidly inspected and tested.

FADA detector control panels and amplifiers are designed, constructed and tested correctly. They are being purchased by amateurs that "know apparatus." Only yesterday a detector and two-stage was sent cross-country to California, and to-morrow a bunch of control panels goes to Hawaii.

Here are listed four instruments that will give you satisfactory service everyday in the year.

Detector Control Panel $17.50

Detector and one-stage Amplifier 45.00

Detector and two-stage Amplifier 65.00

Two-stage Amplifier 50.00

A beautiful catalog fully describing these instruments and other **FADA** products will be mailed to you for 10c. Send a dime for your copy.

DETECTOR CONTROL PANEL

ABOVE—TWO STAGE AMPLIFIER

SPECIFICATIONS

The reason **FADA** instruments function properly is because every care is taken to make them according to the best engineering practise. Facts about their design include: **Panels:** Genuine Bakelite XX, $\frac{3}{16}$" thick, milled edges and a hand grained finish. **Cabinets:** The cabinets are really better than the ordinary. They are made of quartered oak, and have a beautiful Ebony finish. The covers are hinged and allow inspection of the interior. A blue print of the connections is attached underneath each cover. **Tube Sockets:** Bases are bakelite XX. Contact strips of phosphor bronze and set into milled grooves insuring permanency and eliminating "tube noises." **Amplifying Transformers:** The new Federal transformers are used, and have correct impedance ratios for the tubes now on the market. **Automatic Filament Control:** Special telephone jacks provide automatic filament control of every tube, which saves the life of your tube and battery. The flexible control of amplification is very convenient. **Binding Posts: FADA** non-removable top binding posts allow for all necessary connections. Separate "B" Battery connections are used for the detector and amplifier circuit. **Engraving:** Each panel is engraved on a special pantograph machine and the letters filled in with a pure white enamel. **Wiring:** The wiring is very compact and yet all leads are separated as far as possible. Howling is entirely absent on any wave length. **General appearance:** Every instrument is very carefully assembled and the way to distinguish a **FADA** instrument is by its superior workmanship. **Operation:** Careful tests under actual working signal conditions prove that our instruments "produce results."

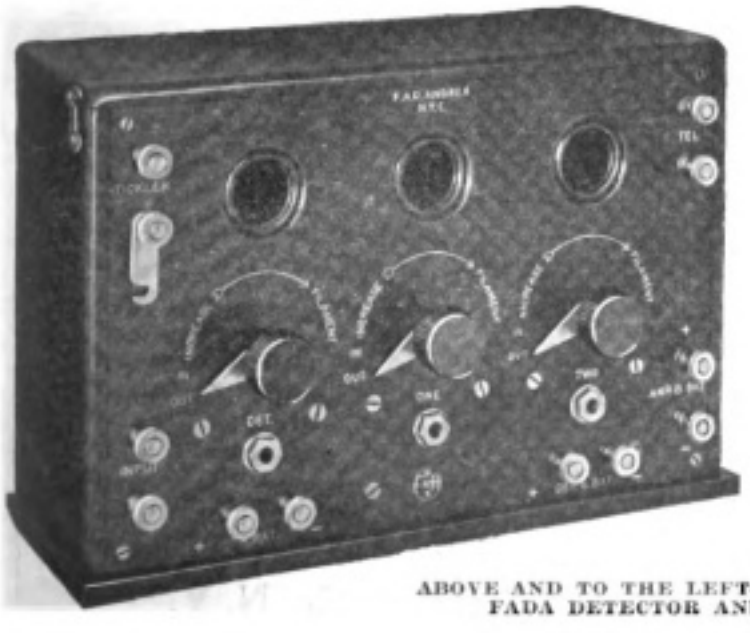
DEALERS: FADA instruments and parts are fast moving merchandise. If you desire to sell the highest quality goods at prices the buyer gladly pays, get my proposition.

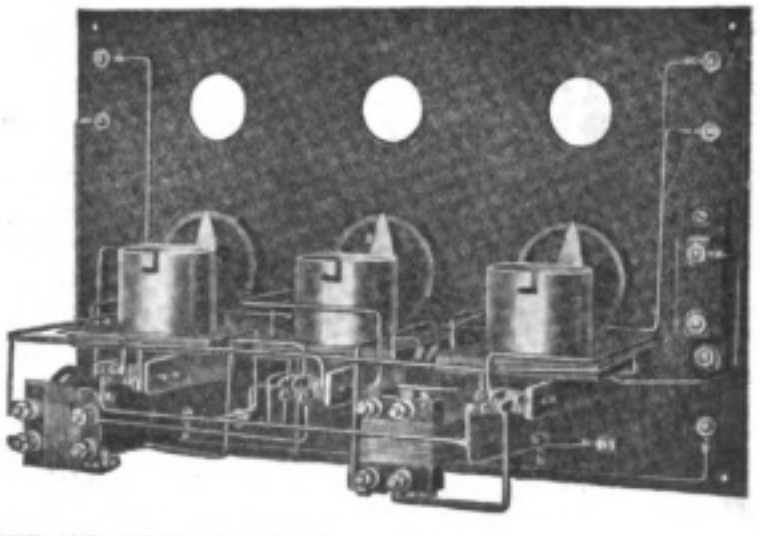
Frank A. D. Andrea

MANUFACTURER OF

Fada Radio Instruments

1882-C Jerome Ave. *N. Y. C.*





ABOVE AND TO THE LEFT— **FRONT AND REAR VIEWS OF FADA DETECTOR AND TWO STAGE AMPLIFIER**

Contents of THE WIRELESS AGE for Oct., 1921

VOLUME 9 — Edited by J. ANDREW WHITE — No. 1

RENEWALS—When subscription expires you will find a renewal blank enclosed. Return with remittance promptly.

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Entered as second class matter Oct. 9, 1913. Post Office at New York, N. Y., under the Act of March 3, 1879.

Edward J. Nally, Pres. J. Andrew White, Vice-Pres. L. MacConnach, Sec'y. George S. De Sousa, Treas. J. D. Commee, Business Mgr.

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

"Says Confucius: 'A man who, while living in the present age, reverts to the ways of antiquity, is one who will bring calamity upon himself.'"

"What terrible fate must be in store for him who, knowing the worth of the CR-8, persists in using ancient apparatus—which Confucius would have cast into the muddy depths of the Yang-Tse-Kiang."

Doctor Wu.

GREBE RADIO

CR-8 Short Wave Regenerative Receiver

is one in which perfection in even the minor details has been attained. It is indeed a masterpiece. Just look at these new features! Exclusive, every one of them:—

New moulded variometers — that will last a century.

Rubber-tired Verniers — make *real* tuning a pleasure.

Aluminum shields eliminate troublesome change of frequency when receiving C. W.

Direct reading wave-change and rheostat controls.

Battery binding posts in the rear—eliminating unsightly connections.

Constant calibrated wave-length range—150 to 1,000 Meters.

If it were possible to make a finer short-wave regenerative receiver, Grebe would be making it.

Your dealer will gladly order one of these receivers for your inspection. Ask him for bulletins.

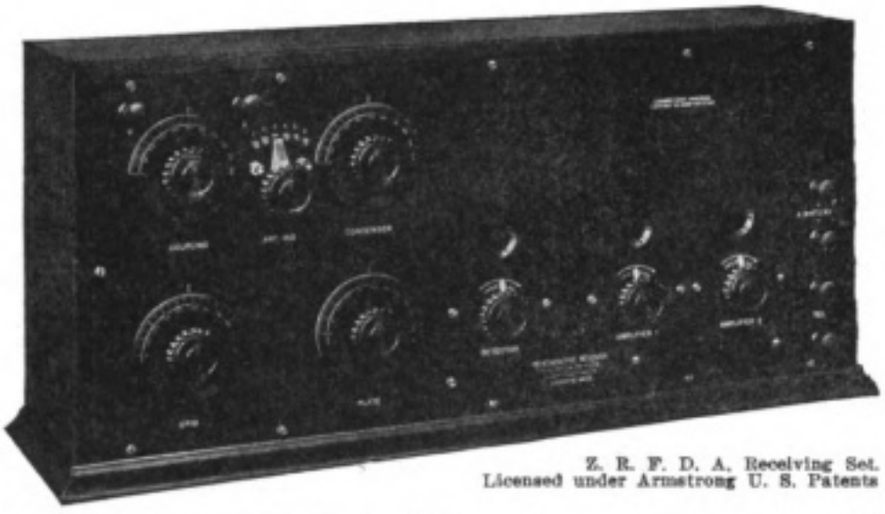
Bunnell & Co., J. H., New York City.
Central Radio Company, Kansas City, Mo.
Chicago Radio Apparatus Co., Chicago, Ill.
Continental Radio & Electric Corp, New York
Detroit Electric Co., Detroit, Mich.
Doubleday-Hill Electric Co., Pittsburgh, Pa
Electrical Specialty Co., Columbus, Ohio.
Holt Electric Utilities Co., Jacksonville, Fla.
Hurlburt Still Electrical Co., Houston, Texas.
F. S. Katzenbach, Trenton, N. J.
Kelly & Phillips, Brooklyn, N. Y.
Klaus Radio Company, Eureka, Ill.
Manhattan Elec. Supply Co., New York, Chicago, St. Louis.
Leo J. Meyberg Co., San Francisco, Cal.
Newman-Stern Co, Cleveland, Ohio.
F. D. Pitts Co., Inc., Boston, Mass.
Philadelphia School of Wireless Telegraphy, Philadelphia, Pa.
Western Radio Electric Co., Los Angeles, Cal.
Hickson Electric Co., Inc., Rochester, N. Y.

A. H. GREBE & CO., Inc. 78 Van Wyck Blvd., Richmond Hill, N. Y.

Superlatives

No wonder you, Mr. Radio Man, are confused by the extraordinary descriptives such as best, most efficient and all the others you know so well. Do you ever stop to think that any one who can pay for an advertisement can make these claims? Fraternize with the old-time radio men and find out their opinion of Clapp-Eastham apparatus, of Clapp-Eastham service which goes with every sale and their reputation for fair dealing.

No one need experiment with unknown products unless he wants to. Your dealer will sell you our products if you insist but he is only human and is often tempted by a greater profit on an inferior product. Remember you pay this greater profit. Our apparatus will give you the greatest possible bargain, YOUR MONEY'S WORTH—you cannot hope for more. And with every purchase goes the guarantee of the oldest manufacturer of Radio Apparatus in the United States.



Z. R. F. D. A. Receiving Set.
Licensed under Armstrong U. S. Patents

Type Z. R. F. D. A. Regenerative receiving set is designed exclusively for those who require the very utmost in long distance short wave reception. It comprises two of our Z. R. V. Variometers, one Z. R. C. Variocoupler with switch, one of our famous balanced condensers and a detector and two stage amplifier.

All are mounted on a highly finished formica panel in heavy oak case with hinged cover.

Price complete except bulbs, batteries and telephones	$140.00
Same set without amplifiers, Type Z. R. F. D.	85.00
Same set without detector, amplifier, variable condenser or cabinet, Type Z. R. F.	38.00
Detector panel only, Type Z. R. D.	12.00
One stage amplifier panel, Z. R. A.	18.00
Variometer, Type Z. R. V. With dial and knob	6.50
Variocoupler Type Z. R. C., with dial and knob	7.50
Variocoupler, Type Z. R. C. with dial and knob switch and points	9.00
Balanced Variable Condenser, Type F800 with dial and knob	7.00
Two stage amplifier, Type O. Z. in cabinet	40.00

Amplifying coil, semi-mounted, Type Q. O.	$4.00
Unmounted Filament Rheostat, Type Z. R. R.	1.20
Knob and dial, 3 inch, heavy brass, black finish, composition knob	.75
Graphite Potentiometer, 5000 ohms	3.00

The Hytone Panel Transmitter

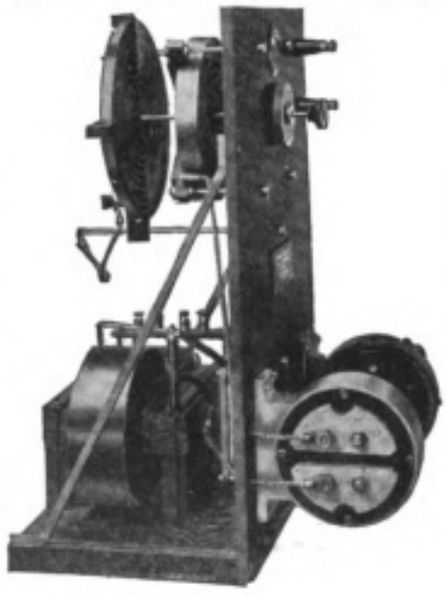
All the advantages of 500 cycle transmitters are combined in this set without the use of cumbersome and expensive motor generator sets as it operates directly on 60 cycle current. It produces a clear high pitched note which is variable at will. This set is highly efficient, with low decrement and gives sharp tuning and minimum of interferenec with maximum radius of communication. The set includes the following instruments all mounted on a formica panel ¼ inch thich: Transformer, special low voltage type, Hytone rotary spark gap entirely enclosed in aluminum housing, Variable speed motor direct connected through flexible coupling, Mica condenser, Oscillation transformer, Thermo couple ammeter, main line switch and key.

Complete ½ K W Transmitting set as above	$250.00
Similar Transmitter 1 K W capacity	500.00

These sets are also supplied in ratings of 2-3-5 and 10 K. W. Prices on application.

We also supply the following transmitting apparatus as shown in our complete catalogue:

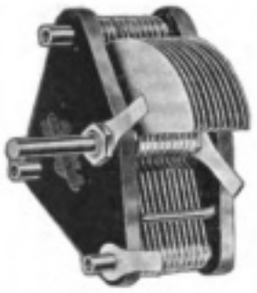
Transformers, Type Z. R. L. 400 watts, especially for rotary spark gaps	$15.00
Transformers, Type L 500 watts, mounted $28.00, unmounted	22.00
Transformers, Type L 1000 watts, mounted $40.00, unmounted	34.00
Cambridge Rotary Spark Gap for use up to 1 K W including variable speed motor	50.00
Improved antenna switch	12.50
Boston Key on engraved Formica base, 10 amperes $7.50, 20 amperes	8.00
Oscillation Transformers Type Z 651	16.00



COMPLETE CATALOGUES SENT FOR 6c STAMPS. Patronize your local dealer. If he won't supply our material your order will receive immediate factory attention.

CLAPP-EASTHAM COMPANY 161 MAIN STREET CAMBRIDGE, MASS.

HEADQUARTERS FOR RADIOTRON TUBES — All Types in Stock



ABC 21 Plate Condenser

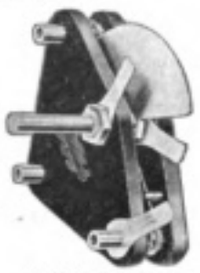
No. 650-21. 21 plates
Capacity, .00055 Mfd.
Price, $3.75.

All *ABC* Condensers have "Condensite" heads for perfect insulation. This exclusive feature costs us more, but it's worth it.

ABC 11 Plate Condenser

No. 650-11. 11 plates
Capacity, .00028 Mfd.
Price, $3.00.

Automatic machine production makes every *ABC* condenser absolutely accurate, and every part instantly interchangeable.



ABC 3 Plate Condenser

No. 650-3. 3 plates
Capacity, .0001
Price, $2.25

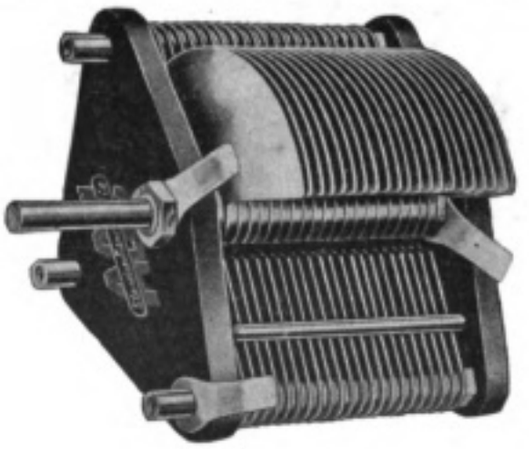
This type is an excellent vernier condenser, for extremely sharp tuning, in connection with a larger condenser; or as a variable grid condenser.

ABC Brass Dials

Condensers supplied with *ABC* Nickel-plated Brass Dials and composition knobs for 75 cents extra.

With Chelsea Knob and Dial, $1.00 extra.

ABC Knob and Dial Alone, $1.00



ABC 43 Plate Condenser

One-half actual size

No. 650-43.
43 Plates.
Capacity, .0011 Mfd.
Price, $5.00.

These Nine Improvements Cost You No More—

EXAMINE these photographs carefully. Pick out the *nine features* that distinguish *ABC* condensers from any other make on the market: 1st, Sturdy plates,—.022 inch thick, that will not jar out of position: 2nd, Individual, *not cast* spacers, wide to prevent short circuiting: 3rd, Stop acts on *all* moving plates; 4th, One-piece shaft of brass, *not steel*, turned from solid brass rod: 5th, Shaft turns in solid brass bushing, which extends *thru* head: 6th, *Exclusive* Condensite head, the perfect insulator: 7th, Set screw (underneath) and locking lever for delicate friction adjustment: 8th, Easily mounted,—all studs *exactly* spaced: 9th, Minimum losses,—1¼-in. between opposite polarities.

Comparisons are difficult, because there never was a condenser so accurately made before. But compare these prices with the best condenser you ever used.

ABC condensers are *far lower in price* than any other condenser of similar quality. The automatic production that makes every *ABC* condenser alike, and every part interchangeable,—at the same time cuts manufacturing cost to a minimum. Materials are the finest obtainable, workmanship is unexcelled. Automatic production gives you *most value per dollar.*

ABC Standardized Radio VARIABLE CONDENSERS

Order direct from this advertisement. Your ABC condenser will be shipped at once in a specially designed carton that prevents any damage in the mail. It will arrive in perfect condition, ready for mounting without any adjustments or loss of time. Also send ten cents for your copy of the new ABC 2-color catalogue, in handy pocket size, illustrating the complete ABC line of "Professional Radio Equipment at Amateur Prices." To insure immediate attention request "Catalogue CZ 10."

Just mail this coupon and one dime today to the Wireless Equipment Co., Inc., Newark, N. J., for your copy of the new *ABC* catalog, CZ 10.

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Address .....
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State .....

Wireless Equipment Co., Inc.
Newark, New Jersey

KENOTRON RECTIFICATION FOR C.W. TUBE TRANSMISSION

KENOTRON
UV—216
20-Watt Output
PRICE $7.50

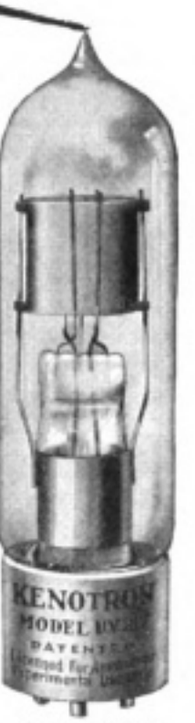
THE least expensive and the most satisfactory method of obtaining a direct-current source for plate-excitation is the use of A. C. with Rectifier Valves.

Two types are available for use with Radiotrons.

Kenotron Model UV—216 is especially designed to operate with Radiotron UV—202, the 5-watt-transmitting tube. Filament requires 7.5 volts at 2.35 amperes. The A. C. input is 550 volts. The output of this rectifier tube is 20-watts at 350 volts D. C.

Kenotron Model UV—217 is designed to operate with Radiotron UV—203, the 50-watt tube. The Filament requires 10 volts at 6.5 amperes. The A. C. input is 1250 volts. The output of this rectifier tube is 150-watts at 1000 volts D. C.

Our Standard Porcelain Socket, Model UR—542 at $1.00 will fit Kenotron UV—216, while a larger socket of the same type, Model UT—541, price $2.50, is required for Kenotron UV—217.



KENOTRON
UV—217
150-Watt Output
PRICE $26.50

The Radio Corporation's tubes are covered by patents dated November 7th, 1905, January 15th, 1907, and February 18th, 1908, as well as by other patents issued and pending. Tubes licensed for amateur and experimental work only. Any other use will constitute an infringement.

Send 25 cents for the new C. W. Transmission Book and Catalogue of Radio Apparatus.

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Division, Commercial Department, Suite 1801
233 Broadway, New York City

Radio in The Home

With Westinghouse Simplified Receiving Apparatus

RECEIVING SET NO. 1

Type RA Tuner	$65.00
Type DB Crystal Detector	5.00
Brandes Superior Phones	8.00
Receiving Antenna Outfit..	7.50

ADDITIONAL ITEMS

For Distant Reception and Loud Speaking

Type DA Detector Amplifier		$65.00
Vacuum Tubes (4 required)	ea.	6.50
Type CB Loading Coil	ea.	5.00
Dry Battery (2 required)	ea.	2.25
Storage Battery		24.00
Pacent Plug Adapter		2.00
Victrola Attachment, or Grafonola Attachment		15.00

FOR BATTERY CHARGING

Rectigon Battery Charger	$18.00
Extra Bulb for same	4.00

RECEIVING SET NO. 2

Type RC Receiver		$125.00
Vacuum Tubes (4 required)	ea.	6.50
Type CB Loading Coil		5.00
Dry Battery (2 required)	ea.	3.50
Storage Battery		33.00
Brandes Navy Phones		14.00
Pacent Plug Adapter		2.00
Receiving Antenna Outfit		7.50

ADDITIONAL ITEMS

For Loud Speaking

Victrola Attachment, or Grafonola	15.00

For Battery Charging

Rectigon Battery Charger	28.00
Extra Bulb for same	8.00

Receiving Set No. 1 consists of a highly efficient single-circuit tuner, a supersensitive crystal detector, a set of head phones, and a complete antenna outfit.

It has a wave-length range of 180 *to* 700 *meters.*

Receiving Set No. 2 consists of a single-circuit tuner, a three tube, two-stage detector-amplifier, four vacuum tubes (one spare), a loading coil; two dry batteries, a storage battery, head phones and a complete antenna outfit.

It has a wave-length range of 180 *to* 700 *meters.* The addition of the loading coil allows the reception of signals on 1600 to 2800 meters wave-length, such as Arlington time.

Folder 4476 *gives interesting details. Send for it.*

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
EAST PITTSBURGH, PA.

Westinghouse

CONTINENTAL NEWS

OCTOBER, 1921

PUBLISHED EVERY MONTH IN WIRELESS AGE BY THE CONTINENTAL RADIO AND ELECTRIC CORPORATION

The PHONETRON
Electric Sound Converter

More Than a Loud Speaker!

Designed for both reception and wireless telephone transmission in place of a microphone transmitter.

Price $45.00

Send for FREE descriptive leaflet about Phonetron, the improved type of loud speaker.

Order by mail from New York's leading Radio Store

ITS A lucky thing for a good many radio stores, that amateurs are willing to blame the mails when they have to wait for their goods. You can order from Continental with the assurance that you won't have to wait. You can bank on it that your order will start toward you the day we get it. Everything listed in our catalogue is right here in stock,—no delays. And there isn't much worth having, in radio, that *isn't* listed in the CRECO catalogue. It's not out of place to say that the Continental mail order stock includes *worth-while* apparatus for every part of your station. No matter what wireless equipment you need, you can be sure that Continental has it, or will get it for you quicker than you could get it yourself.

Send your next order to Continental. No matter how large or small, it will be filled promptly, courteously, carefully. Please make all remittances by bank draft or Post Office Money Order, to avoid any possible delay.

PARAGON
scores again

The hearty endorsement of Paragon R. A. Ten by leading amateurs speaks for itself. Last month we printed 2ZL's enthusiastic letter This month we have selected this similar statement from 2ZM as representing the opinions of hundreds of amateurs who have been astonished and delighted with the results they have secured.

"Wish to acknowledge receipt of my Paragon in good shape.

"At the same time, I wish to say that I have gotten some surprising results, having read a number of DX stations that were never heard before, with my other receivers, even in the winter time.

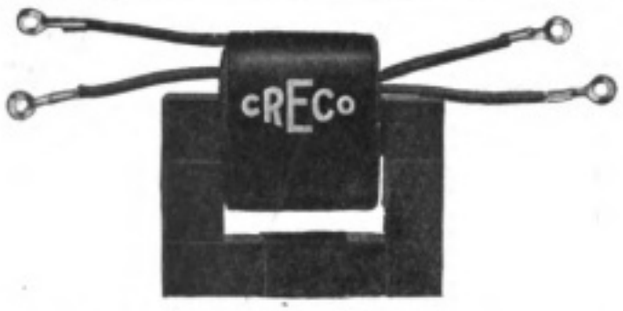
"I can truthfully say that the Paragon gives better results for all around amateur work than any receiver I have ever used, and will highly recommend it to my fellow amateurs."

(Signed)

L. SPANGENBERG,
Radio 2ZM.

Ask your Radio dealer

to show you a Paragon R. A. Ten regenerative receiver. If he hasn't one in stock, he will gladly get one if you ask him for it. The seals have now been broken to show you the splendid inside construction. Examine a Paragon carefully—convince yourself that these leading amateurs have not overstated one particle in their complete approval of Paragon results,—and that Paragon is well worth its $85.00 price.



CRECO AMPLIFYING TRANSFORMER

High in Quality—Low in Price

$3.25

In keeping with the Continental policy of distributing only apparatus of the highest quality at a reasonable price, we offer this instrument of utmost mechanical and electrical efficiency. It was developed specially to fulfill the requirements of present day VTs. Sold complete, ready for mounting. Important features are:

Unequalled audibility and amplification.
No holes in core, eliminating magnetic leakage.
No castings used, etc., etc.

Such a simple, but efficient instrument should interest you, at any price. But at the price of only $3.25 (far lower than any other transformer) you will have to act quickly. Send for enough Creco transformers for all your VTs at once. We cannot guarantee to keep the production up to the demand.

DEALERS: Write for proposition.

Honolulu comes to Continental

(read this letter)

Today I am sending you a radio again for some wireless supplies.

You are getting me delivery in fifteen days from the day I cable you, and that is some service to the center of the Pacific.

(Signed) CYRIL O. SMITH.
Permanent address, The Royal School, Honolulu, U. S. A.

OUR SERVICE COVERS THE WORLD

DO YOU STILL OWN A QUARTER?

If so, and if you haven't already sent for the Creco catalogue, that's the best way to invest it. 112 pages for a quarter, chock full of illustrations, descriptions, prices, and all the radio apparatus you ever heard of. Also codes, abbreviations, tables, etc., that you will use daily. Be a sport. Risk a quarter on the best radio buy ever offered you! Anyway, you get credit for quarter on your first $5.00 order, so you really get the catalogue for nothing. Your copy is all ready to be mailed. Slip your name and your quarter into an envelope now!

CONTINENTAL RADIO AND ELECTRIC CORPORATION

EXCLUSIVE WHOLESALE DISTRIBUTORS FOR PHONETRON AND PARAGON R. A. TEN

J. DI BLASI, Sec. *J. STANTLEY, Treas.*

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First in Accomplishment

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USE THIS COUPON

If you want to get in on our future events. We want your name on our membership roll.

APPLICATION FOR MEMBERSHIP

Harry L. Welker, Secy.,
Nat'l Amateur Wireless Assn.,
326 Broadway, New York. Date .....

Please count me in. My $2.50 is enclosed. Send my membership certificate, pin and pennant to me at the address below. Enter my name for a year's subscription to THE WIRELESS AGE.

Name ..... Age....

Street ..... Call Letter & No.....

City ..... State .....

PLEASE ANSWER ALL QUESTIONS

1. No. of Gov't. License ..... 2. If you have none do you intend to apply for one .....
3. Name and address of Radio Clubs and their Secretaries to which you belong. .....
4. Are you now a subscriber to THE WIRELESS AGE? .....
5. Describe briefly your equipment. .....

Now that you have "signed up," how about your friend?

Steppin' Along!

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NOW

You should be a member of the organization that is doing real things for the advancement of amateur radio. You will want to know what we are going to do next—what the programs will be and when we are going to do it.

We want you with us—we want to feel that we have the biggest and best list of active members that can be enrolled, so that when our *big* events come off we have all the "reliables" we need to make more amateur history.

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A-25-TE

VOL. 9. No. 1. OCTOBER, 1921

THE WIRELESS AGE

WORLD WIDE WIRELESS

Radio Central Station to Open Soon

TWO of the mammoth wings of the lofty antennae towers of the Radio Corporation's Central Station at Rocky Point are complete. Twelve steel towers, each 400 feet high, compose the two wings or one operating unit. When the entire station is complete, there will be twelve of these wings.

The total distance between the first and twelfth towers of the completed unit is approximately three miles. In the centre of these twelve towers stands the central power house, which is now fully completed, so that in reality it will be the focus or hub of the entire system when future wings are added. Two of the 200 kilowatt Alexanderson high frequency alternators have been installed ready for operation.

The present unit is designed to communicate with Europe and will considerably aid the present high power radio stations located at Marion, Mass., and New Brunswick, N. J. Later on communication will be established with South America. This modern receiving plant marks the climax of investigation started some time ago when radio engineers looked over the map of Long Island and found a site sufficiently in the wilderness to allow various tests over long stretches of ground and were able to obtain the most effective reception from distant European high power stations, such as those located at Nauen, Germany; Stavanger, Norway; Towyn, England, and Lyons, France.

✦ ✦ ✦

International Radio Congress Approves American Plan

THE international wireless conference held in Paris during the last two months has just finished its sessions and has solved many of the problems which were left over by the recent Washington communications congress.

Some of the contentions of the American representatives who were headed by Maj.-Gen. George O. Squire, chief of the signal corps of the United States army, were that certain bands of wavelengths should be reserved for wireless telephony. The European delegates opposed this with the argument that telephony would occupy too great a part of the usable waves. Japan sided with the United States.

The great advances made in this country on the problem of selectivity in tuning and the use of dual wave transmission was recognized by the conference and greatly assisted this country in having its ideas predominate over the entire body. The problem of static elimination was also considered and its elimination predicted as usual. C.W. both modulated and unmodulated was given most attention and it appears that in years to come the spark apparatus will be in the minority.

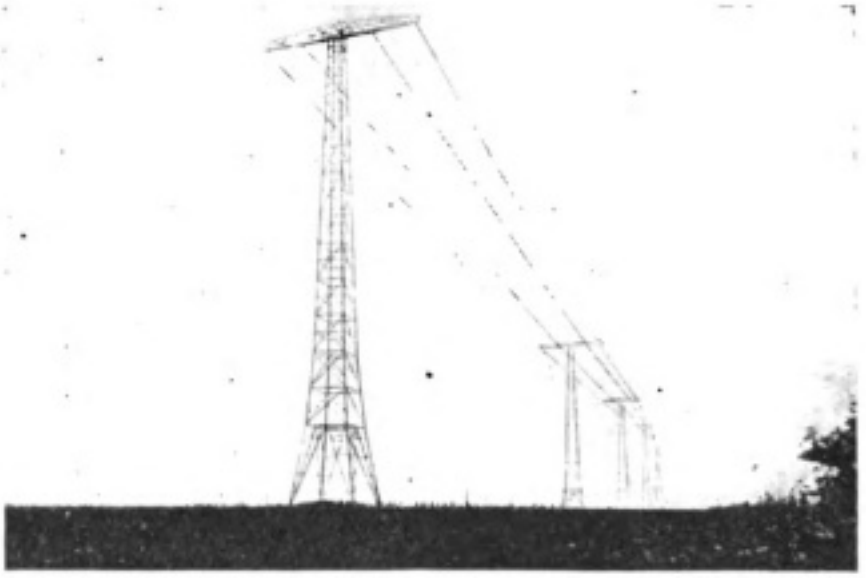
The report of the conference, which will fill seven mail bags, offers solutions for problems that were not solved at the Washington Communications Congress. It is believed that this report will be submitted to the Washington Government in November.

Radio Corporation of America Buys International Company

A CONSOLIDATION has been concluded whereby Radio Corporation of America acquires International Radio and Telegraph Co. By this action, Westinghouse Electric Co. will take over a substantial block of treasury stock of the Radio Corporation. Among patents owned by Westinghouse, which will be turned over for use to Radio Corporation, are the Armstrong and Fessenden receiving apparatus, now in use at coastal stations of International Radio.

The merger will mean the closing of some of the stations of International Radio along the Atlantic coast. Six stations will be taken over and two or three retired. Radio Corporation has stations of its own on the Atlantic coast. It is the present intention to leave seven stations in all, this number being considered sufficient to handle the business.

The International stations, mainly for communication with steamships on the Atlantic coast, which have been taken over by the Radio Corporation, include those at the Bush Terminal, New London, Conn.; Newport, R. I.;



The first unit, consisting of twelve towers, each 400 feet high, of the Radio Corporation's Central Station at Rocky Point, L. I.

Nantucket Island, Belfast, Me., and Cape May, N. J.

Negotiations have been under way for some time for the consolidation just completed.

August 22, Edward J. Nally, president of Radio Corporation; Guy E. Tripp, of Westinghouse Electric, and Owen D. Young, vice-president of General Electric Co., sailed for Europe. These officials will confer with Sir Godfrey Isaacs, managing director Marconi's Wireless Telegraph Co., Ltd., presumably regarding traffic agreements with the foreign company.

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Italian Radio Station Re-named in Honor of Marconi

THE Italian Government has renamed the Coltano (Italy) high-power wireless station "Guglielmo Marconi" as "a tangible and lasting proof of the country's gratitude for his meritorious discoveries in the field of radiotelegraphy."

✦ ✦ ✦

Vancouver Wireless Station

THE Dominion Government will erect a very powerful wireless station near Vancouver, possibly on Lulu Island, to carry on land work. Another station will be erected at Prince Rupert, and thus provide direct service. At present it is relayed from Rupert through several small stations. The Point Grey wireless will devote its work to shipping. Estevan, on the west coast of Vancouver Island, will be fitted with new and more powerful apparatus.

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Spanish Courts Uphold Marconi Patents

A VERDICT in favor of Marconi's Wireless Telegraph Company, Ltd., and the Compania Nacional de Telegrafia Sin Hilos, has been given in the Spanish Courts as the result of a joint action brought by these companies against the Compania Iberica de Telecomunicacion for infringement of patents relating to thermionic valves. The award nullifies certain "Telecomunicacion" patents known as the "Deforest Audion"; requires the defendants to hand over to the plaintiffs all materials manufactured under the patents concerned, and orders the payment by the Telecomunicacion Company of an indemnity to be fixed.

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Marconi and Mars

WILLIAM MARCONI is now convinced that he has intercepted wireless messages from Mars, J. H. C. Macbeth, London manager of the Marconi Wireless Telegraph Company, Ltd., said at a Rotary Club luncheon at the McAlpin. Mr. Macbeth added by way of prediction, that should this prove to be so, it will be only a question of time before inventive genius and ingenuity in deciphering unknown codes will evolve a method of communication between the two planets.

Signor Marconi's announcement nearly two years ago that he had caught wireless signals with wavelengths far in excess of those used by the highest powered radio stations in the world aroused a storm of scientific controversy in this country and Europe. Numerous explanations were offered disputing the Martian communication theory, usually on the ground that the mysterious signals were caused by atmospheric disturbances.

Mr. Macbeth has elaborated upon his Rotary Club address. What convinced Signor Marconi and other wireless experts and scientists that these messages came from another planet, he said, was the fact that the wavelength is almost ten times that produced at our most powerful stations. Marconi, he added, could not accept the asmospheric or electric disturbance theory because his signals were intercepted regularly, regardless of other interference.

The maximum length of waves produced by radio stations in the world today is 17,000 meters," said Mr. Macbeth. "Until Marconi conducted his experiments on his yacht, the Electra, in the Mediterranean several months ago, radio receiving apparatus was capable of receiving wavelengths up to 24,000 meters. His receiving apparatus was tuned to many times this figure. With this he picked up waves estimated at 150,000 meters, and their regularity disproved any belief that they were caused by electrical disturbances. The only resemblance to the code used on this planet is in the letter "V" of the international code. These "V" splashes were continued time after time, much after the manner of station calls or test signals sent out from radio stations.

"Now this much is known about Mars: Astronomers assert their belief that life can be sustained on that planet. Whether human life and whether Martians, if they exist, have eyes in their forehead or the back of their heads, of course, is speculation. But in support of the assumption that thinking agencies exist on Mars, astronomers have charted maps of the Martian canals.

"Again, Mars is older than Earth. If life exists on that planet, it obviously follows that it is higher developed than on earth. Witness the intricate canal system, and if higher developed, then 150,000 meter wavelengths no longer become mysterious."

Siberian Radio Station

AN expedition will leave Moscow for the Siberian coast to investigate the problems of navigation between Europe and the mouths of the Siberian rivers, says a despatch from the Russian capital.

Another of the aims of the investigation is the fitting up of wireless communication with the Siberian coast, and the establishing of stores of supplies, etc., along the coast.

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Radiophones Reduce Forest Fires

WIRELESS telephones are proving successful in fighting forest fires, according to a report of the forest service of the Department of Agriculture.

In the case of a fire in the Idaho national forest a message was transmitted to a ranger in four minutes, "when round-about telegraphic communication would have taken the best part of two days," it is stated.

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Osiris Prize Awarded for Radio Work

AT a joint meeting of the five academies of the Institute of France, the annual Osiris prize of 100,000 francs was awarded to General Ferrie "as recompense for the immense services rendered by him to the country in the organization of wireless telegraphy in the field during the war." The prize is awarded every year for "the most remarkable discovery of work in connection with science, letters, arts, industry and generally everything touching the public interest."

General Ferrie, on whom fell the bulk of the work in organizing the application of wireless methods to military purposes, is now inspector of military telegraphy and transmission services, his headquarters being the Eiffel Tower.

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Greenland Radio Station for Weather Forecasts

THE establishment of a meteorological station in Greenland, equipped with high-power radio, which has been planned by the Danish Government and will be accomplished at an early date, will provide an important link between the weather observations of America and Europe.

The new station will be of untold value to weather forecasting in Europe, and may also aid the weather predictions of Canada and the United States. At present American observations cannot be used in Europe. The new station was recommended by the

International Commission for Weather Telegraphy, which met in London last November.

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Remarkable Radio Results in Paris

WITH a one-meter loop antenna and a special 12-tube receiving set, remarkable results have been obtained of late in Paris. Even transmitters of low power have been heard some 5,000 miles away under conditions by no means ideal. In fact, messages have been recorded on photographic tape at times when commercial radio companies were greatly troubled with static. The 12 tubes employed for the receiver serve to detect, amplify and even filter the signals so that static and other disturbances are weeded out.

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Radiophone on German Trains

WIRELESS telephones will be installed on important German express trains and receiving instruments will be placed in hotels and embassies, in Berlin.

Experiments in a moving freight car have shown that the wireless system works well, the men engaged in the testing being able to hold conversation with friends in the city. The tests were made under the observation of engineers, military attaches and diplomatic representatives of the United States and Sweden. It is declared that in three weeks it will be possible for travelers on express trains to reserve hotel accommodations by the radiophone.

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Moscow to Have New Wireless Station

A WIRELESS station that will be one of the most powerful in the world is being constructed near Moscow, according to information that has reached the London Daily Mail. It will enable Moscow to speak simultaneously to every place on the face of the earth.

The apparatus is being made in a big radio laboratory under the supervision of a band of Russian scientists.

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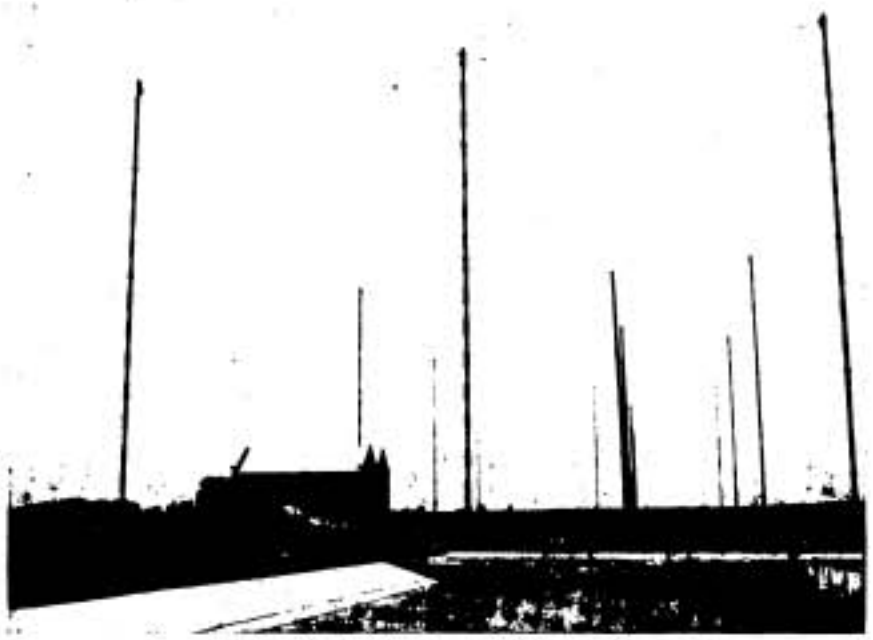
Radio Market and Weather Service

THE Post Office Department's radio market and weather reports in a standardized form are now broadcasted from air mail radio stations at Washington, Cincinnati, St. Louis, Omaha, North Platte, Neb., Rock Springs, Wyo., Elko, Nev., and Reno, Nev., at definite periods each day. These are standardized stations consisting of a five K.W. transmitter, having a transmitting radius of approximately 300 miles, which thus covers an aggregate area equal to more than half the United States.

This radio broadcasting completes a very interesting cycle of operations. Market news is concentrated from all over the United States in the Bureau of Markets through a network of telegraph wires, and a consolidated report is rushed to the air mail radio station in the Post Office Department by messenger. Promptly at 8 P. M. two reports are transmitted, one covering grain and live stock, the other fruit and vegetables. These reports are copied by stations as far north as central New York and as far west as Ohio.



General view of the first radio station of the imperial wireless chain at Leafield, Oxon, England

Banks, commercial clubs, agricultural associations and groups of farmers are employing special operators to take this service, having found the reports are in far great detail than telegraph reports. Radio marketgrams are disseminated through the bulletin boards in post offices, railway stations and public buildings and in addition are furnished to local telephone exchanges.

State agricultural colleges are putting on special radio courses; manufacturers of radio apparatus advise greatly increased sales in the areas covered; State agricultural bureaus announce increased activities among the farmers in the formation of associations and requests are coming from all Western States for the immediate extension of grain and live stock broadcasts to all sections.

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Regular Radio Opera Service

FRESH German-made music will be served nightly in Christiania next winter. Recent experiments in transmitting entire operas to Scandinavia by wireless telephone have been so successful that a Berlin firm has signed a contract for a nightly service to be opened in the near future.

This will enable Norwegians assembled in the newest type theatre, which has neither stage nor actors, nor even a screen of the silent drama, to hear Wagnerian opera at the same time as the Berliner sitting in the State opera house, or the entire evening program of one of the great concert halls here.

The sounds will be conducted from the stage to the Government wireless station and from the receiving apparatus in Christiania to instruments placed in a large hall selected especially for the purpose.

Radio and Politics

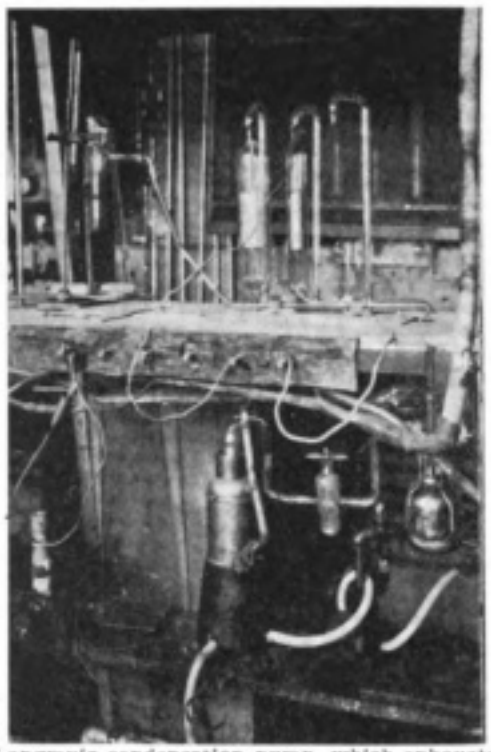
MR. MAGEE, Major Williams, Dr. McGregor and their associates, of Pittsburg, are turning to the wireless telephone for campaigning purposes. Arrangements have been made with the Westinghouse Electric and Manufacturing Company whereby the regular nightly programs sent out by wireless will be given over to the candidates for one week. It is to be a wireless telephone political week. In all, the messages will reach about 40,000 operators through the United States and Canada.

It was found impossible for the candidates to reach the Westinghouse broad-casting station at East Pittsburg, known in wireless telephone parlance as the KDKA station, and at the same time fill their many speaking dates throughout the county. So the Westinghouse Company has installed another broadcasting station at Wood and Liberty streets and the candidates will be whirled to the sending end of the wireless, where they will make their speeches in turn, and then will be whirled back to their tours of the city and county.

The Manufacture of Modern Vacuum Tubes for Radio Detection, Amplification and Power Work

CONTRARY to the prevailing impression among some radio experimenters, automatic machinery plays a relatively less important part than is generally realized in present-day methods of making vacuum tubes for wireless work. Many skilled hand operations enter into the process of manufacture and increase the difficulty and cost of production to a marked extent. The truth of this assertion can be strikingly illustrated by a visit to the Edison Lamp Works of the General Electric Company, one of the modern plants where vacuum tubes for radio purposes are made. The views here shown were taken at this plant. They illustrate in detail the various steps in the manufacture of radiotrons, the new series of vacuum tubes put on the market by the Radio Corporation of America.

Figure 1 shows fourteen different stages in the making of a radiotron before the filament and grid are inserted into the bulb. The bulb, in turn, is exhausted of its air content and sealed, after which comes the work of inspection and testing. This will be described further on.



Langmuir condensation pump, which exhausts air from vacuum tubes by passing a blast of mercury vapor across the mouth of the container, thus producing the most perfect vacuum known

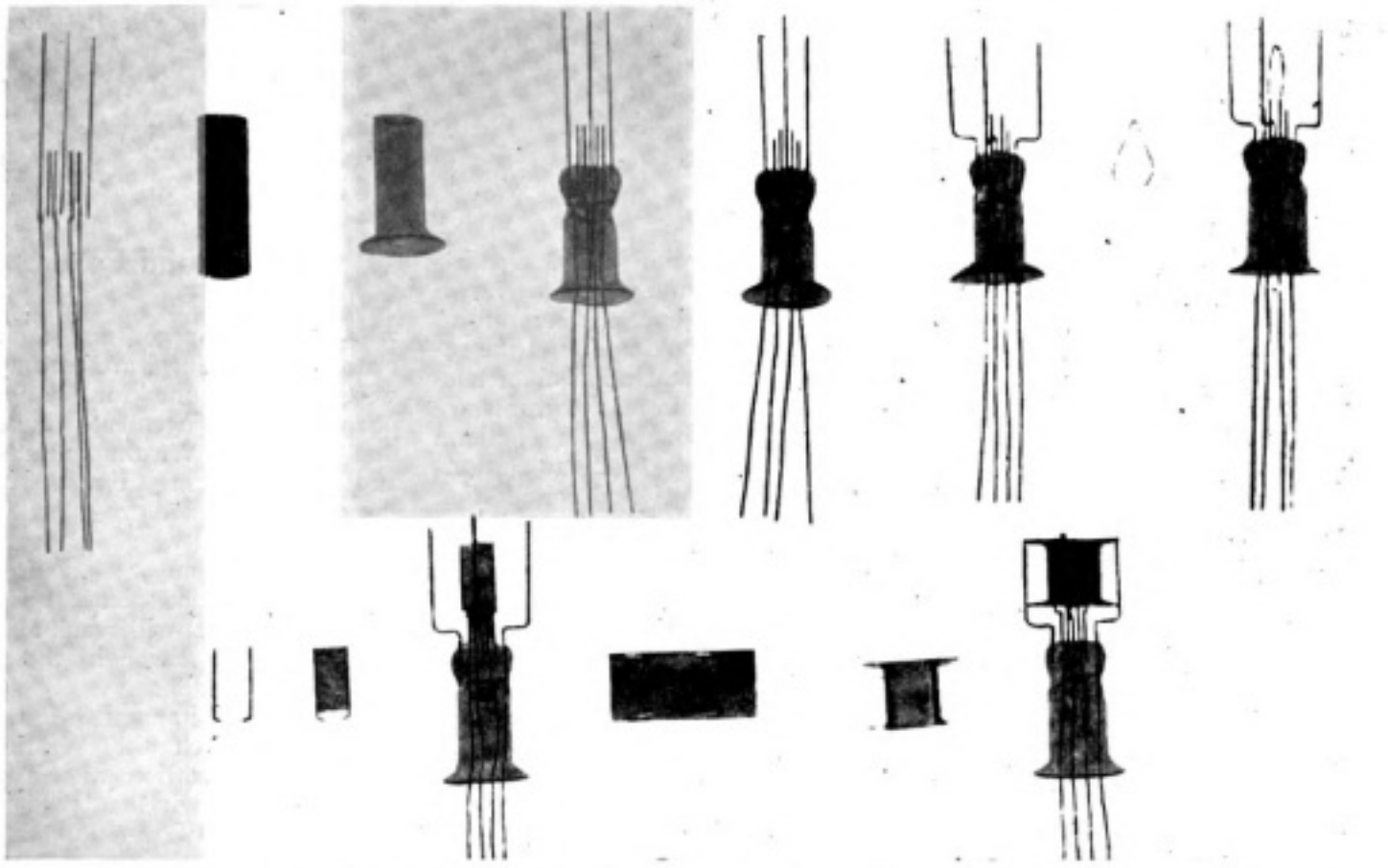


Figure 1—Various stages in the manufacture of a Radiotron up to the time the apparatus is ready to be sealed into the bulb

The top row of figure 1, from left to right, shows the welding or joining together of the leading-in wires to the supporting leads, which subsequently hold the grid and filament. The necessity of preventing any possibility of air leakage makes the sealing of the leading-in wires into the glass stem of supreme importance. Ordinary sealing will not do, so the junction is made tighter by beading the wire with a small globule of molten glass, which hardens about the joint. These welded and beaded joints make an air-tight connection when pressed into the seal shown in the fourth figure. The leading-in wires are cut to the proper length by means of hand-operated cutting dies and three of the supporting leads are bent to the shape necessary to hold the plate (see sixth figure from the left). Extreme care in manipulating the device which bends the leads is necessary to secure uniformity.

Another nand-operated die forms the tungsten filament in an inverted V shape. Because of the small diameter of this wire, care again must be exercised to see that the filaments are exactly uniform both in size and shape. Upon the exact length of wire depends the best operation of the tube. If it is 5 per cent. short, for instance, the life of the tube may be cut in half. When finally formed, the filaments are welded to the leads.

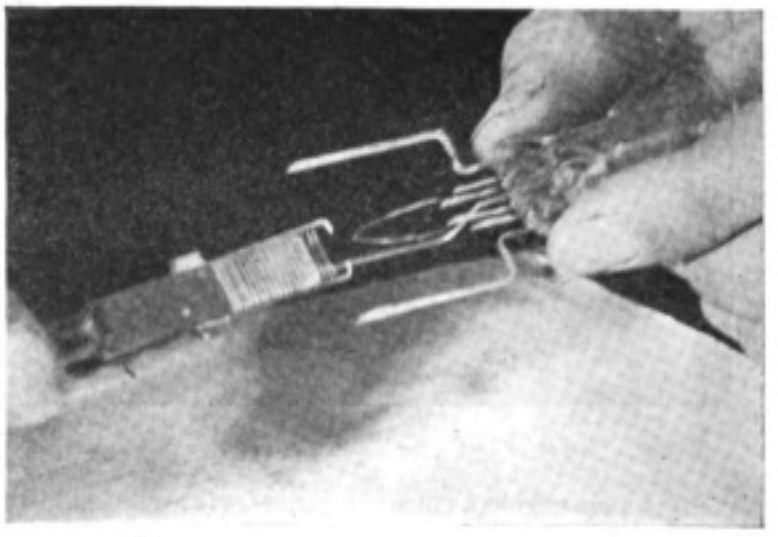
Formation of the grid is the next step, the two supporting side rods being first bent to a degree of extreme nicety. Around these two supports is now wound the grid mesh and securely welded wherever contact with the side support is made. Only specially selected wire of uniform tensile

strength can be used in making the grid, as uniformity in shape must be assured. Although this welding operation is accomplished by machine, the operator must obtain perfect welds by close application to the work; and since the welder is hand operated, uniform pressure is essential to secure a perfect weld. It sometimes takes two weeks or more to adjust the welder to the proper operating conditions. Too much current will cause the wires to melt, too little will not insure a good weld. The exact amount of current and pressure must be determined by operating experience. If even one of the grid mesh wires is not welded closely to its supporting rod, the tube will fail to pass the rigid tests required of it.

The third figure from the left in the lower row of figure 1 shows the grid attached to the lead of the stem with the filament supported inside, equidistant from the two grid rods and from the grid mesh. The delicate nature of the material which must be worked, shaped and attached to the supports calls for a much higher order of intelligence on the part of the operator than would be necessary were the operations entirely accomplished by machinery.

After the grid and filament are in place, the plate is punched from sheets of nickel or molybdenum and welded to the upright supports. This is another operation which requires careful use of the welder by the operator.

Anchoring the filament to one of the supporting leads by a tiny wire hooked under the end of the filament and welded to a support



Assembling the grid over the filament

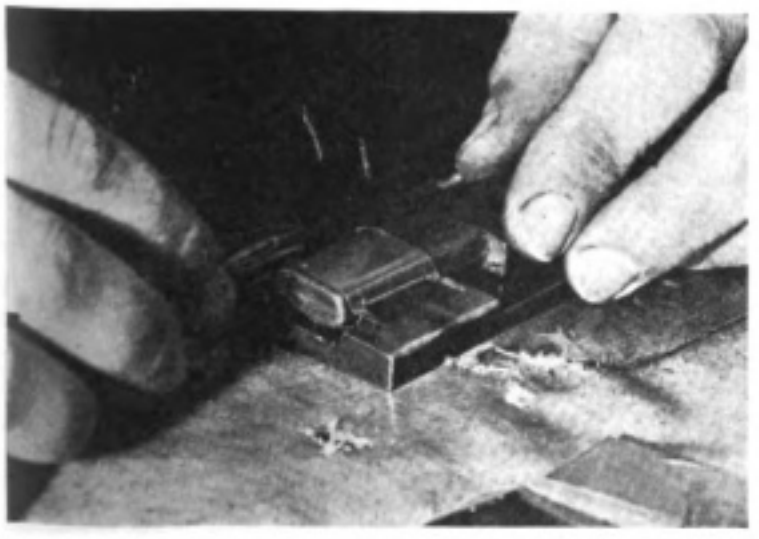
The last operation consists of "anchoring" the filament in place. A small wire, hooked at one end, is inserted beneath the top of the filament and the other end is then welded to the third upright. Securing the proper tension on this anchoring wire or support, to hold the filament firmly in its place and at the same time to allow for expansion when operating, is one of the finer points of the process which involves much calculation and thought.

The stem containing the grid, filament and plate, is now ready for insertion in the bulb, after which it is sealed at the base. The tubes are then prepared for exhaustion, placed in racks and connected to evacuation pumps by means of which the highest known degree of vacuum is attained through a process which, in addition to being among the most important steps in the manufacture of the tubes, is one of the most interesting as well.

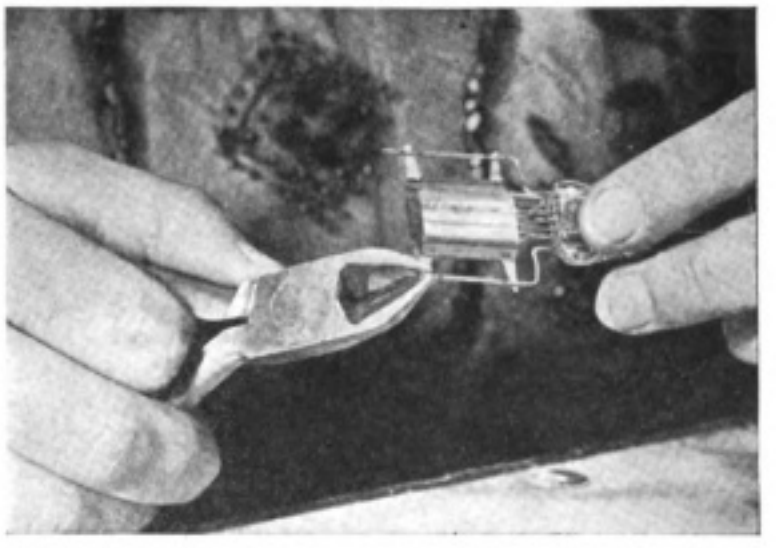
The vacuum pump, in spite of its remarkable effectiveness, is simplicity itself in operation. It has no moving mechanical parts. A stream of mercury vapor, produced by a small electric boiler, and moving at high velocity, entraps and sweeps along with it the air or gas molecules from the container undergoing exhaustion and delivers them to the rough pump, which ejects them into the air, while the mercury vapor itself is condensed and flows back into the little boiler.

Accurate machines and dies are relied upon for the major process; but, as stated at the beginning of this article, they are not so automatic that the human element is eliminated. In fact, much of the success of turning out a uniformly excellent product depends quite as greatly on the intelligent manipulation and maintenance of the apparatus used as on the accuracy with which the machinery itself is designed.

Care in designing the apparatus is not all that is involved, however. Analysis of the material to be employed in the tubes is a phase of manufacture



Forming the plate with hand-operated die previous to its attachment to the supports

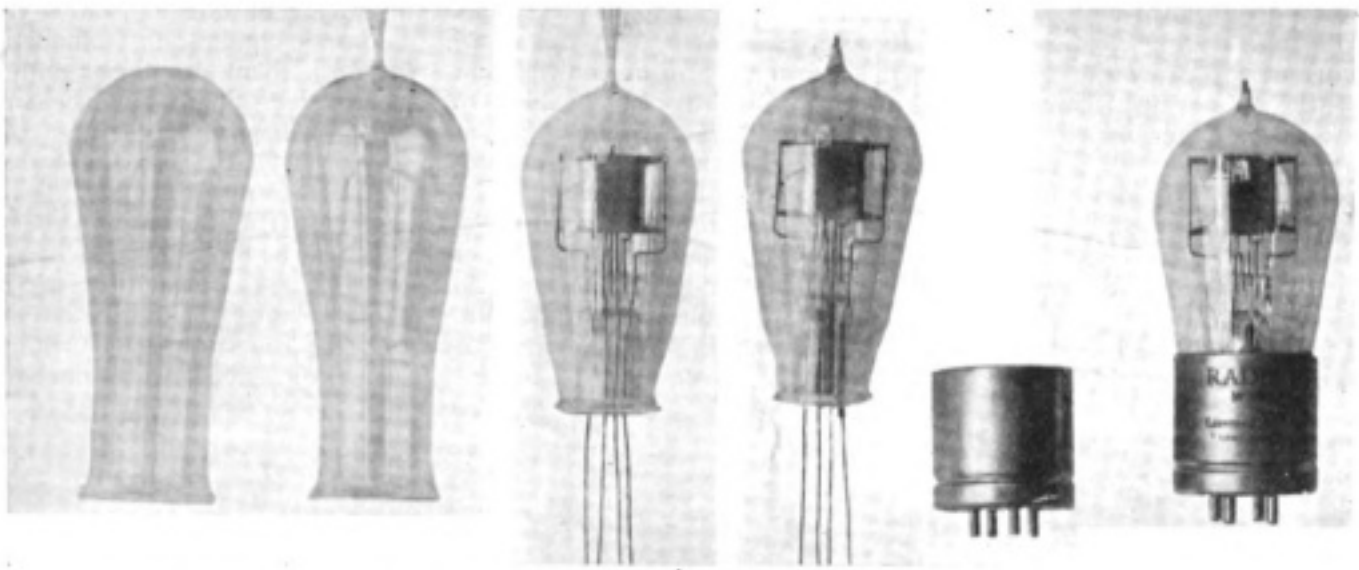


Mounting the plate on the supporting leads over the grid and filament

Testing detector tubes under actual operating conditions before shipment

which is being given constant attention. Thus, the nickel, wire, copper, molybdenum, etc., are put through various tests to determine their fitness for use and whether they will stand up under continued operation.

Testing of each type of tube made is accomplished in sets where the tube is operated under normal conditions and every tube is tried out in these sets and must show a performance within predetermined limits.



The grid, filament and plate sealed into the bulb, which is then exhausted and sealed into the base receptacle

Radiophone Broadcasting by Radio Corporation

REGULAR broadcasting of music and speech will be started about October 15 by the Radio Corporation of America from a new radiophone station which is now being installed at Aldene, (Roselle Park), N. J. The power will be approximately one kilowatt and the wave length on which all broadcasting will be done will be 360 meters. The call letters for this station will be WDY. It is expected that the station will be operated three or four nights each week between 7 and 11 p. m., although it may be decided later on to increase this schedule. Definite announcement as to hours of operation and programmes will be made in next month's issue of THE WIRELESS AGE.

The UV-216 Kenotron — Its Operation and Application

By W. R. G. Baker
Radio Engineer, General Electric Co.

QUITE recently the radio amateur has become interested in C.W. telegraphy and telephony. In order to utilize these methods of transmission a number of new pieces of apparatus were required, among them Kenotrons, Radiotrons, etc. The present article, the first of a series, will consider the Kenotron only with a view to assisting the amateur in its proper use and application.

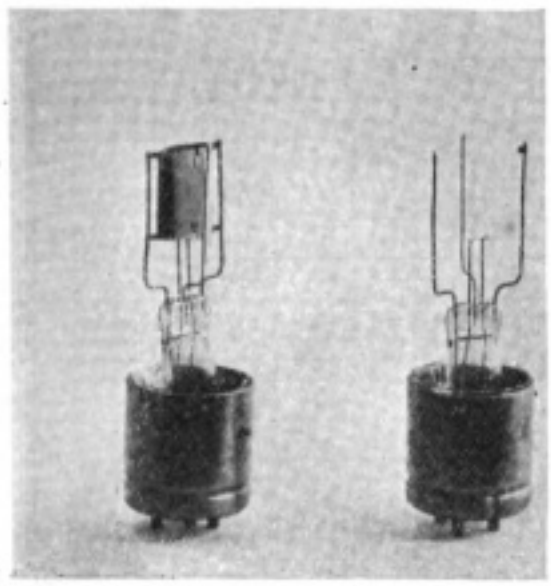


Figure 1—20-Watt Kenotron model UV-216

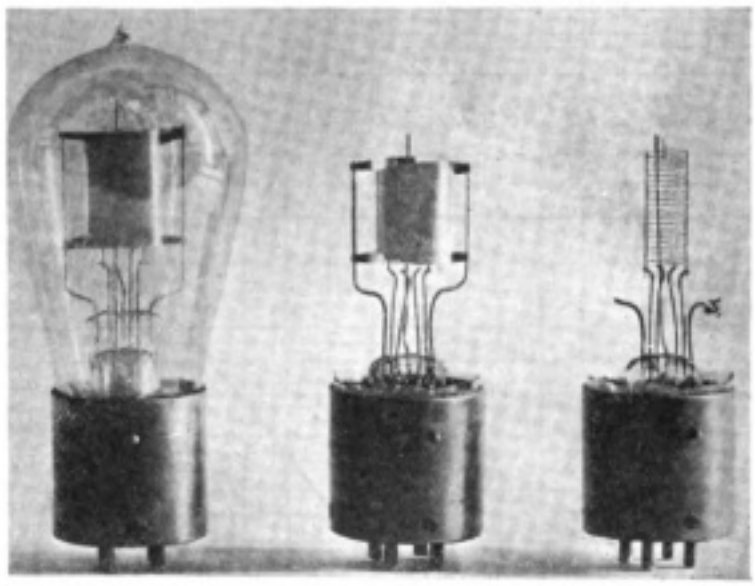


Figure 2—5-Watt transmitting tube; Radiotron UV-202

The introduction of these new systems of transmission have necessitated the use of a high frequency generator or radiotron capable of supplying radio frequency currents of constant amplitude. The Radiotron requires a d-c. power supply of comparatively high voltage depending upon the type of Radiotron employed.

Several power sources are available:

1. D-C generator
2. Mechanical rectifier
3. Chemical rectifier
4. Kenotron rectifier

The first three types have been tried by many, but the manifold advantages of the last type are not so generally known. For the average amateur the motor generator set is usually prohibitive from the standpoint of initial cost. The mechanical rectifier is quite limited as to the power it can handle and has the additional disadvantage of moving parts and contacts. The chemical rectifier requires considerable care, is bulky and is generally a source of trouble due to breakage of jars and heating of cells. The Kenotron rectifier has all the advantages of the other methods with many additional features. All that is required is a reasonable understanding of its operation to obtain excellent results.

While a thorough knowledge of the physics of the Kenotron is not absolutely essential, some idea of its functioning will be of considerable assistance. Of course, the amateur can determine for himself how this tube may be applied by actual experiments. This procedure is apt to be expensive and may not produce results.

The starting point with all electron tubes, whether Kenotrons or Radiotrons is the electron theory. According to this theory the atom of electricity is called an electron. The electron is the indivisible unit of electricity, or more specifically the unit of negative electricity. An atom of matter contains electrons, the number of which depends upon the particular kind of matter under consideration. If an atom of matter has electrons in excess of normal, it is considered as being negatively charged. Conversely, an atom of matter is positive if the number of electrons are less than normal. When a current of electricity flows, we may consider it to be due to a definite movement of either electrons or positive or negative atoms. These electrons and atoms of matter are thus capable of carrying electricity and as such are called ions.

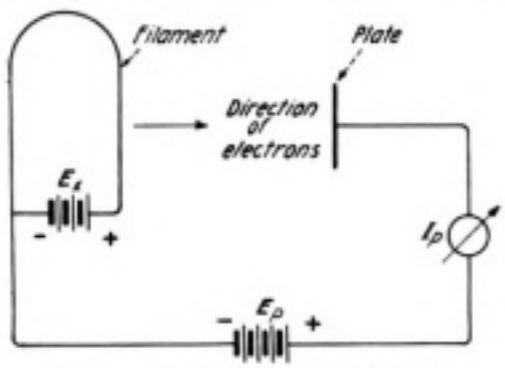


Figure 3—Circuit for obtaining D.C. characteristics

In a conducting material there is constantly occurring a shifting of the electrons, but unless an electric field is applied the unattached electrons have no definite movement. When, however, a difference of potential is maintained between two points of the conducting material a steady movement of the electrons take place toward the point of higher potential. Under this condition the electrons leave the conducting material at the point of higher potential and are returned at point of lower potential.

Under ordinary temperatures the electronic movement is continually occurring within the boundaries of the body. When the temperature is increased the velocity of the electrons increases until finally the attraction between the electrons and the atoms of matter is overcome and the electrons pass through the boundary surfaces and leave the body. This evaporation of electrons from the hot body is termed emission and while dependent upon the temperature is also materially affected by such factors as the nature of the material, presence of gases, etc.

The UV-216 Kenotron to be considered is shown in figure 1. It will be seen that it is quite similar in appearance to the UV-202 Radiotron shown in figure 2, having the same overall length of 5¼ inches and utilizing the same mounting base.

The hot element (cathode) in the UV-216 Kenotron is a filament of ductile tungsten wire about 2 inches in length and bent in the shape of a V. The cold element (anode or plate) is made of sheet molybdenum formed

into an oval shape about 1 inch long, 5/8 inch wide and 1/4 inch thick.

In order to study the operation of this device we shall first study its characteristics under no load conditions.

Referring to figure 3, if we make the plate positive with respect to the filament, then electrons emitted by the filament will be drawn toward the plate. If the plate is negative with respect to the filament or if it is at the same potential as the filament, the electric field necessary to attract the electrons to the plate is not present with the result that the electrons accumulate around the filament. This accumulation of electrons creates a negative charge which reacts on other electrons and forces them back to the filament. It is only by neutralizing the negative or space charge that the electrons leaving the filament can exceed those returned, due to repulsion by the space charge. For any given filament temperature a certain number of electrons are emitted but these will be balanced by an equal number of returning electrons unless after emission the electrons are carried away.

It is evident then, that the current between the filament and plate depends not only upon the emission of electrons, but also upon the potential between the plate and filament. As the potential of the plate is increased the current between the filament and plate increases until the potential becomes so great that the electrons are removed as fast as they are emitted. An increase in potential of the plate beyond this point results in no further increase in current and the current at this point is called the saturation current. The potential of the plate at which the saturation current occurs is called the saturation voltage.

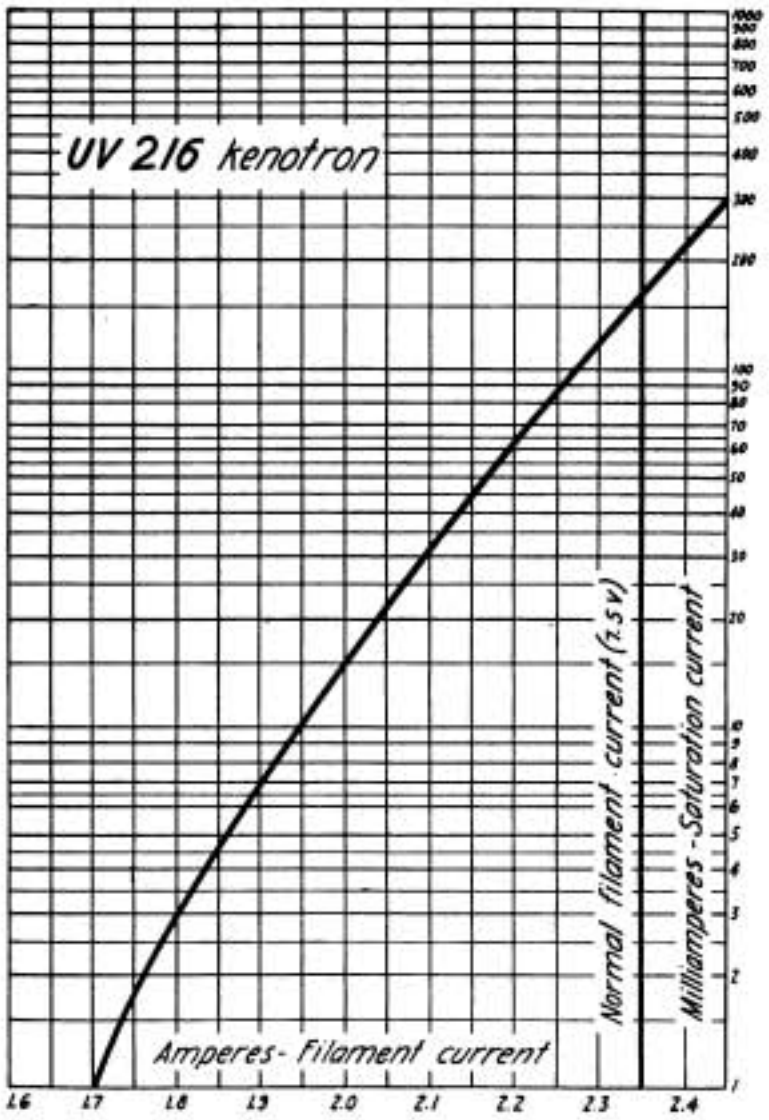


Figure 4—Saturation current obtainable from a UV-216 Kenotron with different filament currents

Figure 4 shows the saturation current obtainable from a UV-216 Kenotron with different filament currents. This curve is obtained by the circuit arrangement shown in figure 3. The anode is maintained at a D.C. potential sufficiently high to carry all the electrons from the filament. This means that no space charge effect is present, due to the fact that every electron is carried across to the plate. It should be noted that, with this no load condition, the entire potential drop occurs in the Kenotron.

The plate current in this case is sometimes termed the emission current, in that it represents the maximum electron emission possible, since no space charge effect is present.

If, instead of maintaining sufficiently high voltage to withdraw all the electrons from the filament the applied voltage is 100 or less we obtain the characteristic curve shown in figure 5. The plate current under this condition is called the space charge current to indicate that the space charge is now a factor, due to insufficient plate voltage.

The I_p, E_p characteristic curves shown in figure 6 illustrate the variation of plate current with the voltage applied to the plate when different filament voltages are used. This family of curves having the same general characteristics, are usually termed the D.C. characteristic curves and provide us with considerable information.

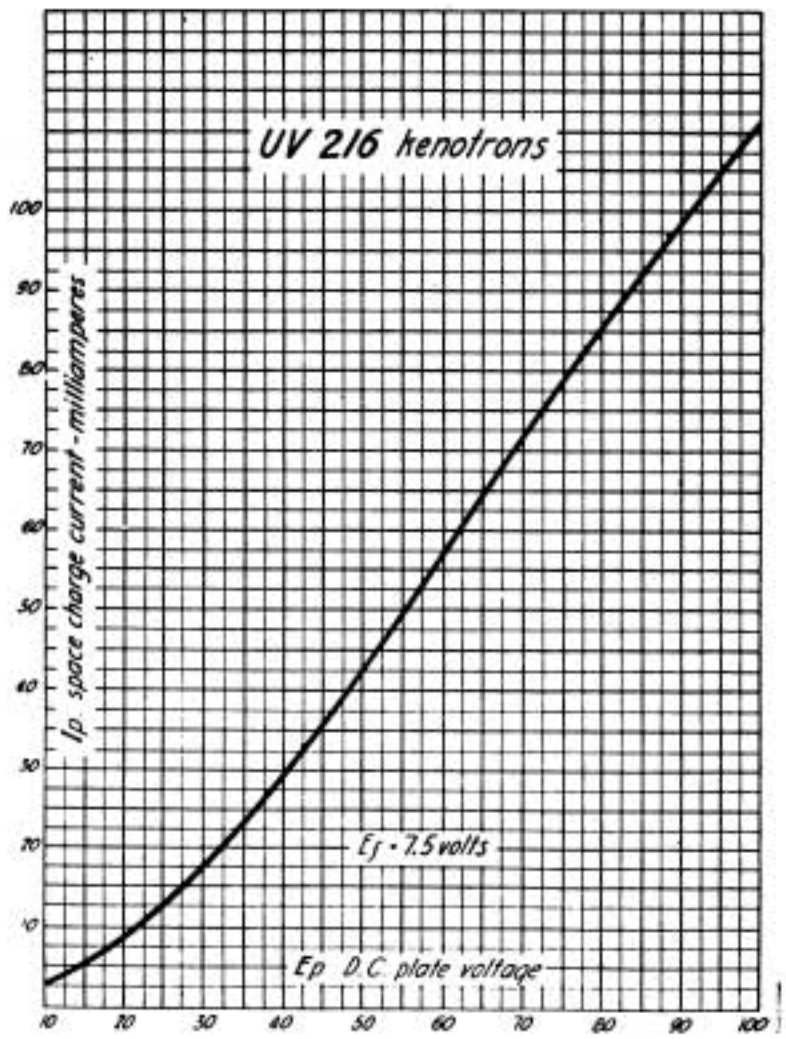


Figure 5—Characteristic curve of the space charge current

It should be noted that for a given filament voltage an increase in the voltage applied to the plate or anode results in an increase in the plate current up to a certain value of E_p. As this value of E_p is exceeded the rate of increase of I_p gradually decreases until finally a further increase in E_p results in practically no increase in plate current. Let us consider what occurs in the Kenotron to produce this effect.

Referring to curve No. 2 we see that the plate current steadily increases until the potential applied to the anode reaches 120 volts; that is, the drop of potential between filament and plate is 120 volts. As this voltage is ex-

ceeded, the rate of increase begins to fall off until at about 160 volts the plate current is practically independent of the potential applied to the plate.

It is evident that the electron emission is sufficient to maintain a space charge effect until the anode voltage exceeds 120. Beyond this voltage and until 160 volts is exceeded the space charge effect is rapidly decreasing until when the plate voltage exceeds 160 we find that I_p has practically attained its maximum value. The limitation in plate current in this case, is due to the fact that, at the filament temperature corresponding to 7.5 volts, all the electrons emitted are drawn to the plate. The voltage applied to the plate when saturation occurs (E_s) is determined, from the curves, by the intersection of the tangent lines, and the saturation current is taken as the plate current corresponding to this voltage.

If the plate current did not continue to increase slightly with increased plate voltage the current corresponding to 160 volts would have the same value as the saturation current corresponding to $E_f = 7.5$ volts, figure 1. This increase in plate current is due to the higher filament temperature resulting from the plate heating up. For our purposes we can neglect this additional increase in plate current.

It is seen that as the filament voltage is increased the value of the saturation voltage and current is also increased. This is due to increased emission (figure 2) caused by the increased filament voltage. The greater emission in turn requires a stronger electric field to remove all the electrons and this is obtained by increasing the potential drop through the Kenotron.

Figure 7 shows another family of curves illustrating the variation of the plate current as a function of the filament voltage, the circuit arrangement still being that shown in figure 3.

It will be seen that for a given plate voltage I_p increases with the filament voltage until a point is reached at which the rate of increase in I_p falls off until finally the plate current is independent of the filament voltage. At this point the emission is so great that the anode voltage cannot draw all the electrons to the plate. The space charge therefore limits any further increase in I_p by repelling electrons back to the filament at the same rate they are emitted. The saturation current is in this case called the full space charge current since the current is independent of the filament voltage.

These curves indicate that a certain minimum temperature must be reached before the full space charge effect is obtained and that the higher the applied voltage, that is, the drop of potential through the kenotron, the higher must be the cathode temperature to obtain the full space charge effect.

So far we have established the following general characteristics of the UV-216 Kenotron.

1. If the voltage applied to the anode is sufficiently high the space charge effect does not occur and we obtain the emission current.

2. The plate current may be limited by the filament temperature; that is, the applied voltage is sufficiently high to draw all the electrons to the plate (figure 6).

3. The plate current may be limited by the space charge effect, in which case the emission is so great that the voltage applied to the plate is insufficient to withdraw all the electrons from the neighborhood of the filament (figure 7).

We have so far considered the D.C. characteristics of the Kenotron. Before investigating the operation of the device under load conditions we will consider its application as a rectifier of alternating currents.

In order to illustrate the rectifying properties of the UV-216 Kenotron we will consider two simple circuits, one for half wave and the other for full wave rectification. The circuit for half wave rectification is shown in figure 8, where the filament supply is taken from either a separate winding on the plate transformer or from a separate transformer. In either case the winding of the filament transformer must be insulated for the plate voltage. From our previous consideration of the Kenotron we know that the device conducts practically no current when the plate is negative. When the plate is positive the device becomes conductive. This action results from the fact that the plate is the cold element, hence does not emit electrons. Electrons emitted from the filament are carried to the plate resulting in one-way conduction through the tube. Figure 9 shows an oscillogram of the voltage applied to the plate of the Kenotron, and the wave shape of the plate current. It will be seen that the negative half of the wave has been completely eliminated, hence the term half wave rectification.

The circuit for full wave rectification is shown in figure 10. Oscillograms of the voltage applied to the plates and the rectified current wave is shown in figure 11. It will be noted that the negative half of the wave has been shifted to the positive side and fills in the spaces caused by its elimination when using half-wave rectification.

The oscillograms of both half wave and full wave rectification show the rectified current wave having the same general shape as the applied voltage wave. The shape of the current wave depends upon the D.C. characteristics of the Kenotron and upon the magnitude of the voltage applied to the plates. Referring to figure 6, curve 2, suppose that the peak value of the voltage applied to the plate exceeds the saturation voltage E_s. The current wave will then show a flat top

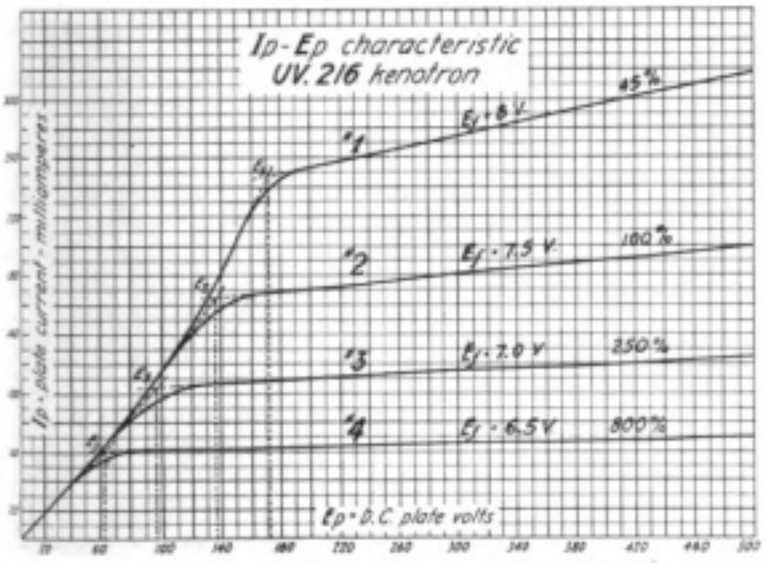


Figure 6—Variation of plate current with the voltage applied to the plate when different filament voltages are used

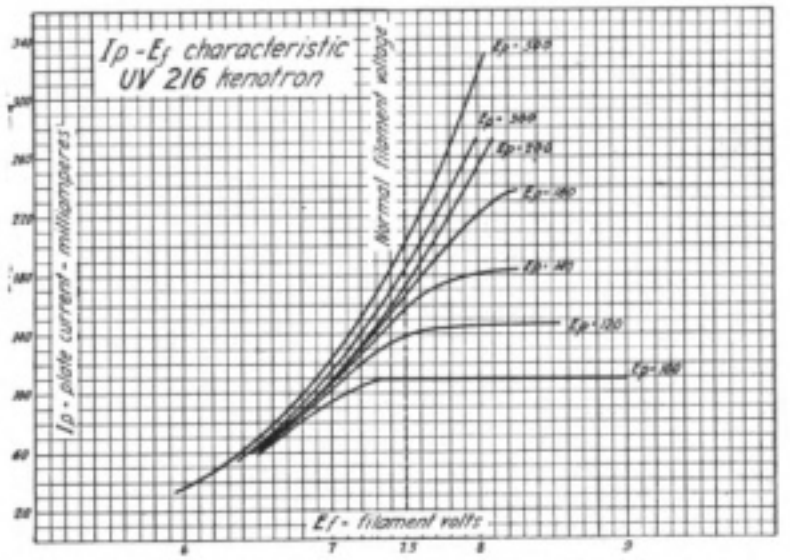


Figure 7—Variation of the plate current as a function of the filament voltage

instead of approximating that of the applied voltage. This is due to the current-voltage charactertistic of the tube and never occurs unless the tube is improperly operated.

It is evident that distortion of the current wave may also occur by operating at reduced filament voltage. If, for example, the Kenotron is operating under normal conditions and the filament voltage was reduce to 7 volts, the value of E_s is decreased with the result that the potential applied to the plate greatly exceeds this new value of E_s This effect is shown by the oscillograms in figure 12, for full wave rectification with different values of filament voltage. With the normal filament voltage the current wave is practically a reproduction of the applied potential, but as the filament voltage on the tubes is reduced the current wave begins to exhibit a flat top.

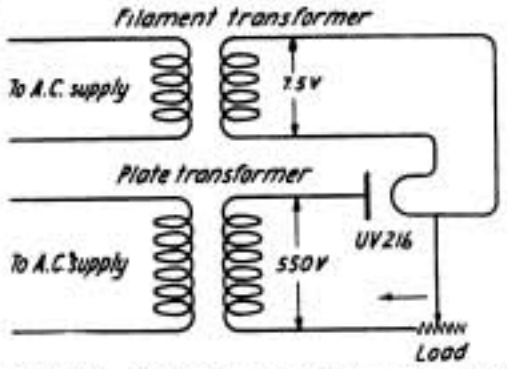


Figure 8—Circuit for half wave rectification

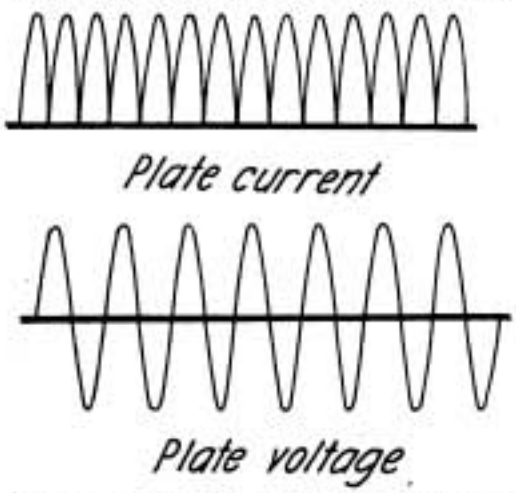


Figure 11—Oscillogram full wave rectification

Figure 13 shows oscillograms of full wave rectification where the filament voltage of one tube is maintained normal, while that of the other tube is gradually decreased.

It is therefore evident that the saturation voltage is of considerable importance, since an increase in voltage beyond E_s results in no further increase in current. Hence, if the drop of potential through the Kenotron exceeds E_s the device operates inefficiently. On the other hand, since we have found that the value of the saturation current increases with the filament voltage the Kenotron operates inefficiently if the applied voltage to the plate is less than E_s. This is due to the expenditure of power in the filament when the resulting emission cannot be utilized due to the low value of applied voltage.

In applying the Kenotron as a source of direct current; that is, as a rectifier, we must consider the operation of the device under load conditions. For the present the use of filtering or smoothing-out apparatus will not be considered, the load consisting of resistance inserted in the plate circuit as shown in figures 8 and 10.

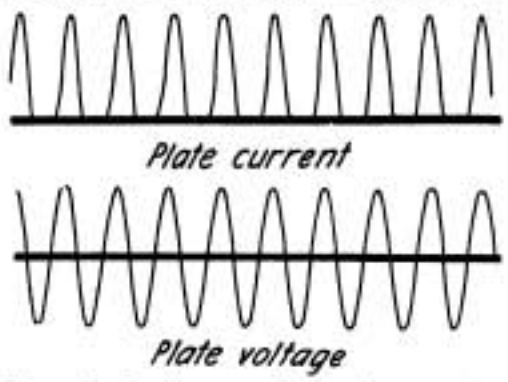


Figure 9—Oscillogram of the voltage applied to the plate and the wave shape of the plate current

When using the Kenotron as a rectifier of high voltage A.C. it should be noted that current is not passed with the high voltage at the terminals of the tube. Curve 2 in figure 6 shows that the maximum drop of potential (E_s) through the Kenotron is about 140 volts. During that part of the cycle when the filament is negative with respect to the plate, current flows through the external circuit in the direction shown by the arrows in figures 8 and 10. Evidently the voltage drop through the tube now depends upon the kenotron resistance and the load resistance as we have in effect two resistances in series across the supply. If the load resistance is sufficiently high the drop through the tube will be less than that required for efficient operation. As has been shown, this results in expending power in the filament that is not utilized. If the load resistance is decreased the current through the circuit increases, hence, the voltage drop through the Kenotron increases. This increase in current can continue until the voltage drop through the tube reaches the saturation voltage. The current through the circuit then represents the saturation current. A further decrease in load resistance then simply applies a high voltage across the tube without increasing the current. When the load resistance is entirely cut out the full supply voltage is applied to the anode with the result that practically all the energy is liberated as heat at the plate and may raise it to such a temperature that ionization will occur, ruining the tube.

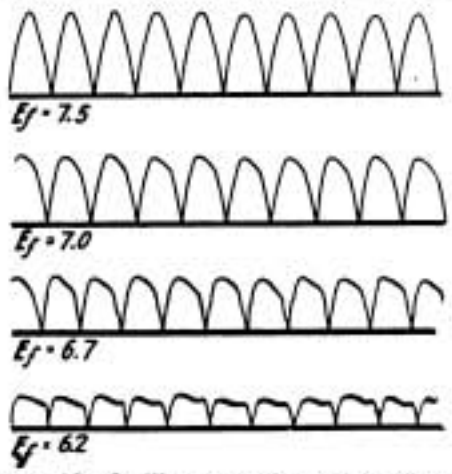


Figure 12—Oscillograms illustrating effect of filament voltage on wave shape. Full wave rectification

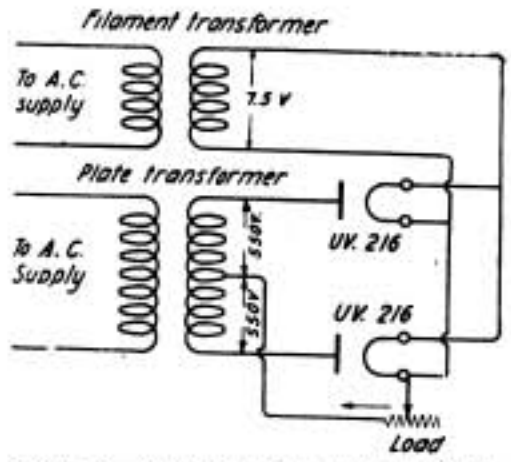


Figure 10—Circuit for full wave rectification

The curves shown in figures 14, 15, 16 and 17 illustrate the characteristics of the UV-216 Kenotron for both half and full wave rectification. These curves were obtained with the circuit connections shown in figures 8 and 10 with the Kenotrons at all times operated at normal rating, which is:

Filament Volts	7.5
Filament Amperes	2.35
A.C. Input Volts	550

It will be noted that the action of the Kenotron, as the load resistance is increased, is the same, whether full or half wave rectification is employed. The curves show that the rectification efficiency increases as the load resistance is increased. This would be expected since the effective resistance of the Kenotron is nearly constant when working below the saturation voltage

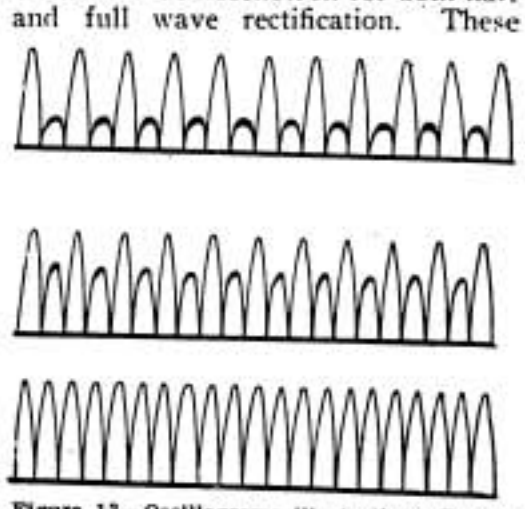


Figure 13—Oscillograms illustrating effect of filament voltage on wave rectification

(E_s) so that as the load resistance is increased a greater proportion of the energy supplied is consumed in the load. Full wave rectification will, of course, deliver twice the energy since both halves of the wave are utilized. The "overall efficiency" and "watts output" curves illustrate that the Kenotron, like almost all electrical apparatus, gives the maximum output when the resistance of the load is equal to the effective resistance of the Kenotron.

It is apparent from the curves that we can increase the output of a Kenotron by raising the voltage without increasing the losses within the tube, provided we also increase the resistance of the load so as not to exceed the saturation current. It must be remembered, however, that the full transformer voltage is applied to the Kenotron during the negative half cycle and since the tubes are designed for 550 volts effective, this is the maximum A.C. voltage that should be applied.

In obtaining the data shown in curves 14 to 17 the plate and filament voltages were maintained constant and an ammeter reading effective current was placed in series with the load resistance (figures 8 and 10). For the purpose of illustration, we may consider a case where a single Kenotron is used for half wave rectification.

E_f = 7.5 volts
I_f = 2.35 amperes
E = 550x.707=389 volts
I = .071 amperes
R = 4030 ohms

The output of the rectifier is then given by

$$W_o = I^2R$$

where

W_o = Output in watts
I = Effective current in load
R = Resistance of load

Since the load current and the plate transformer current are the same the input is

$$W_i = EI$$

where

W_i = Input to rectifier in watts
E = Effective plate voltage

In the case of half wave rectification the effective plate voltage is only .707 times the effective transformer voltage, since only one-half of the wave is utilized.

The total input is given by

$$W'_i = EI + E_fI_f$$

where

W'_i = Total input to Kenotron in watts
E_f = Effective filament voltage
I_f = Effective filament current

The electron efficiency; that is, the efficiency of rectification, is

$$E\,el = \frac{W_o}{W_i} = \frac{IR}{E}$$

E el = Electron efficiency

and the overall efficiency of the Kenotron is

$$E'\,eff = \frac{W_o}{W'_i}$$

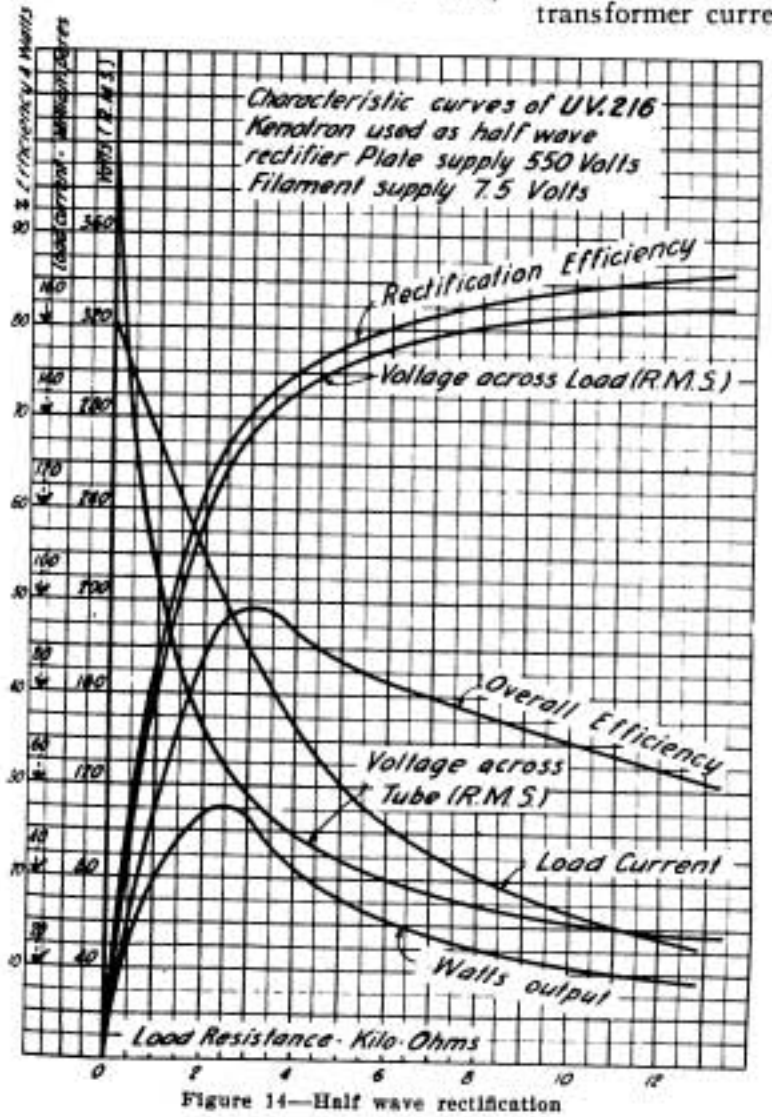


Figure 14—Half wave rectification

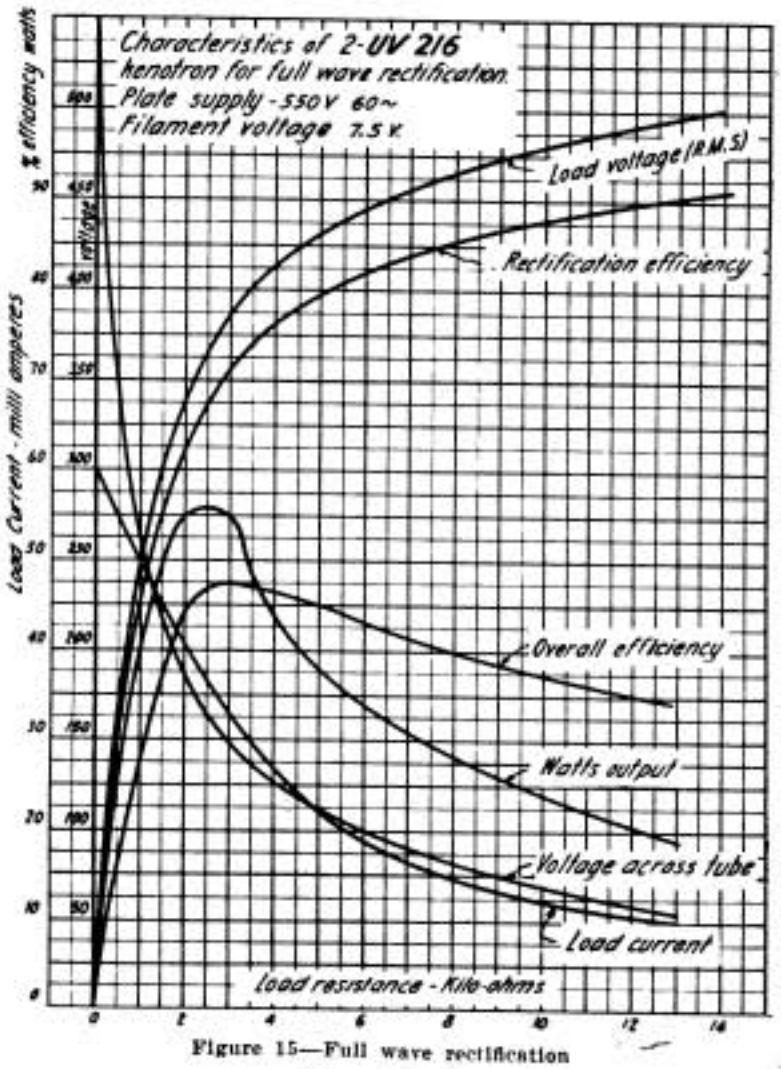


Figure 15—Full wave rectification

The effective voltage across the tube itself is

$$E_t = E - IR$$

The loss in rectification is given by $W_i = E_tI = W_i - W_o = W_i\,(1 - E\,el)$ Where W_i is the loss in watts and appears as heat dissipated at the plate. hence—

$$W_o = \frac{.071}{2} \times 4030 = 20.3 \text{ watts}$$

$$W_i = .071 \times 389 = 27.6 \text{ watts}$$

$$W'_i = (.071 \times 389) + (7.5 \times 2.35) = 45.2 \text{ watts}$$

$$E_{el} = \frac{20.3}{27.6} = 73.5\%$$

$$E'_{eff} = \frac{20.3}{45.2} = 44.9\%$$

$$E_t = 389 - (.071 \times 4030) = 103 \text{ volts}$$

$$W_L = 27.6 - 20.3 = 7.3 \text{ watts}$$

The results shown above are modified slightly when a filter circuit is used, but, in any case, the UV-216 Kenotron is capable of delivering 20 watts at 350 volts. If the filter circuit is properly designed we are then able to provide the UV-202 Radiotron with a suitable high voltage direct current supply. The filter circuits will be considered in a later article.

One of the chief considerations from the viewpoint of cost is the life of the Kenotron. In general, the life of the tube is taken as the life of the filament. With metallic filaments, such as tungsten, the volatilization causes the filament to gradually wear away with a resulting increase in the resistance of the filament.

If the filament is operated at a constant voltage the decrease in the diameter of the filament will cause a decrease in the filament current but not a decrease in the electron emission because the filament emissivity increases during the life.

If the filament is operated at constant current, then as the resistance of the filament increases, due to evaporation, the temperature also increases, resulting in increased emission and only about one-third the life. It is evident, therefore, that the filament should be operated on a voltage and not a current basis.

Other factors, such as the diameter of the filament wire, etc., also govern the life. For our purposes it will be sufficient to call attention to two operating features that usually determine the usefulness of the Kenotron. The first is operating at filament voltages other than the rated 7.5 volts. The effect of such operation is indicated in figure 6. Taking the life obtained with 7.5 volts as 100 per cent. the effect of operating at other voltages is shown in percentages on the curves. It should be noted that with 8 volts on the filament the life is but 45 per cent. of that obtained with the normal voltage of 7.5. The effect of operating at decreased voltages is to increase the life very materially, but this cannot be carried to the extreme. The general rule should be never to use a voltage above 7.5. In some cases a slightly lower voltage may be used, but in general the normal voltage of 7.5 should be maintained.

The second operating feature resulting in decreased life is the use of higher effective values of A.C. voltage than that specified which is 550 volts. The Kenotron like almost any other device can be overloaded. While the UV-216 Kenotron can stand considerable overload, such operation, if continued, may result in heating the plate or other metallic structure or the glass of the stem to such an extent that a minute amount of occluded gas is liberated. The presence of this gas means an imperfect vacuum and collisions will occur between the electrons emitted by the filament and the molecules of the gas. The result of these collisions will be the breaking up of the gas molecules into electrons and positive atoms. The electrons will be drawn to the anode possibly colliding with other gas molecules and ionizing them, the positive atom will be driven into the space charge and possibly the filament. If this condition prevails to any considerable extent, the ionization will become visible as blue glow. Whether visible or not, its effect is a great increase in the plate current, hence increasing the overload on the Kenotron until finally either the tube fails mechanically or causes a short circuit on the supply.

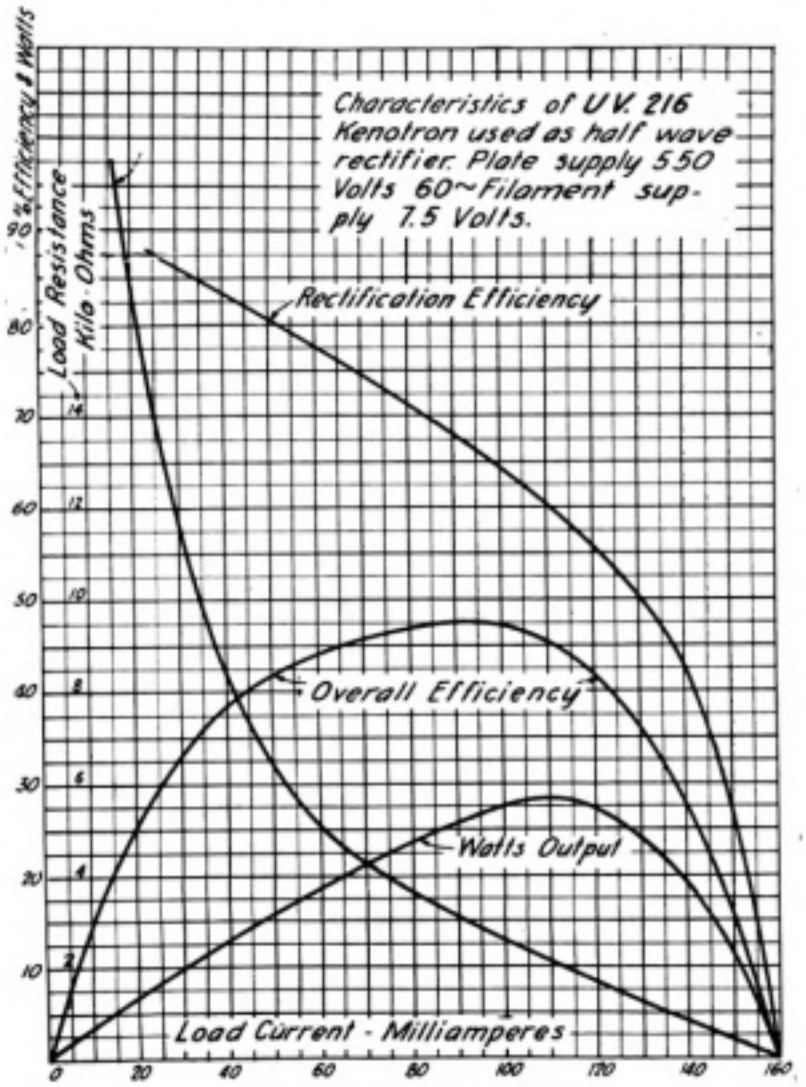


Figure 16—Half wave rectification

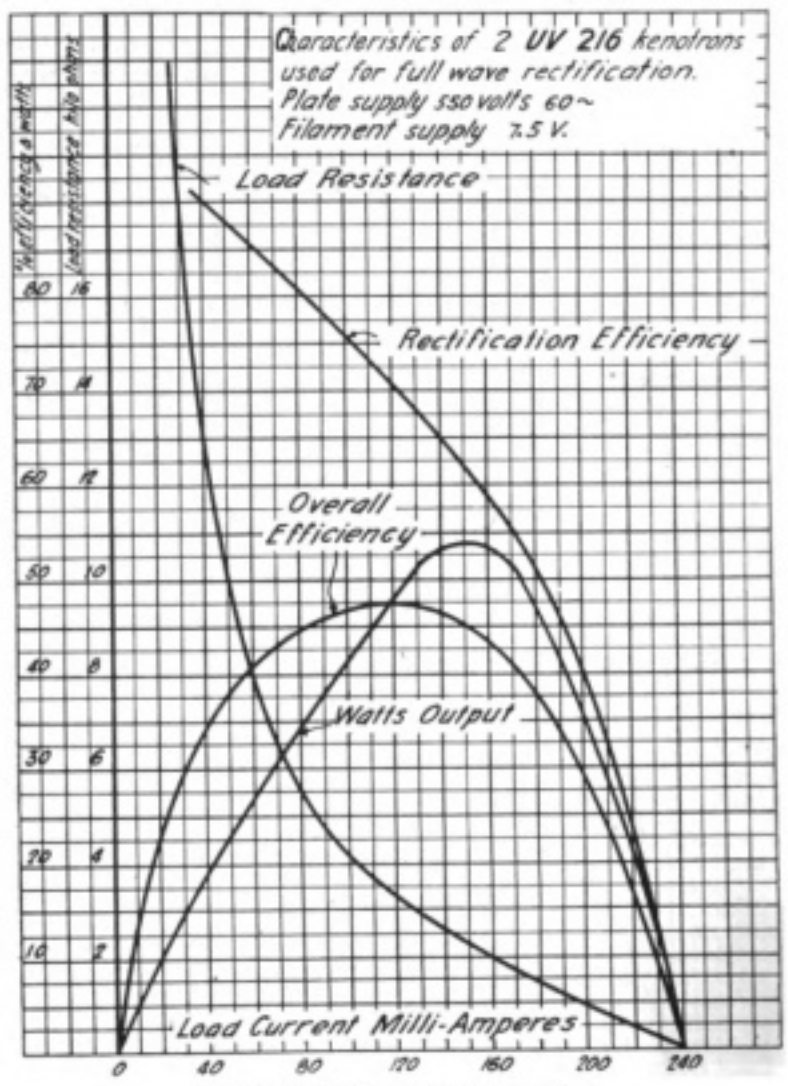


Figure 17—Full wave rectification

Amateurs Aid Flood Victims

Portable Station Erected at Scene Brings Prompt Aid to Citizens of Hatch, New Mexico

By R. W. Goddard

ABOUT six o'clock in the evening of the 17th of August a cloudburst broke over the mountains to the southwest of the Rincon Valley, in New Mexico. The next day rumors drifted down the valley that it had caused a destructive flood, washing away towns, farm houses, crops and stock. Immediate action was taken by the Las Cruces Chamber of Commerce. A meeting was called and a committee appointed to go up the valley and ascertain the extent of the damage and render any necessary aid. A large fund was raised on the spot to carry out this work.

The writer was appointed a member of the committee and proposed the utilization of the portable wireless stations 5FY and 5 FZ of the New Mexico College of Agriculture and Mechanic Arts in connection with his own station 5ZJ as a means of rapid communication between the flooded area and the chamber headquarters at Las Cruces. The idea met with immediate favor. By rapid work with the local telephone, E. Kiernan, a student at the college and member of the college radio club, was reached, who agreed to assist in the work. In an hour and a half, the two stations were packed in a trailer and rolling behind the writer's "Henry Ford" toward the stricken area. Two hours later we arrived at Rincon, 41 miles up the valley, on the edge of the flooded section.

Portable radio station 5FY, which rendered important service and brought timely aid when Hatch, New Mex., was destroyed by a cloudburst

clothing, blankets, tents and cots were sent up by truck. The Salvation Army and the Red Cross of El Paso, Texas, also sent workers to the scene, all combining forces in a general relief committee so that there would be no duplication of effort.

At times some difficulty was experienced at 5ZJ in receiving on account of static. Invariably this would become bad about noon and get worse until sundown, when it would remain about the same until after sunrise the next morning. It would then clear up

drawn from the antenna under such conditions.

The following extracts from the El Paso Morning Times of August 19th gives a fairly accurate account of the flood:

Hatch, N. M., a town of 500 residents, was wiped out by a flood, following a cloudburst yesterday, only three buildings surviving the rush of waters. Many of the residents had to flee in their night clothes. They escaped to the hills nearby without loss of life. All are homeless. Damage to buildings and crops in the vicinity of Hatch will reach a half million dollars, estimates last night indicated. The flood began soon after a cloudburst struck Santa Teresa, a village in the foothills two miles west of Hatch. Representatives of the western division of the American Red Cross and the Salvation Army arrived at Hatch from El Paso and other cities of the southwest last night with supplies, food and tents. The Las Cruces Chamber of Commerce sent a relief committee which at once took charge of caring for 150 residents of the stricken town. Auto trucks from Las Cruces, El Paso and nearby towns are rushing provisions to the scene.

Dean Goddard of the New Mexico College of Agriculture and Mechanic Arts, and Thomas Brownlee, installed a radio telegraph station

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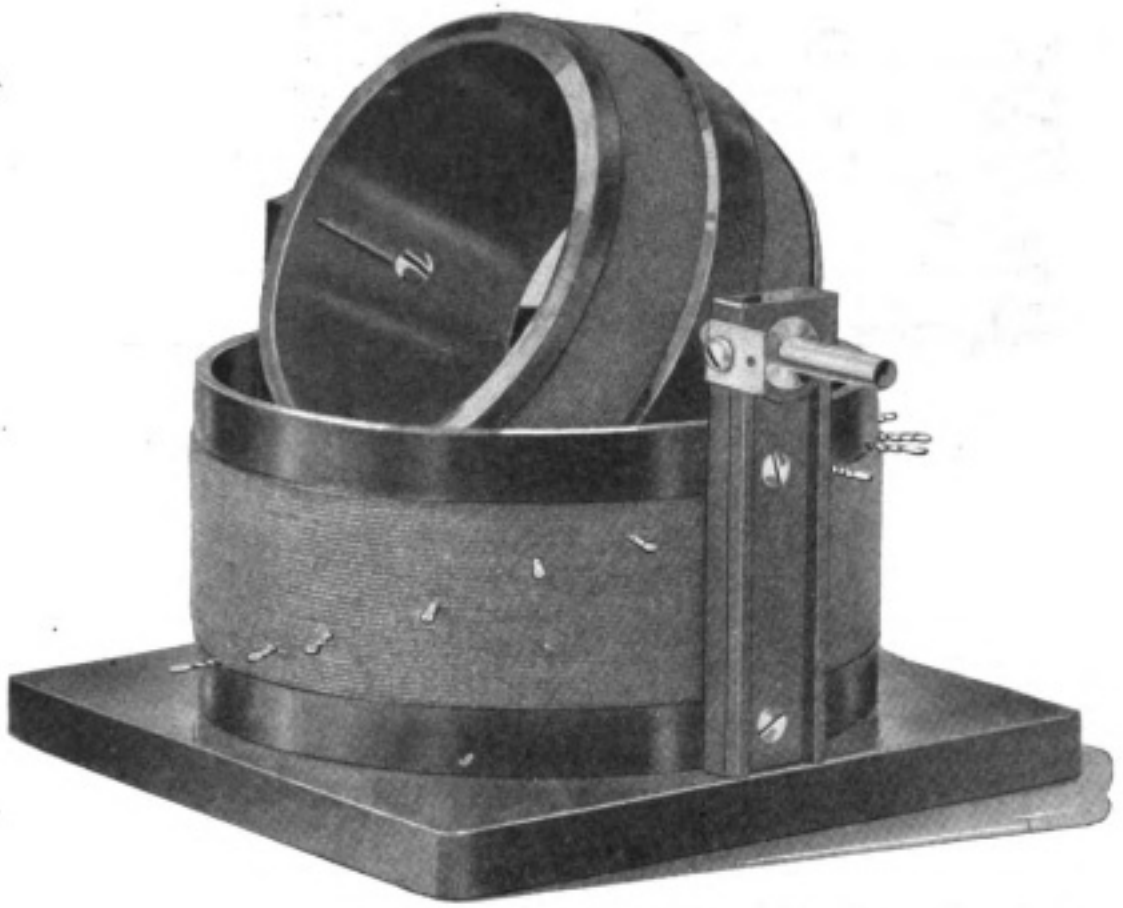

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transmitter respectively, a larger box in which the antenna wires and ropes are packed when moving and which serves as a table in camp, a six volt Edison storage battery and a 45 foot telescoping mast. This latter is often dispensed with, a tree, or telephone pole serving as a substitute.

The transmitter as shown in the cut, is of the damped wave type. The spark coil is a one inch heavy duty wireless coil built by the Duck Company. The fixed gap is also of Duck manufacture. The condenser is a single section of the Murdock molded type. The oscillation transformer is an edgewise wound Murdock with special hinged mountings. There are five turns in the closed circuit windings and eight and three-quarter turns in the secondary. The hot wire ammeter, a General Radio Company's 0-1 amp., is mounted on the panel with a heavy short circuiting plug switch beside it. The antenna switch is of the double-pole, double-throw baby knife type connecting the aerial to the transmitter or receiver and disconnecting the battery from the transmitter when in the receiving position. The key is mounted on the cover of the case which serves as a desk when open. All of the apparatus is mounted on the panel and is thus readily removed from the case for inspection or adjustment.

The receiver consists of a case exactly similar to that containing the transmitter, with the apparatus mounted upon a panel and the B battery in a compartment in the base. The tuner is a simple single circuit hook-up as shown in the wiring diagram, having a .0005 mfd. tuning condenser and interchangeable inductance coils of different sizes for different ranges of wave length. The grid condenser is a variable like the series condenser, a DeForest C. V. 500. Remler filament rheostats are used for the detector and amplifier tubes. Hard tubes requiring no critical adjustments are used with good success.

The antenna system is made up of four aerial and four counterpoise wires each eighty feet long, of No. 14 B.&S. stranded lamp cord. The aerial wires are equipped with harness snaps at one end which snap over a copper band around the mast insulator. The other ends have quarter-inch brass plugs which fit with a taper into an insulated terminal block secured to the mast just above the instruments. The center of each wire has an Electrose four-inch insulator to which the guy rope is fastened by other harness snaps. These ropes are also eighty feet in length. Thus with the centers guyed out at right angles to each other, the aerial takes the shape of a cube standing on one corner, the wires forming the edges. The counterpoise wires are laid out on the ground under the aerial wires and extend outward the full length. They are connected to another insulated terminal block at the ends. The mast is in two section, each 24 feet long and two and one-half inches square, held together much like an extension ladder. The aerial wires and guys support the top section while the top of the lower section is guyed out with four ropes similar to those used for the aerial.

In setting up the station the two mast sections are telescoped, all aerial wires and guys snapped in place, the stick raised and the lower section guys run out and fastened. The top section is then hoisted by a rope and pulley and the aerial guys run out and fastened. The counterpoise wires are then laid and plugged to their terminal block. The instruments are set up and tuned and the station is ready for operation. This has been accomplished by three men in less than twelve minutes after arriving on the selected site.

In operating little attempt is made to tune accurately the transmitter to any particular wave length. The closed circuit is adjusted to about 180 meters, and the aerial circuit has to be adjusted for each set-up to deliver the maximum antenna current. This varies according to the surroundings of the aerial and the condition of the spark coil vibrator points. It usually runs about .6 to .8 amps. The maximum daylight range is unknown. A distance of thirty-eight miles has been easily covered through heavy summer static. Our main trouble with the sets is in keeping the vibrator points in good condition. They pit and burn quite badly after five to ten hours of continual use. In adjusting them we find we get better results if they are given a fairly stiff tension and made to vibrate so as to give about a 250 spark note. The receivers work with great precision and reliability. Their sim-

(*Continued on page* 42)

High-Power Amateur Radiophone

Excellent Work Done by University of Nebraska Station, 9YY, During the Summer

By H. O. Peterson. Bsc., E.E.

THE new high-powered radiophone set of the University of Nebraska, Lincoln, Neb., call letters 9YY, has been in daily operation for several weeks and the results have been very gratifying to those who designed and operated the set, in view of the severe static conditions which have prevailed during the Summer in that section of the country. Interest in radiophones and C.W. transmitters has not been as keen in the Plains States as has been true of other sections of the country and this radiophone set, which is the highest powered set in that section of the country, has created a great deal of interest in this form of transmission.

Musical concerts have been transmitted twice daily by 9YY, at 12 noon and at 7:30 p. m., and many enthusiastic acknowledgments have been received from Nebraska, South Dakota, Iowa, Minnesota, Missouri and Kansas. The station has been heard as far as Aberdeen, South Dakota, in daylight, the distance between Lincoln and Aberdeen being 340 miles.

On Sunday evening, July 24th, the American Legion Band gave a concert at a local amusement park. Through the courtesy of the Lincoln Telephone Company, who provided a through line between the park and the radiophone set, it was possible to broadcast the music of the band by radiophone. The music was picked up by three microphones at the park, relayed over the telephone line and then transmitted by the radiophone set to listeners in neighboring states.

The radiophone set of 9YY, which comprises the front cover illustration of this issue of THE WIRELESS AGE, uses four 50-watt Type U.V. 203 radiotrons and two 5-watt tubes as speech amplifiers. Two of the 50-watt tubes are oscillators and two are modulators. By throwing a switch all four tubes can be used as oscillators for either straight C.W. or I.C.W. By changing a jack the radiophone set becomes a buzzer modulated telegraphic set. When using two 50-watt tubes as oscillators and two as modulators, the antenna current is 3.5 amperes. When all four tubes are used as oscillators, the antenna current is 5 amperes.

The radiophone set used at 9YY was designed and made by H. O. Peterson, B.Sc. E.E., and in the front cover illustration Mr. Peterson is shown operating the set. The outfit is part of the laboratory equipment of the Department of Electrical Engineering of the university. The radio work of the college is under the general supervision of Dean O. J. Ferguson of the Engineering College, who is an active member of the A.I.E.E.

EXPERIMENTERS' WORLD

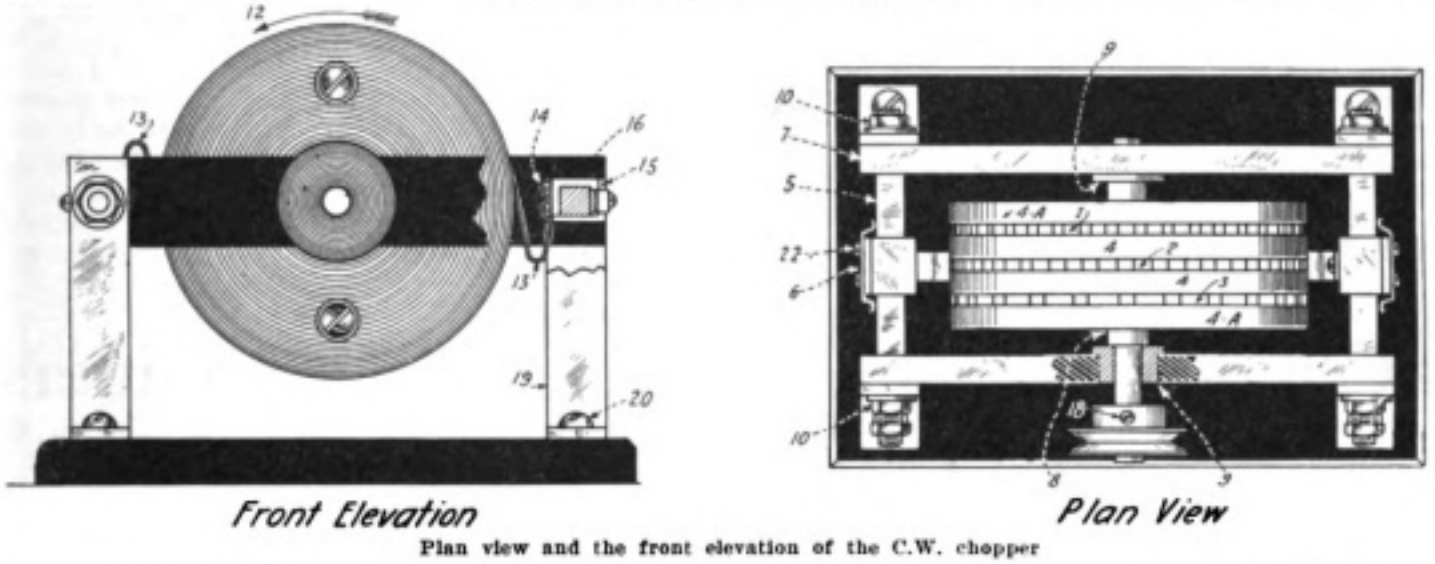
Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Continuous Wave Transmitting Chopper

By M. L. Snyder

FIRST PRIZE $10.00

THE continuous wave set which I employ is a vacuum tube set using three oscillators in parallel. To avoid the use of a separate modulating circuit operated by a buzzer to secure the effect of damped wave transmission, and which would require the use of three more tubes and complicated circuits, I decided to build a chopper, thus interrupting the undamped waves at some high audible rate. At the same time this would enable me to reach a number of amateurs that have no facilities for receiving undamped waves.



Plan view and the front elevation of the C.W. chopper

The chopper in detail which I built is shown in the drawings. Inasmuch as the note interruption on a buzzer is capable of being varied by the tension screw until the desired note is obtained it was considered advisable to have some means of varying the rate of interruption on the chopper. The driving motor which I had was a constant speed motor and so I did not consider it advisable to alter it in any way for speed adjustment, and to invest in a variable speed motor was too expensive. So I decided to build the chopper in such a way that at constant speed I could still obtain at least three different rates of interruption and therefore three different notes of transmission. The method by which this was done will be clear from the following description.

The type of interrupter built is the so-called "rotating interrupter," and differs from the usual type of commutator interrupter in that no commutator is really employed. The rotating part of the chopper consists of a brass disc between two dilecto plates, the brass disc being cut with grooves, a definitive number to a disc. A very fine brush bears on this rotating disc, and brass disc and dilecto plates are so designed that when the brush is opposite a groove in the brass disc it does not make contact with it, but when the disc rotates so that the brush is opposite the ungrooved part of the disc it does make contact. The number of interruptions is thus dependent upon the number of grooves cut in the disc.

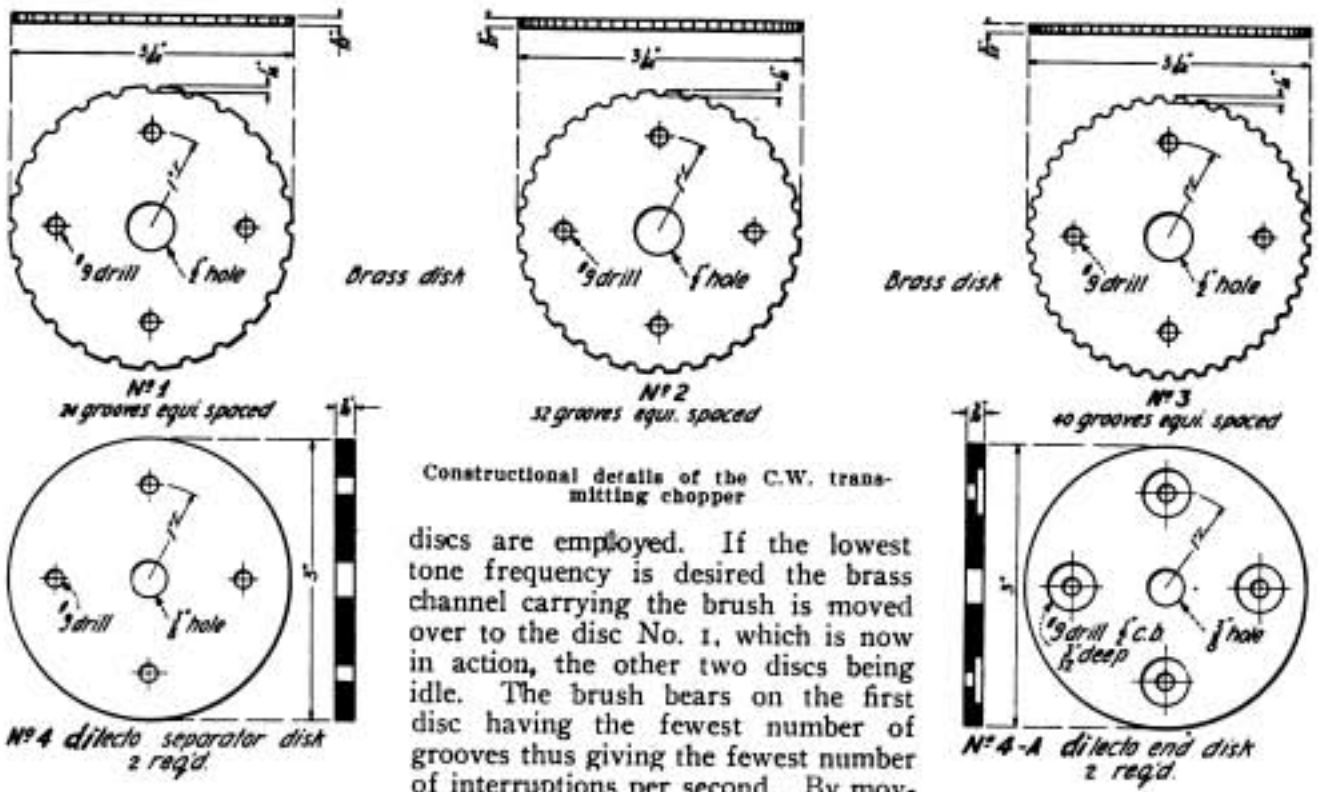
In order to obtain the various notes mentioned above, the chopper was built with three discs, each having a different number of grooves. As noted in detail No. 1 the first disc has 24 grooves, the second in detail No. 2 has 32 grooves, the third in detail No. 3 has 40 grooves. Thus if the first disc gives a note of 600 cycles, using the second disc will give a note of 800 cycles, and the third disc will give a note of 1000 cycles. The three brass discs shown in the above-mentioned details and numbered 1, 2 and 3 in the plan view, are fly cut out of 3/32 inch sheet brass. One-half inch holes are drilled in the center for the shaft and 4 holes drilled with a No. 9 drill to take the clamping screws shown in the front elevation, which are No. 10/32x5/16 inch round head screws. These clamping screws tie the three discs and dilecto plates together. The grooves in the disc were made by means of a rat-tail file. These discs are separated by means of dilecto plates shown in details No. 4 and 4A. The No. 4A are the end plates. All the plates are drilled and counter-bored as shown in the respective details. When the brass discs and dilecto plates are drilled out properly they are clamped together with the clamping screws and assembled with end plates, and set in the lathe. Each brass disc is then turned down so that it just projects a couple of thousandths of an inch above the dilecto separators and end plates. This will insure excellent and tight contact between the brushes and brass discs.

This entire unit is now ready for mounting, and the steel shaft No. 8, shown in the plan view, is forced into the unit, care being taken that a good tight fit is obtained. The mounting for this unit is shown in detail in the plan and front views. The wood base holds the two bearing strips No. 7, which are made of ¼ inch sheet dilecto, and into these are forced the two bearings No. 9, made of ⅝ inch. brass rod. After they are in place the strips 7 are reamed out for the ¼ inch shaft.

The brush shafts No. 5 made of ¼ inch square brass fit into the bearing strips No. 7 as shown in the drawings, and are turned down at each end for an 8/32 thread. It will be noted that on each of these brush shafts one end is left a little longer than the other, this being used as a terminal contact. The brush unit itself is shown very clearly in the front elevation. It is

seen to be composed of a slider mechanism made of the channel brass detail No. 16 and the angle brass detail No. 15. To this angle brass detail is attached the phosphor bronze spring No. 6 for positive contact against the brass shaft No. 5. The channel brass detail No. 16 carries the brush proper which is made of 0.020 inch phosphor bronze sheet. Two brushes are employed 180 degrees apart so that the tension on the rotating unit will be the same for each.

It will be evident now how the three discs are employed. If the lowest tone frequency is desired the brass channel carrying the brush is moved over to the disc No. 1, which is now in action, the other two discs being idle. The brush bears on the first disc having the fewest number of grooves thus giving the fewest number of interruptions per second. By moving the channel to either one of the three discs any of the frequencies desired may be had.



Constructional details of the C.W. transmitting chopper

A pulley drive was used on this chopper, simply because it was more convenient. There is no reason why the direct drive may not be used. Any type of small motor will operate this chopper.

It might be useful to amateurs to note that the 3/8 inch steel shaft No. 8 is machined to a 5/16 inch shoulder and to 1/4 inch for the bearings. The object of the shoulder was to prevent end play which at first caused considerable trouble.

A Chopper for Interrupted C.W. Transmitters

By A. Machson

SECOND PRIZE $5.00

THE advantages of C. W. transmission over damped wave transmission, namely, less interference and greater carrying power, are becoming clearer and clearer to the amateur, as evidenced by the ever growing number of C. W. stations. However for one reason or another there are a large number of amateur receiving stations that have no oscillating receivers and so are unable to receive this C. W. stuff. In order to enable the receiving stations not equipped for C. W. reception to receive C. W. it is necessary to employ a chopper at the transmitter end to interrupt the C. W. into a series or train of waves. This interruption should take place at an audio frequency rate, preferably between 500 and 1000 times per second, in order to derive the benefits of high tone transmission.

Sometime ago in order to carry on certain tests comparing the relative merits and efficiency of mechanically interrupted C. W. with buzzer modulated C. W., the writer had to build a mechanical chopper with which to carry out the experiments. A complete description of this chopper with all the necessary drawings to enable the amateur to construct a similar one, is here given.

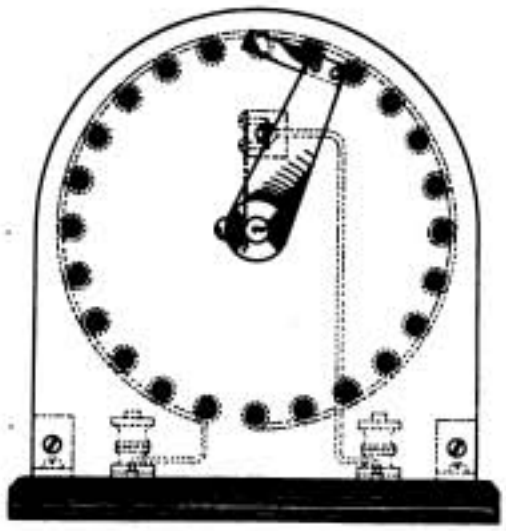


Figure 2—Front view of the interrupter

Figure 1 shows a side view of the completely assembled chopper, figure 2 shows a front view of the interrupter proper with the contact making and breaking members, and the other drawings give all the other necessary details.

This chopper was designed to require a minimum of machine work. This is one of the greatest advantages of it and practically all the parts may be bought in the correct sizes. Only a little drilling and tapping will be found necessary.

The driving motor (1) shown in figure 1 was a small fan motor, but any other small fractional horsepower motor can be used, for as seen from the drawings, the motor has a very light load, and simply rotates the light contact arm 7. It is desirable that the motor be one whose speed is readily variable by varying the resistance in the field or armature, thus securing the advantage of adjusting the pitch of your transmitted note. The motor shaft will not be long enough to carry the various parts of the interrupter proper so an extension shaft 9, of 3/8 inch brass rod, shown in the details, was added. This extension shaft was coupled to the main motor shaft by means of coupling 2, made of

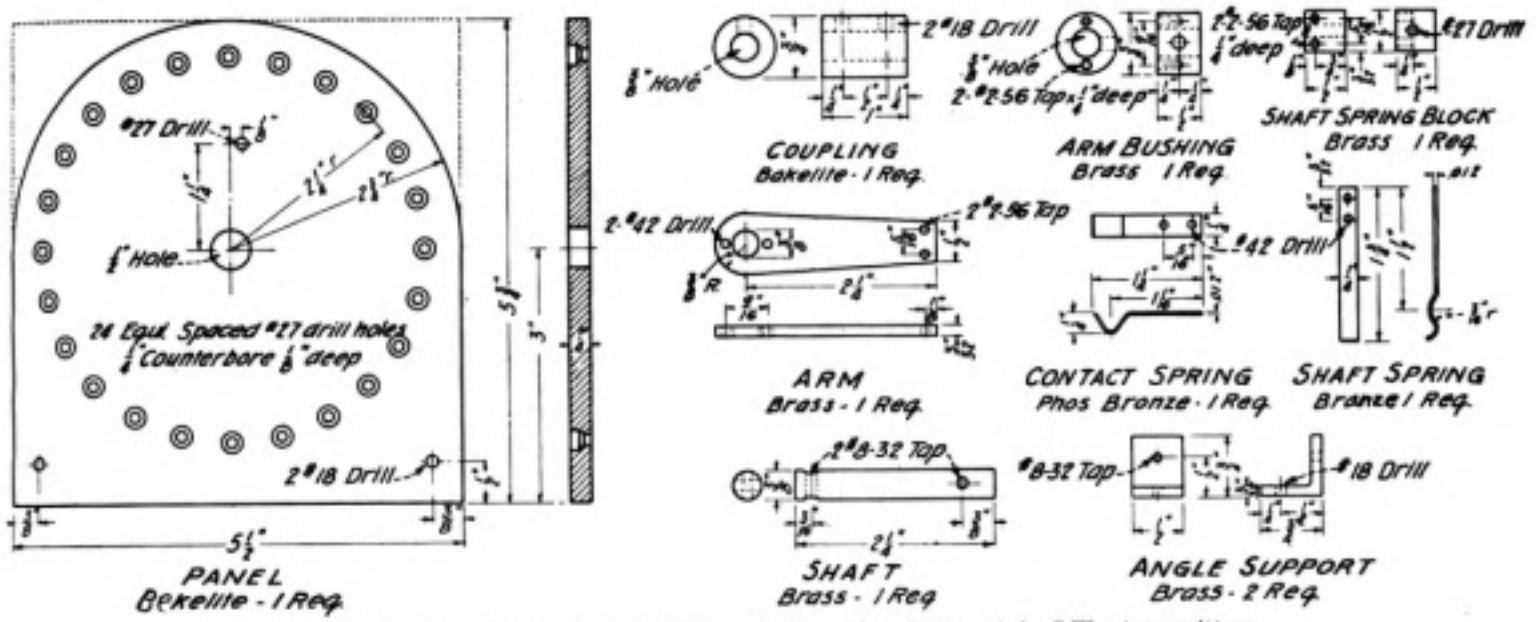


Figure 3—Constructional details of the chopper for interrupted C.W. transmitters

3/16 inch dilecto tubing. The shafts and coupling block were drilled and tapped so as to be secured to each other by 8/32 round head set screws.

From figures 1 and 2 it will be seen that the interrupter consists of a stationary dilecto panel 5, on which are mounted 24 equally spaced studs 10, the rotating arm and contact making and breaking member being the brass arm 7, carrying the contact spring 6.

The panel is made of ¼ inch dilecto stock. Although the detail drawing of the panel shows an arch form, this is not necessary, and the panel may be in the form of a square as shown by the dotted line in the detail. Thus it may be bought to the size required ready for use without any extra machining. The panel drilling is given in detail and practically all the holes can be done with one size drill. The contact studs 10, are inserted so that they are flush with the top of the panel. These studs may be the ordinary receiving switch studs or contacts, obtainable at any radio dealer's. It might be interesting to mention that I first used for these contacts No. 6/32 fillister head screws, the heads of which I filed down until they were flush with the panel. These contacts are fastened to the panel by means of standard hex nuts. On the rear of the panel; that is, on the side facing the motor, these contacts are all electrically connected by means of a bare copper wire soldered to the extended threaded portion of the studs. This wire is seen in figure 1 and shown in figure 2 by the circular dotted lines. This common contact thus made is brought out to one of the terminal binding posts 11. The panel is secured to the base by two angle brass supports 12, which can be easily procured in the required size at any store.

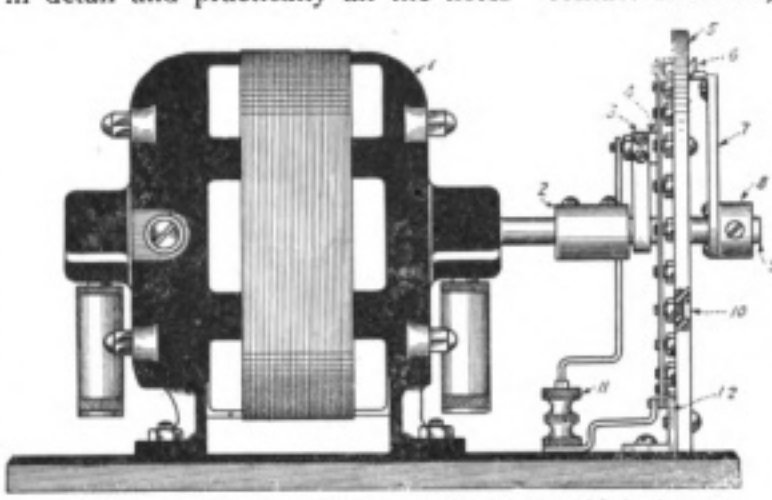


Figure 1—Side view of the completely assembled chopper

The rotating arm 7, which makes and breaks the contacts, is made of 3/32 inch brass. Although the detail of this part shows the arm to taper somewhat, this is not essential. Filing down is about the easiest way to do it. The rotating arm is fixed to the revolving shaft by means of the brass arm bushing 8, made of 3/16 inch brass tubing, threaded in two places by a No. 2/56 tap. The arm is fastened to the bushing at these points by No. 2/56 screws, the bushing held to the shaft by No. 8/32 screws.

The arm 7 carries the contact making spring 6, made of 12 mill phosphor bronze. This has sufficient springiness to always insure a positive and good contact. The electrical connection from this rotating arm is made on the rear of the panel by way of the extension shaft 9, the shaft spring 3, and the shaft spring block 4. The brass arm 7 is in metallic contact with the shaft. A brass block 4 is attached to the rear of the panel, and a phosphor bronze spring 3 makes contact also with the shaft (see figures 1 and 2). The electrical connection is then brought from the block 4, to a binding post on the base. The entire interrupter is secured to the hardwood base.

As stated the speed of the motor may be varied to give any required pitch. At a speed of about 2000 r.p.m. this interrupter with its 24 contacts gives about an 800-cycle note.

A Reliable and Simple Chopper for I. C. W.

By F. A. Miller

THIRD PRIZE $3.00

THE photograph shows a chopper I constructed and which has proven very satisfactory for I.C.W. I doubt if the idea can be called ingenious, but without doubt the chopper is highly practical, reliable and simple.

Any rotary gap with the stationary electrodes reasonably close together may be used. I had an old worn out Henry R. Swope D.C. generator number 4, from which I removed the commutator and soldered wires from each segment (there being six segments) to the segment immediately opposite (see figure 1). Then the rotor was removed from the gap, substituting the commutator for the rotor. Next I took the brush holders out and substituted them for the stationary electrodes on gap. The brush holders are 3/8 inch brass rod with a slot sawed about three-quarters of an inch long and having a screw running through at the open end of the slot to tighten it after the brush is inserted (see figure 2).

Next I inserted three thicknesses of ½ inch phosphor-bronze strip in each brush holder slot and tightened the screws. These brushes are just long enough to reach from the brush holder to the top of the commutator, connection being made with the commutator at a point about half an inch from the end of the brush. A brush is placed on each side of the commutator. The brushes should be sufficiently stiff to make a good firm connection to the commutator and yet let the commutator turn freely. The length of the brushes will be determined by the distance from stationary electrode holders to the commutator. The brushes are easily adjustable, either as to length or pressure on the commutator, by adjusting the set screw in the holder or the set screw on the electrode holder.

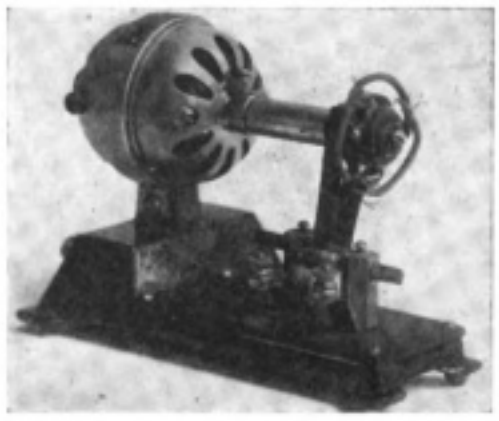


Figure 3—Chopper used for I.C.W.

By connecting the stationary electrode binding posts in series with the circuit to be chopped, the chopper is ready for operation. The chopper may be left in the circuit all the time even for C.W. and phone, by noting that the brushes are resting on the segments of the commutator and not on the insulation between segments. This feature eliminates the necessity for a switch, and all that is necessary to change from C.W. to I.C.W. is to start the motor or vice-versa. The motor in my chopper revolves at a speed of 4000 r.p.m., which with six segments connected in pairs, gives a frequency at six times the speed of the motor, or 24,000 per minute or 400 per second. This chopper can be changed back into a spark gap in five minutes if desired.

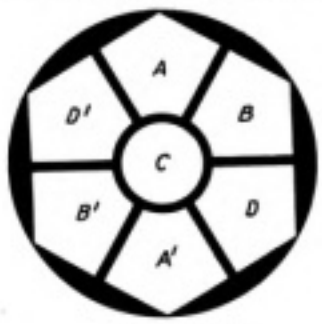


Figure 1

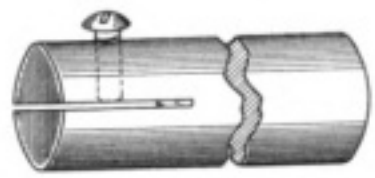
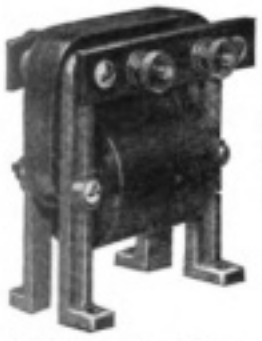


Figure 2

Figure 1

Figures 1 and 2—Parts of a spark gap rigged up to use in the chopper



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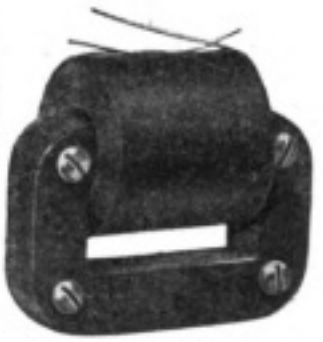

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Making Spark Signals Clearer

By Lincoln C. Peirce

IT is probably the experience of most amateurs using a one bulb regenerative circuit, and possibly even a two-stage outfit, to encounter unwelcomed noises when tuning for spark stations. Speaking from experience, however, I have found that in my UV-200 tube circuit, an improvement may be made whereby spark signals are amplified to a certain extent and cleared from nearly all accompanying noises. I am not sure that there is anything new in the idea, but the diagram shows the connections used for the clearer reception of spark signals. I have not as yet found the idea of any particular value in C.W. reception or for radiophone work. It consists merely in the simple expedient of introducing some variable inductance in addition to the tickler. The logical place to insert it in the circuit, of course, is between the negative pole of the "B" battery and the grid circuit, since the variations from the plate will then be passed on through the phone condenser, thence through the inductances L_1 and L_2, which will pass it again to the grid circuit. The resulting signals will then be heard in clear, high pitched tones suited to the ear by means of the .0005 mfd. condenser.

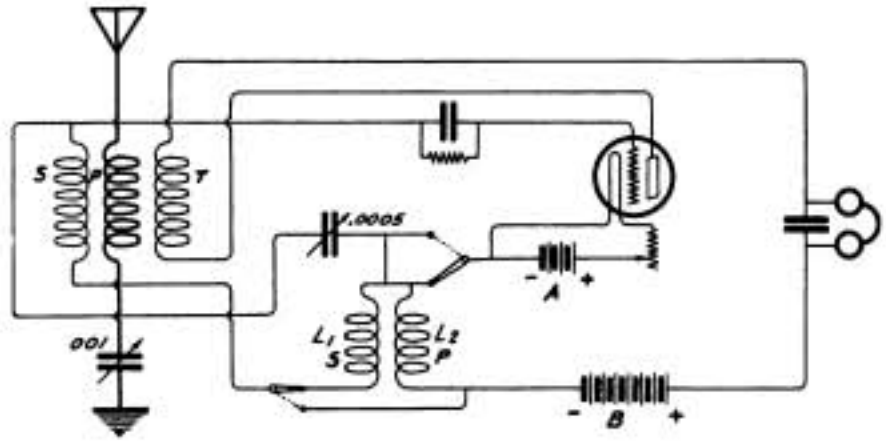


Figure 1—Circuit having a variable inductance in the grid and filament circuits to improve reception of spark signals

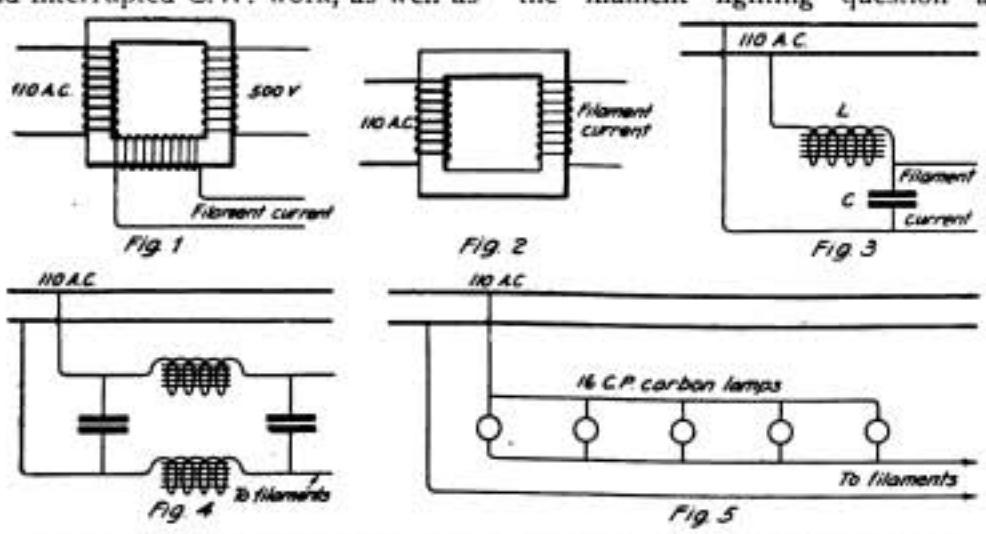
A convenient transformer for this purpose can be made from an old medical coil of variable inductance. I find that it is well to lower the tickler inductance and to use all the inductance possible between the primary and secondary, whatever the type of inductance, whether spider-web coils, loose coupler, etc. The ground condenser may be left at zero for best results and tuning may be regulated entirely with the variable inductance L_1 and L_2 and the .0005 mfd. condenser. Tuning will be found very easy. A double pole switch will serve to cut out the added inductance when receiving C.W. or radiophone.

Filament Current for Radiophone

By E. T. Jones

RADIOPHONE stations are springing up from every nook and corner and the old spark apparatus is being sold to the less experienced amateur so that he may get his start in the usual way. Straight C.W. and interrupted C.W. work, as well as modulated work at speech frequency prove the flexibility of tube transmitter. To merely have the desire to own and operate a radiophone or C.W. transmitter is one step in the right direction. However, a second glance at prices on storage batteries, 500-volt motor generator outfits for the plate supply, and other costly pieces required to successfully manipulate such a set, soon brings the tide of gloom high in the heart of the experimenter.

This article deals particularly with the filament lighting question and shows how the cost at this point was cut down from 300 to 400 per cent.



Details of an economical method of securing filament current for radiophone work

Having reference to figure 1 an elementary diagram of a special design of transformer is shown. Three sets of windings are provided, one for the primary A.C. input, another for the secondary which delivers 500 volts, and a third winding which delivers just enough current to light the filaments of the power and modulation tubes.

Not only is the price of this type of transformer steep, but it acts at all times to the best advantage in a C.W. circuit. Since the load on the plate circuit or secondary winding is variable and dependent upon the large capacity values of the oscillating circuit, a variable supply of filament current is delivered to the tubes according to the existing conditions. It is easy to understand just how much trouble can be expected from such a transformer and it is clear that at times too much current will flow through the filaments and destroy them. This can be guarded against only by inserting a circuit breaker in the filament supply and setting it for a critical amperage.

There is a second type of transformer on the market which is nothing more than an ordinary step-down *transformer*. The price of this instrument is also steep. It is employed in C.W. circuits for lighting the filaments when a 500-volt motor generator set is preferred to A.C. rectification. Such an instrument is shown in figure 2.

Bearing the above in mind the author set to work to devise a method to be employed in lighting the filaments. By glancing at figure 3 the reader will observe that an ordinary reactance unit L, is connected in series with the A.C. 110-volt supply line and the vacuum tube filaments. A large condenser C, of 1 mfd. capacity is shunted across the line on the filament side. Such a reactance, constructed with a slip-core so that the inductance can be regulated will permit the operation of as many tubes as are desired. A better method would be to split the reactance in half, inserting each portion in each leg of the line and shunting two 1 mfd. condensers as shown in figure 4, forming a natural filter circuit at the same time. In figure 5 five ordinary sockets are connected in parallel and these in turn placed in series with the vacuum tube filaments. The lights can be of 20, 40, 60 or 120 watt capacity and by merely screwing them in or out of the sockets, the whole or part of the current can be permitted to pass. If 16 candle power carbon lamps are employed the current flow can be calculated by allowing ½ ampere per lamp. The lamps are connected in the ungrounded side of circuit.

Hobart College Radio Work

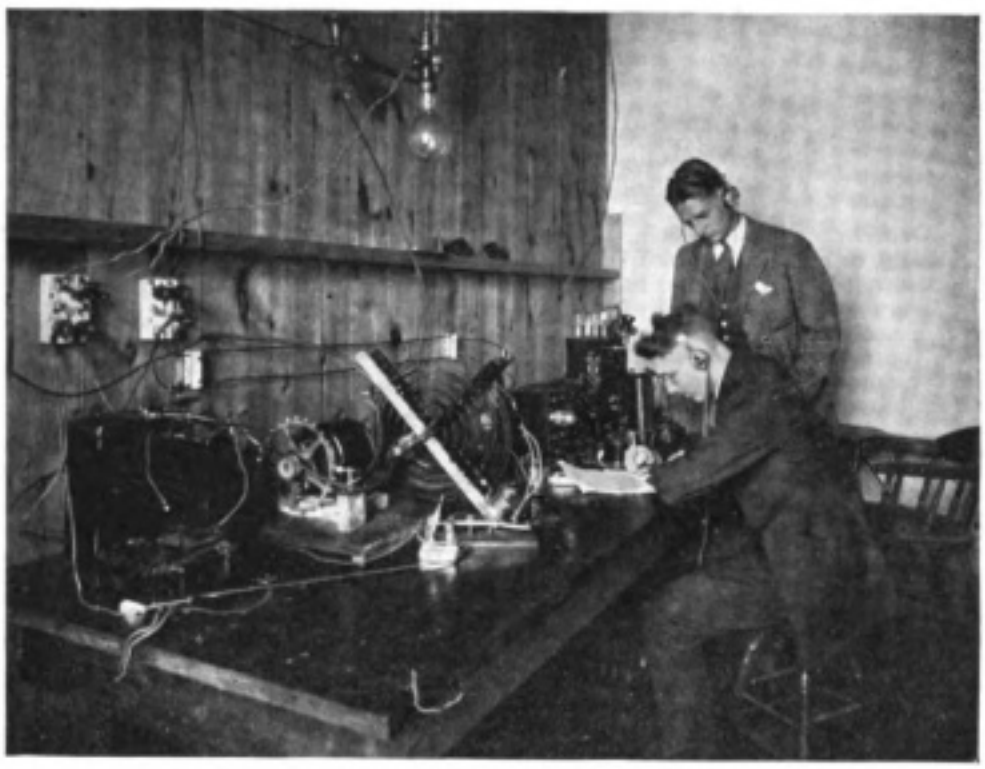
By David E. Peugeot, Jr.

A WIRELESS set, almost entirely homemade, with which it is possible to hear anything capable of being heard, has been installed by the students of Hobart College, Geneva, N. Y. All the work with this apparatus is under the direction of Professor A. C. Haussmann, Professor of Physics at Hobart, who is assisted by Henry A. Wheat, Jr., one of the students.

Under the present system, some 01 the students are usually on duty in the wireless room during the day and nearly every evening until midnight. Besides doing the regular work of relaying messages, police reports from the New York and Buffalo police departments are received and turned over to the Geneva police force. During the football season results of many college games were receivd and posted for the students. The results of Hobart games were also sent out. The students now intend to send out reports of the Hobart lacross games played in Geneva.

The station has received messages from all over including the great Nauen station. Not only are wireless telegraph messages received, but also great success has been met in hearing wireless telephone conversations between ships at sea, which are heard with remarkable clarity. Many concerts have been heard from different cities, especially New York, Washington and Philadelphia. A short time ago one of the student operators reported hearing part of an opera being sung at some opera house in London, England. The students have also been hearing a regular church service every Sunday, which has been sent out by a station in Pittsburgh, Pa. The men declare that the music of the organ is distinctly heard and that the sermon comes as plainly as over a telephone.

The complete set, in itself, offers nothing novel in the way of being connected up. The conventional hook-up is used. The sending set consists of a ½ kw. Packard transformer, several plate condensers, a rotary spark gap and key. The greatest problem which presented itself during the installation of the set was the construction of a rotary spark gap. As the gap was needed immediately there was no time to spend in constructing a complicated apparatus, so it was necessary to find the simplest and most available materials.



Radio station of Hobart College, Geneva, N. Y. Most of the apparatus was made by the students

An unused 2000 r.p.m. motor was found in the stock room of the laboratory, which was used as the motive power for the spark gap. For the rotor disc, a 26 tooth bicycle sprocket was used. As the diameter of the hole in the sprocket was much larger than the driving shaft of the motor it was necessary to use a bushing. A piece of fiber was turned down to fit the driving shaft and the outer side tapered slightly to provide a driving fit on the sprocket. Two pieces of fiber were then drilled out slightly smaller than the diameter of the shaft and was driven on before placing the sprocket in place. After this the other piece of fiber was forced on to hold the sprocket in place. To make sure that the apparatus would not fly apart the pulley was tightened with a set screw and the whole apparatus mounted upon a board. The spark gap works very well and other stations report that it has a clear note and is easily read. The condensers are made of heavy glass, cut about 8x10 inches, between which are sheets of copper. They are mounted in old storage battery jars and the jars filled with transformer oil. The amplifier, also homemade, is assembled in accordance with the Navy hook-up and is mounted in a mahogany cabinet.

With this set, on a 200-meter circuit, messages have been sent over two hundred miles and anything capable of being heard can be received. The radiation of the sending set is about two amperes, which is all that can be expected from the apparatus. Since completing the set, the students have been experimenting with a small telephone and expect to install a regular wireless telephone very shortly.

The MONTHLY SERVICE BULLETIN *of the*

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President* — J. Andrew White, *Acting President* — H. L. Walker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

HEADQUARTERS: 326 BROADWAY, NEW YORK

THE Department of Commerce has made a ruling to the effect that any station which attempts to monopolize the air and which uses unnecessary power in doing it is violating the law. The Department has ruled that all stations are to share in the use of the air and that any attempt to monopolize it by a single station constitutes unnecessary interference. The use of power is also clearly defined by law as being excessive if more power than is necessary to successfully put through any communication is used. The practice, therefore, of using high power for local work, for the purpose of "beating down" other stations which desire to work, is a clear violation of the law.

The Department has also gone on record as officially recognizing amateurs who are acting as traffic officers of an organization of amateurs with the object of assisting the Department in the enforcement of the radio laws. Individuals acting in the capacity of traffic supervisors, when duly appointed for this purpose by amateur organizations, therefore, have the support and backing of the Department in the enforcement of the radio laws.

▽ ▽

THE following question was recently put up to the editor of the Pacific Radio News:

How long can two stations hold the air without fear of suspension of the station license? Can two stations communicate with each other for a whole hour without even waiting to hear if somebody else wants the air? If two amateurs are talking together for a long time and I want to send, are they required to stop and give someone else a chance?

The above question was referred to Radio Inspector J. F. Dillon, of the Sixth District, who replied as follows:

This depends on the class of traffic being handled, and the needs of the individual case. If the long-continued use of the air is necessary, as handling legitimate traffic, etc., while the person waiting is simply desirous of "chewing the rag," the former stations should have the priority. It is the purpose of the Department that everyone should obtain the maximum benefit from the operation of their stations, hence stations unmercifully "hogging" the air are clearly guilty of violations of the laws and regulations concerning the transmission of superfluous signals, and of interference. If the stations are located in a district where traffic schedules are in effect, any unnecessary communication during the long-distance periods will be considered as willful interference, and the violators treated accordingly. It is probable that the interference caused by the stations mentioned was due to the use of excessive power for short distance work, which is another violation of the laws and regulations.

THE United States Civil Service Commission announces an open competitive examination for radio inspector on October 5, 1921. Vacancies in the positions of radio inspector and assistant radio inspector in the Bureau of Navigation, Department of Commerce, at $1,800 to $2,200 a year, and in positions requiring similar qualifications, at these or higher or lower salaries, will be filled from this examination.

The entrance salary within the range stated will depend upon the qualifications of the appointee as shown in the examination and the duty to which assigned. Appointees whose services are satisfactory may be allowed the increase granted by Congress of $20 a month.

All citizens of the United States who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles. For these positions in the Bureau of Navigation men are desired. The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called upon to examine radio operators.

Subjects and weights: Competitors will be examined in the following subjects, which will have the relative weights indicated: 1. Theoretical and practical questions in the construction, use, and adjustment of radio apparatus and auxiliaries, 50 weights. 2. Education and experience in the line of the required duties, 50 weights. Total, 100 weights.

Applicants must have reached their twenty-first but not their fiftieth birthday on the date of the examination. These age limits do not apply to persons entitled to preference because of military or naval service. Applicants should at once apply for Form 1312, stating the title of the examination desired (Radio Inspector) to the Civil Service Commission, Washington, D. C.

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A RADIO telephone report, which covers the important features of the St. Louis livestock, grain and provision markets will be sent out daily by the Department of Science of St. Louis University, was inaugurated on August 22. The messages are broadcasted at 2 p. m., on a wave length of 350 meters. The service is intended for the country tributary to St. Louis for a radius of 150 miles, going to the same receiving and distributing stations that now are receiving the daily weather forecasts and river gauge readings distributed by the university's radio telephone station.

The new service is an expansion of the weather service instituted three months ago, and will be a resume of the compilations of the various branches of the United States Bureau of Markets. It will consist of statements of receipts of cattle, sheep and hogs at the Nation Stockyards, condition of the market and prices. The expected shipments for the following day, both in East St. Louis and Chicago, also will be given. In the grain department will be given local receipts of wheat, corn and oats, with the offerings at country points, demand and closing market prices, both cash and futures.

The provision market report will be confined to staples and seasonable fruits, with the Chicago potato market added.

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A FORMER Toledo, O., amateur, is now an officer on the new super-dreadnaught California, the biggest and latest addition to the United States navy, which was officially commissioned August 11 at Mare Island Navy Yard, San Francisco. He is Ensign Jennings B. Dow, son of Mr. and Mrs. C. M. Dow, 419 Walbridge avenue.

He was formerly a student at Waite High School here and installed the first wireless apparatus in Toledo high schools in 1914 and was the first wireless instructor in the high schools.

He was graduated from the United States Naval Academy and commissioned two years ago. He is widely known in the radio world and has contributed many scientific articles to technical magazines.

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WHILE excessive static interfered somewhat with the success of the public demonstration of the wireless telephone, the concert given on the streets of Utica, N. Y., on August 20, by the Utica Radio Club demonstrated the practicability of the apparatus.

The wireless set, mounted on a truck, reproduced music sent from the station of Charles Schrader in Dudley avenue, and altogether 34 records were played. Many stopped and watched the truck, heard the music and applauded.

It is now planned to have a set placed downtown where with longer aerial and better controlled conditions, concerts can be given frequently.

The last stop of the truck carrying the apparatus was made at the lawn fete of Louise Hart Tent, Daughters of Veterans, held at Osborn avenue and Genesee street, where the best results were attained.

Elmer Smith, president of the Utica Radio Club; Robert Evans, chief operator; Edward Weis, vice-president, and Dean Wallace had charge of the traveling radio telephone set.

▽ ▽

AT the last meeting of the Cleveland Radio Association, Edwin H. Poad (8UK), 1509 E. 123d street, was elected president, James W. Speer (8WP), 2994 Euclid boulevard, Cleveland Heights, was chosen vice-president. F. M. J. Murphy (8ML), Warner road and Grand division avenue S. E., was re-elected secretary. H.

U. Hurd (8ALY), 914 Greyton avenue, Cleveland Heights, was elected treasurer.

Directors include, beside the officers mentioned, Norman McConnell (8BS), 14005 St. Clair avenue N. E.; Robert S. Van Cleve, 14401 Strathmore avenue, East Cleveland; Norman M. Kraus (8AFO), Brooklyn Heights; Robert G. Signell (8BBW), 1268 W. 128th street; Edward Dieghan (8ZP), Hotel Cleveland; Cyril H. Krieghbaum (8NQ), 1256 E. 125th street, and Paul Marsal (8AY), 1527 Lakeland avenue, Lakewood.

▽ ▽

MORE than 200 members and candidates for membership of the Radio Engineering Society of Pittsburg met in their clubrooms on the second floor of The Dispatch Building, 1333 Fifth avenue, on August 27, to attend the first smoker of the society. The meeting resulted in the taking in of 30 new members. The meeting was conducted by P. E. Wiggins, vice-president, in the absence of the president of the organization, J. B. Coleman.

Among those taken in as new members were B. P. Williams, first president of the older organization; Edward A. Dorn, Phillip Thomas, Roy C. Coderman, Frank Falhnor, Charles E. Rankin, Ralph Cohen, and James W. Shane.

▽ ▽

RADIO Station 1RO, owned and operated by Miss Edith E. Rotch, 157 Bay State Road, Boston, Mass., is one of the well known stations of the First District. Miss Rotch holds a first grade commercial license. Amateurs in New Jersey, Maine, Connecticut, New York, are consistently copied, while on the long wave set 1OR has copied CCK, Chile. The antenna is of the umbrella type, the guy wires also forming the antenna wires.

Miss Rotch first became interested in wireless in 1916 in connection with war work. She served as instructor for about a year at the United States radio school under Mr. Arthur Batcheller at Mechanics Building, and received a letter of commendation from Secretary of Commerce Redfield for her excellent work. Shortly after she enrolled in the United States signal corps and was given the rating of radio inspector at large, in which capacity she inspected a considerable amount of government radio apparatus. Not satisfied with radio alone, Miss Rotch holds down a day trick at the Postal Telegraph office.

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THE Amrad double prize contest has been extended to December 31, 1921, according to announcement by the American Radio & Research Corp. Nearly $175 worth of new apparatus is offered as prizes in the two contests. Information and contest blanks may be obtained upon application to the Contest Department, care of the Company, at Medford Hillside.

Announcement of the prize winners will be made as soon as possible after the close of the contest.

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THERE were 130 amateur and experimental transmitting stations in operation in the United Kingdom on August 1 of this year. The list is not an official one however, having been compiled by the Wireless World of London, by means of information furnished voluntarily by the owners of stations, private or experimental.

Licenses for radio stations in England are issued by the Department of Posts and Telegraphs. The power which amateurs in England are allowed to use is small as compared to the amount allowed in the United States, but the English amateurs are allowed the use of wave-lengths that are beyond the wildest dreams of American amateurs. For instance one amateur experimental station is allowed the use of a transmitting wave length of 200 and 700 meters. Another one is authorized to use 280 and 1000 meters and another 1000 and 3000 meters. In the majority of cases, however, the wave lengths allotted are 180 and 1000 meters.

Transmission is usually on a definite schedule, and the entire transmitting scheme, so far at least as a division of time is concerned, is on a more methodical basis than is true of amateur operation in the United States. As a general thing each station transmits at a given time in periods varying from one-half to two and one-half hours each day.

The system of official call letters for English amateur stations is practically the same as that in use in the United States. Practically all of the stations so far licensed to transmit in England have calls beginning with the figure 2, followed by two letters. As many of the transmitting stations use tube transmitters, of 100 watts input, there is a possibility that the signals from these English stations can be heard on our Atlantic Coast. If any American amateur is interested in a series of tests with these English stations the N. A. W. A. will be glad to make the necessary arrangement for such tests with some of the highest powered English experimental stations.

Distance Records

WHEN signals from a radio station are heard at unusual distances it is proof that the station is an efficient radiator of energy. The location, apparatus, construction and operation of an efficient station is therefore, of great interest to all amateurs, and THE WIRELESS AGE wants this information.

You are therefore requested to send us a monthly list of distant amateur stations heard, which will be published regularly. Report only stations located 200 miles or more distant from your station. Arrange the calls by districts (each district a paragraph), and the calls in alphabetical order.

In a second group arrange the stations you hear regularly by district, including only two or three stations, to determine consistency of performance.

State whether the stations heard use a spark or C. W. transmitter. THE WIRELESS AGE will follow the records closely and whenever possible will secure and print for your benefit and the benefit of amateurs in general detailed descriptions in illustrated articles on the stations consistently heard over long distances.

If a station is an efficient radiator of energy, it should be given proper credit in the history of amateur progress, and at the same time you will be given credit for efficiency in receiving in having heard it, as your name, address and call letters will be published with all lists submitted by you.—THE EDITOR.

STATIONS 200 miles or more distant should be reported for each calendar month. Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of the second month will be published in the next month's issue. For example, September lists received by October 10th will be published in the November issue. Spark and C. W. stations should be arranged in separate groups.

8XAC, JULY (EDWARD MANLEY), 328 Fourth Street, Marietta, O.

Spark: 1AW, 2BG, 2OI, 2EL, 2RU, (2ARY), 3AC, 3AN, 3CC, 3HB, (3HG), 3HJ,3OU,3UC, 3XF, 4AG,4FD,(4GN),4XC, 5DA, 5FV, 8BK, 8BO, 8EV, 8HR, (8OI), 8ON, 8TT, 8WA, 8WY, 8WZ, 8AEY, 8AFB, 8AGK, 8AKV, 8AMF, 8AMQ, 8ARD, 8AWP, (8AYN), (8BBU), (8BDC), (8BDY), 8YV, 8ZN, 9FS, (9UH), 9VK, 9AAW.

C. W.: (2DN), 2KL, 2AQM, (2AWL), 2XK, 3CC, 4GL, 8CT, 8IV, 9AZV, NMW.

2EL (SEPTEMBER 13th) HARRY H. CARMAN, Freeport, Long Island.

(1AZJ cw), (1TS cw), (3HJ cw), (4GL cw), 8AIO cw, (8DE cw), (8WY cw) (8ZV cw), (8ACF cw), (9ZN cw), (1OE), 3IW, (3OU), (3BP Can.), (4EY), (4FD), (4DT), (8TT), (8BO), (8SP), (8FE), (8AWP), (ZR), (8AGK), (8AY), (8RU), (8HU), (8AYH), (8AW), (9AAW), (9AWZ), (9ME), (9UU).

The majority of these stations were worked with CW.

▽ ▽

THE last meeting of the Houston, Tex., Radio Club was an interesting one. The club met at the home of Mr. B. J. Still, one of the most prominent members and owner of 5ZE station. After the regular routine of the meeting was completed the whole club enjoyed a watermelon feast with Mr. B. J. Still acting as the host.

A previous meeting was devoted to a "ladies night." Two of the ladies were on the program. It is noticed that the First District is raising all sorts of Q R M about finding one lady operator in the whole district. There are four in the Houston Club.

A swimming party was enjoyed by all members and their lady friends recently at the South End Pool.

Two of our members, 5CA and 5ZAA will soon be on the job as relay stations. The owner of 5JI station is spending the summer in California.

▽ ▽

G. L. GREENE, well-known Pittsburg amateur, who has been operating radion station 8ANK, has returned from his vacation, spent at the home of his parents in Kentucky. It was learned over the radiophone that he has added another operator to the personnel of the station, who hereafter will be known as Mrs. 8ANK.

▽ ▽

J. O. OLSEN, president of the Radio Electric Company and treasurer of the Radio Engineering Society of Pittsburg, disappeared suddenly last week from his place of business, leaving no clue as to his destination. After several days he was found at the home of his parents safely married to one of our Pittsburg radio enthusiasts.

▽ ▽

MESSRS. Faulknor and Wiggin of Station 8BT are working on a new antenna and counterpoise system for this winter's operation. Two poles are under construction and when complete will stand 100 feet high and 100 feet apart at the base. The antenna will be a six-wire cage built on two-foot hoops with a cage lead-in four inches in diameter. The counterpoise will be a fan 10 feet above the ground, consisting of 20 wires spaced two feet apart at the far end and coming to a point at the station. The location of the antenna is an excellent one, and should add considerably to the efficiency of this station.

▽ ▽

AT a recent meeting of the Wireless Association of Atlantic City, William Paulus, one of its members, gave a description of a radio set used by a local radio fan on board an express train to Philadelphia while the train was in motion. The hat racks on the coach were joined together by wire and used as an aerial, while the steam heating pipes were used for ground connection. Signals were received from ships at sea and naval stations.

THE Hudson County Radio Club met on August 10 at the clubrooms, 89 Franklin Street and discussed plans for acquiring larger quarters which are needed because of the increasing membership. A membership drive will be made in the fall. All those interested in the club are invited to communicate with the headquarteers, 89 Franklin street.

A visit was recently made by members of the club to the wireless station at Fort Wood, where they were the guests of Private J. J. Walsh of the Fourth Service Co., Signal Corps, U. S. Army.

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THE New York Police Department has discontinued the practice of broadcasting a daily list of stolen automobiles. There have been instances where the prompt work of amateur radio operators in giving the lists to the police of other communities has enabled the latter to trace automobiles stolen from New York city, and apprehend the thieves when the latter, with the stolen car, arrived in the town where the radio message had been intercepted. No reason was given for the discontinuance of the broadcasts.

▽ ▽

THE following, from Paris, gives a vivid idea of French telephone service: An amiable and worthy young Frenchman, made the acquaintance of a charming girl, a daughter of an American millionaire, who, with her mother, was stopping at the Hotel Ritz. The youthful pair fell in love and soon it became the question of an engagement.

The lady thought her mother could easily be persuaded to agree, and it was eventually arranged that the lover should telephone the millionaire's wife and ask her permission. Miss X counted on dealing with her father in New York herself.

She went at once to the wireless office in the Rue Froidevaux, and a rapid exchange of Trans-Atlantic messages ensued, until at last the young lady was victorious. She rejoined the happy man.

"Father's agreed,' she told him. "What does mother say?"

"Alas!" he replied, "I have been trying to get your mother on the phone for an hour and haven't succeeded yet."

▽ ▽

ONE of the features of the wireless concert given at Utica, N. Y., on the evening of August 10, was the solo of Robert Owens. He sang "Let the Rest of the World Go By," and made a distinct hit with the local wireless fans and their friends who were "listening in."

The concert was transmitted from the station owned and operated by Edward Weiss at 778 Lansing street. A checker game, played by radio, was another stunt of the evening. The contestants at the Weiss station was Louis Gates. He played with Robert Evans, 1141 Dudley avenue, who was the winner. Mr. Evans challenges other checker players to play him by wireless.

▽ ▽

AMATEUR wireless operators of Newport News, Norfolk, Richmond and other Virginia cities have been asked to aid police of the state in apprehending automobile thieves. There have been numerous robberies of this kind in the state during the past several months.

The Richmond and Norfolk police forces have installed wireless stations to improve police work. The police of this city have no such station, however, and the amateur operators everywhere are asked to communicate to police information of this kind which they hear on the air.

▽ ▽

HARRISBURG, Pa., members of the 55th Brigade Headquarters Company, National Guard, organized a radio club exclusively for the members of this section on August 19, at the home of Sergeant Howard M. Zimmerman, 1009 South Ninth

street. The following officers were elected for the ensuing year: President, Howard M. Zimmerman; secretary, George F. Bruker, and treasurer, Conrad H. Nordby. The members are planning a wide scope of activities. It was decided to hold meetings every Thursday evening at 8 o'clock at the Zimmerman residence.

▽ ▽

FIRST District Radio Inspector C. C. Kolster has recently been receiving congratulations on the arrival of an eight and one-half pound wireless operator who will be given the official designation of Frederick C. Koster.

▽ ▽

A LARGE chemical rectifier was in process of installation at the Marion, Mass., radio station recently when it was discovered more borax was needed. Irving Vermilyea, 1ZE, made tracks for a local soda water and candy store and managed to get about 50 pounds together.

"What in the name of Hannah's ghost are you up to now, wanting 50 pounds of borax, I'd like to know?" said the girl in the store. And Vermilyea, not wishing to go too deep into detail gave as an excuse, as he carted off the borax, "Oh, I'm going to make a little lightning of my own, that's all."

That night and most all the next day, the biggest thunder storm that part of the country ever had experienced swooped down upon the little town of Marion. It blew the fire whistle till it got hoarse, blew all the lights out, knocked a church steeple down, and set two barns afire before it decided to call it a "day's work."

But the next day 1ZE, forgetting all about what he had said he was going to do with the borax, calmly blew into this same shop, and the first thing that greeted his ears was: "You needn't come in here for any more borax. Goodness, gracious sakes alive, do you wanta get us all 'stuck'? Why, my telephone has been out of order ever since you started that borax storm; no, sir, you can't have another bit of that stuff, and if we have any more such goin's on I'm gonna tell the sheriff who's doin' all this!"

▽ ▽

THE Greenpoint, L. I., Radio Association was recently organized at 79 Eagle street, the home of E. L. Hinds. The following officers were elected: E. L. Hinds, president; George Pope, vice-president; F. Horvath, treasurer; H. Gerlach, secretary.

▽ ▽

THE first national convention of the American Radio Relay League was held at Chicago, Ill., August 30 to September 3, inclusive. A large number of radio men from all parts of the country attended. The affair was handled by the Chicago Executive Radio Council. Convention headquarters were located at the Edgewater Beach Hotel and the Sheridan Plaza Hotel. The manufacturers exhibits were located in the Broadway Armory, 5875 Broadway. The business and general meetings were held at the Senn Auditorium, Ridge and Glenwood Avenues.

The first day of the convention, August 30, was devoted to meeting arriving delegates and getting acquainted. On the morning of August 31 the first business meeting was held at the Senn Auditorium. In the afternoon the Central Division of the League held an organization meeting at the Broadway Arena. At various times during September 1 and September 2 technical papers were presented and discussed. A boat ride on the lake was enjoyed by several hundred of those attending the convention, on the evening of September 2. The steamer Theodore Roosevelt was specially chartered for the occasion. The convention ended on Saturday night with a banquet and dance at the Drake Hotel.

THE 1921 Electrical Show held at the 71st Regiment Armory, Park Avenue and 34th Street, New York, September 28th to October 8th, inclusive, has proven of great interest to the radio world, both professional and amateur.

On September 30th, at 8.30 P. M., a code speed contest for the championship of the

world was scheduled. This contest was expected to bring out all the speed kings in code reception, among them, B. G. Seutter, who won a similar contest at the Second District Executive Radio Council Convention last March.

A jamming contest, open to amateurs only, was scheduled for the afternoon of October 1st.

An outstanding feature of the show was the ½ KW. radiophone station of the National Amateur Wireless Association. This station, located on the Signal Corps drill floor, call letters 2BZL, wave length 200 meters, was used to broadcast music and speech every afternoon and evening during the show.

△ △

ON September 12, Harry H. Carman, of Freeport, L. I., 2EL, son of the proprietor of Carman's Market, at Rockville Center, ordered 100 pounds of bacon from a wholesaler at New Haven. The order was transmitted by amateur radio stations and was promptly acknowledged by the wholesaler, as follows:

"Please accept our thanks for your order received via Amateur Radio Station 1AZJ, at New Haven. This order will be shipped promptly by express."

△ △

EDITOR of THE WIRELESS AGE: In your August issue I note that you have credited me with carrying out, at Yonkers, the reception of the fight news broadcasted from Hoboken under the auspices of the National Amateur Wireless Association.

This is giving me credit I do not deserve, as the work was done by Paul Hobe who constructed and operated the entire receiving system which was used. My part was limited to arranging a few details in connection with the hall in which the apparatus was set up, and the credit for the success at Yonkers rests entirely with Mr. Hobe. I know you will be glad to straighten this out for your readers.

(Signed) E. H. ARMSTRONG.

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EDITOR, THE WIRELESS AGE: I would like to have you insert a correction in THE WIRELESS AGE, regarding my article entitled "Detector and Three-Stage Radio Frequency Amplifier" appearing on pages 25-26, September issue. In the circuit diagram on page 26 the detector tube should be at the end; the amplifier tubes coming first instead of the detector for radio frequency.

(Signed) F. J. RUMFORD, E. E.

Amateurs Aid Flood Victims

(*Continued from page 30*)

plicity and ease of adjustment make them ideal for this class of service. Different sized coils give a wave length range of from 150 to 20,000 meters.

While the sets were designed and built for maintaining communication between the several units and the College of our Reserve Officers Training Corps while on its annual military encampment trips to the mountains, other uses are continually appearing. Demonstrations at county fairs, conventions and other meetings, testing and experimental work, picnics and camping trips, Boy Scout outings and last, but not least, during the recent flood, represent a few uses that have proved their worth and practicability.

C. W. Transmitter

HERE are the constructional details of a C.W. transmitter which radiates ½ to ¾ ampere in the antenna. The cabinet, which should be given a good finish, measures 10 in. by 7 in.

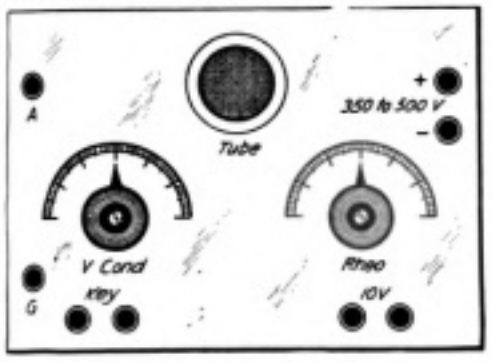


Figure 1—Panel arrangement

by 4 inches. The panel should be drilled as shown in the diagram. The current supply can be obtained from a 400-volt generator, but it may be obtained in any suitable way provided it

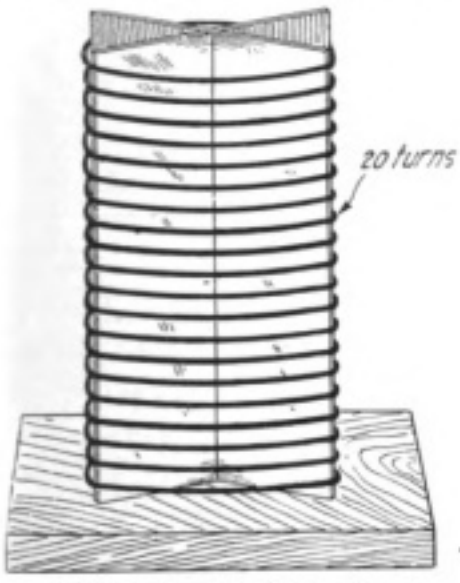


Figure 2—The choke coil

is properly filtered. The choke is made by winding one pound of number 18 wire on a core and is boiled in paraffine. If bought ready-made it should have 15 microhenries inductance. Condenser C1 is a variable of .001 mfd. capacity; C2, .0005 mfd., and C3, .001 mfd. The latter

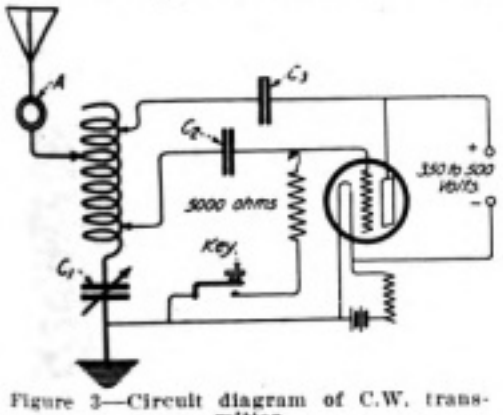
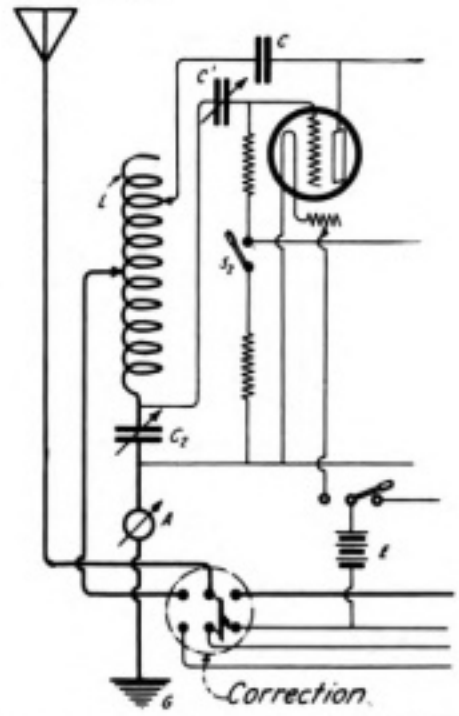


Figure 3—Circuit diagram of C.W. transmitter

two are of the fixed type. The resistance for the key is 5000 ohms of any standard make. The diagrams are self explanatory.

Correction

ON page 30 of the September WIRELESS AGE, in the article entitled "Efficient Design of Combined Receiver and Radiophone Transmitter," the wiring diagram showed a three-point one-way switch in the lower left-hand corner. This should have been a two-point double-throw switch instead. The section showing the correction is contained in the diagram below:



Queries Answered

ANSWERS will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

H. M. P., Sewaren, N. J.

Q. 1. If an aerial is not exactly at right angles to a power line, will there be much noise heard in the receiving set as a result of this? My aerial is to be about at an angle of 80 degrees to the trolley wire.

Ans. 1. This should be sufficiently non-inductive for your purpose.

Q. 2. Do trees near the aerial impair its efficiency much, if any?

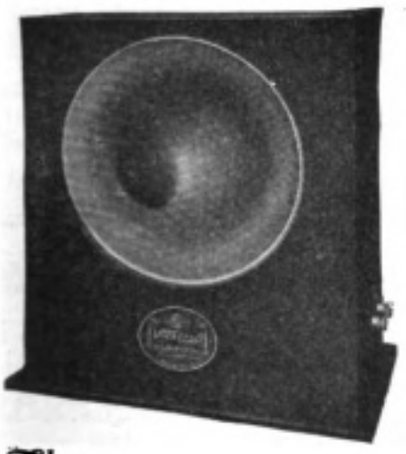
Ans. 2. Trees in the immediate vicinity of an aerial have quite a noticeable effect upon its efficiency both for reception and transmission and an aerial should be kept at as great a distance from such obstruction as possible.

Q. 3. Will you please tell me if radio frequency amplifying transformers can be bought and if so, where?

Ans. 3. Coils for use as radio frequency transformers can be purchased from the Coto Coil Co., Providence, R. I.

Q. 4. Will you also tell me, if possible, whether or not there are any radio clubs in or near Perth Amboy, New Jersey?

Ans. 4. Suggest that you communicate with J. J. Hallahan, 180 Market street, Perth Amboy, N. J.



The

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SEE ANNOUNCEMENT ON PAGE 20

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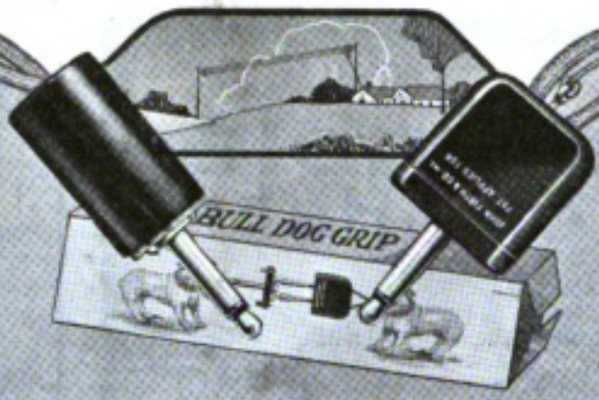
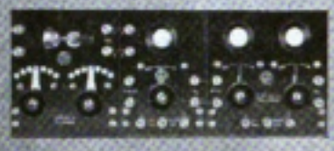


FIRCO SACO-CLAD
amplifying transformer

FIRCO RADIO EQUIPMENT

FIRCO VOCALOUD
Station Type



THERE might be a full page ad devoted to every instrument on this page. But the actual apparatus is far more convincing than anything we could say. So we simply refer you to your dealer. He has our elaborate loose-leaf catalogue, and will gladly obtain any instrument you ask for. In fairness to yourself, insist on examining Firco instruments before you buy.

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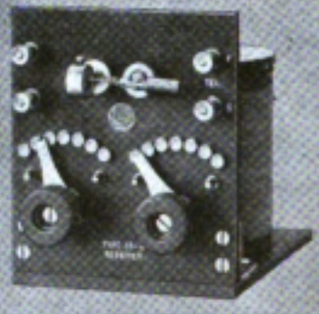

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