

W3CJN J. N. ALLENDER  
901 Overbrook Road  
Baltimore 12, Md.

# Chi-Rad Handbook-Catalog

## Contents

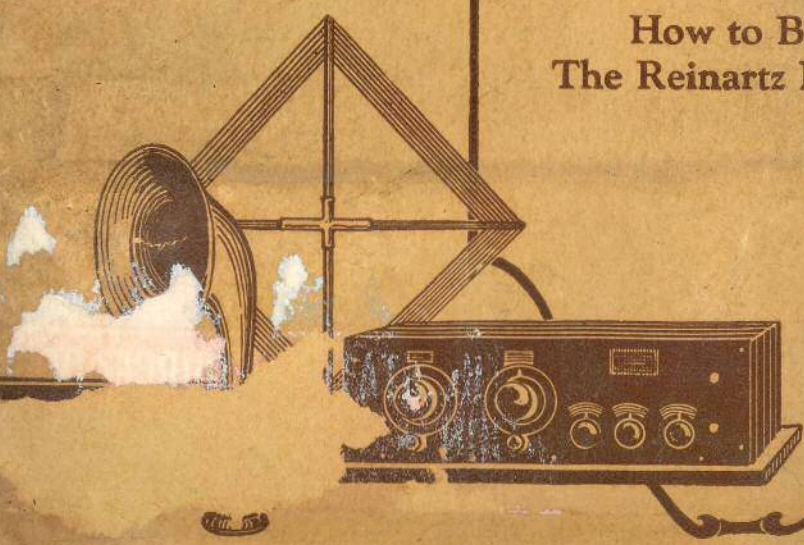
Complete Receiving Sets

Accessories  
for Receiving Sets

Parts for Receiving Sets

Parts for Transmitting  
Sets

How to Build  
The Reinartz Receiver



Chicago Radio Apparatus Co.  
415 South Dearborn Street, Chicago.



*"If it's in Radio, 'Chi-Rad' has it!"*

# "Chi-Rad" Handbook — Catalog

including apparatus from  
the following manufacturers

Acme Apparatus Co.  
Adams-Morgan Co.  
American Radio & Research Corp.  
C. Brandes, Inc.  
Burgess Battery Co.  
Carter Radio Co.  
Chelsea Radio Co.  
Chicago Radio Apparatus Co.  
Electrical Research Laboratories  
Federal Tel. & Tel. Co.  
General Radio Co.  
Giffilan Bros.  
Colin B. Kennedy  
Le Fax, Inc.  
Mu-Rad Laboratories, Inc.  
Wm. J. Murdock Co.  
Pacent Electric Co.  
Rauland Mfg. Co.  
Remler Radio Mfg. Co.  
Thordarson Elec. Mfg. Co.  
Western Electric Co.  
Wireless Press, Inc.

**Chicago Radio Apparatus Co., Inc.**

415 S. Dearborn St., Retail  
407 S. Dearborn St., Wholesale

**Chicago**

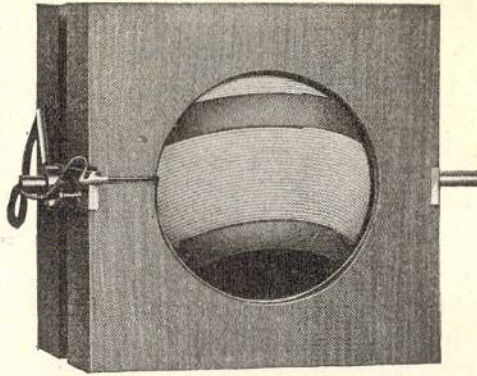


**List of Abbreviations to be used in radio communication.**

Abbreviation	QUESTION
PRB	Do you wish to communicate by means of the International Signal Code?
QRA	What ship, or coast station is that?
ORB	What is your distance?
ORC	What is your true bearing?
ORD	Where are you bound for?
ORF	Where are you bound from?
ORG	What line do you belong to?
QRH	What is your wave length in meters?
QRJ	How many words have you to send?
QRK	How do you receive me?
QRL	Are you receiving badly? Shall I send 20? for adjustment?
QRM	Are you being interfered with?
QRN	Are the atmospherics strong?
QRO	Shall I increase power?
QRP	Shall I decrease power?
QRO	Shall I send faster?
QRS	Shall I send slower?
QRT	Shall I stop sending?
QRU	Have you anything for me?
QRV	Are you ready?
QRW	Are you busy?
QRX	Shall I stand by?
QRY	When will be my turn?
QRZ	Are my signals weak?
QSA	Are my signals strong?
QSB	{ Is my tone bad? { Is my spark bad?
QSC	Is my spacing bad?
QSD	What is your time?
QSF	Is transmission to be in alternate order or in series?
QST	What rate shall I collect for?
QSK	Is the last radiogram cancelled?
QSL	Did you get my receipt?
QSM	What is your true course?
QSN	Are you in communication with land?
QSO	Are you in communication with any ship or station (or; with .....)?
QSP	Shall I inform..... that you are calling him?
QSQ	Is.....calling me?
QSR	Will you forward the radiogram?
QST	Have you received the general call?
QSU	Please call me when you have finished (or; at.....o'clock).
QSV	Is public correspondence being handled?
QSW	Shall I increase my spark frequency?
QSX	Shall I decrease my spark frequency?
QSY	Shall I send on a wave length of.....meters?
QTE	What is my true bearing?
QTF	What is my position?

**"Chi-Rad"**

**Variometer**



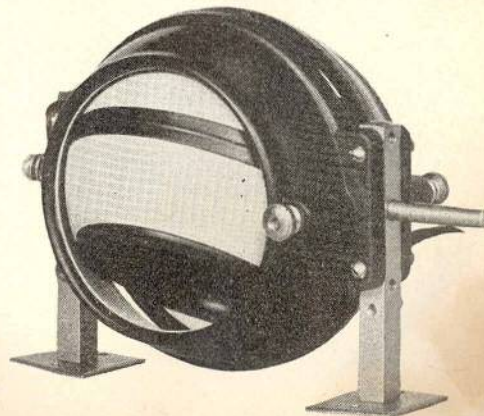
"Chi-Rad" Variometer No. A3

In the manufacture and assembling of the "Chi-Rad" Variometer, great care has been taken to secure permanent and proper relationship between Rotor and Stators.

Both Rotors and Stators are accurately turned from solid blocks of selected and well seasoned poplar which has been thoroughly impregnated in order to prevent the windings being affected by moisture or varying climatic conditions.

Flexible connectors are used instead of friction contacts, which a large experience teaches us is a wise discrimination.

"Chi-Rad" No. A-3, Mounted... \$4.00  
 "Chi-Rad" No. A-4, Unmounted... 3.00  
 Shipping weight, 2 lbs each.  
 Remler, Type 500..... 7.50  
 R P M, Molded Bakelite..... 6.50  
 Shipping weight 2 1/2 lbs. each



R.P.M. Variometer (Molded Bakelite)

**"Chi-Rad"**

**Binding Posts**



S-1

"Chi-Rad" No. S-1 — Nickel-plated brass, wt. per C—7 lbs. Each ...\$0.12



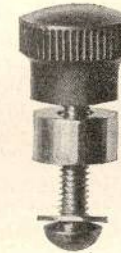
S-2

"Chi-Rad" No. S-2 — Nickel-plated brass, wt. per C—5 lbs. Each ...\$0.10



S-3

"Chi-Rad" No. S-3 — Nickel-plated brass, wt. per C—5 lbs. Each ...\$0.12



S-4

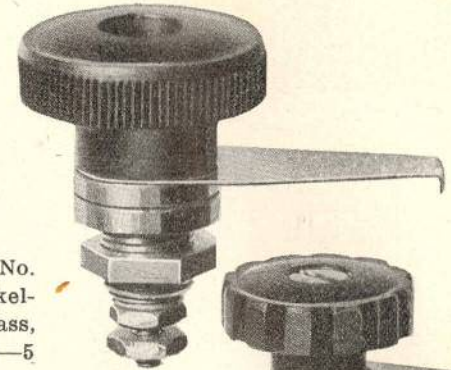
"Chi-Rad" No. S-4 — Rubber Tips, balance brass, wt. per C—5 lbs. Each ...\$0.12



S-5

"Chi-Rad" No. S-5 — Rubber Tips, balance brass, wt. per C—4 lbs. Each ...\$0.10

**Switch Levers**



S-10

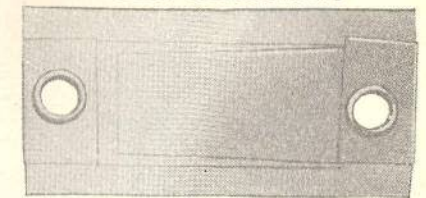


S-11

Bearing Style, with 1 1/2" radius, knurled bakelite knobs, all brass parts nickel-plated. Cut is actual size.

Shipping weight, 4 oz.  
 No. S-10.....\$0.50  
 Plain style with 1" radius. Corrugated Bakelite Knob is 1" in diameter. Brass parts are nickel-plated. Cut is actual size. Shipping weight, 3 oz.  
 No. S-11.....\$0.25

**Grid Condensers**



S-15

The conductors of No. S-15 are of copper foil and insulated with mica sheet. The capacity is .00025.  
 No. S-15. Grid Condenser...\$0.25  
 Remler Grid Condenser..... .20  
 Remler Grid Leak..... .40  
 Howard Grid Condenser..... .60  
 Shipping weight, each 1 oz.

**Switch Stops, Contact Points**



S-17

S-17 Price per dozen.\$0.36  
 Price per hundred .. 2.75  
 Shpg. wt., per doz. .. 4 oz.



S-18

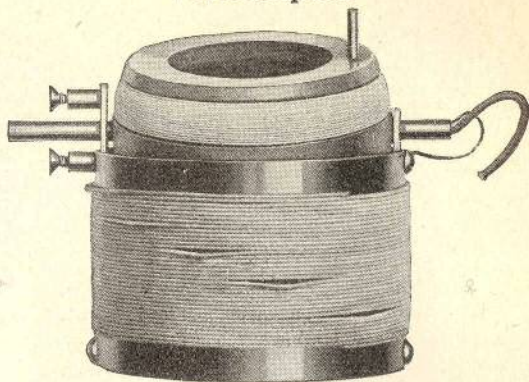
S-18 Price each .....\$0.04  
 Shpg. wt., per doz. .. 5 oz.



Abbreviation	ANSWER OR NOTICE
PRB	I wish to communicate by means of the International Signal Code.
ORA	This is.....
ORB	My true bearing is.....degrees.
ORC	My distance is.....
ORD	I am bound for.....
ORF	I am bound from.....
ORG	I belong to the.....Line.
ORH	My wave length is.....meters.
ORJ	I have.....words to send.
ORK	I am receiving well.
ORL	I am receiving badly. Please send 20..... for adjustment.
ORM	I am being interfered with.
ORN	Atmospherics are very strong.
ORO	Increase power.
ORP	Decrease power.
ORO	Send faster.
ORS	Send slower.
ORT	Stop sending.
ORU	I have nothing for you.
ORV	I am ready. All right now.
QRW	I am busy (or: I am busy with.....). Please do not interfere.
QRX	Stand by. I will call you when required.
QRY	Your turn will be No.....
QRZ	Your signals are weak.
QSA	Your signals are strong.
QSB	{ The tone is bad. { The spark is bad.
QSC	Your spacing is bad.
QSD	My time is.....
QSF	Transmission will be in alternate order.
QSG	Transmission will be in series of 5 messages.
QSH	Transmission will be in series of 10 messages.
QSI	Collect.....
QSK	The last radiogram is canceled.
QSL	Please acknowledge.
QSM	My true course is.....degrees.
QSN	I am not in communication with land.
QSO	I am in communication with.....(through.....).
QSP	Inform.....that I am calling him.
QSQ	You are being called by.....
QSR	I will forward the radiogram.
QST	General call to all stations.
QSU	Will call when I have finished.
QSV	Public correspondence is being handled. Please do not interfere.
QSW	Increase your spark frequency.
QSX	Decrease your spark frequency.
QSY	Let us change to the wave length of.....meters.
QSZ	Send each word twice. I have difficulty in receiving you.
QTA	Repeat the last radiogram.
QTE	Your true bearing is.....degrees from.....
QTF	Your position is.....latitude.....longitude.

# "Chi-Rad"

## Variocouplers



"Chi-Rad" Variocoupler No. A-1

The "Chi-Rad" Variocoupler is designed to tune to wave lengths between 150 and 600 meters.

The wave length may be increased to 700 meters by using a condenser of .00025 mfd. capacity across the secondary.

The primary is wound on a Formica tube and is looped for the reception of six taps.

The Secondary or Rotor is turned from a well-seasoned block of Poplar to a diameter of 3 3/4 inches. The Variocoupler is 4 1/2 x 5 1/2 inches over all.

"Chi-Rad" No. A-1, Mounted... \$3.00

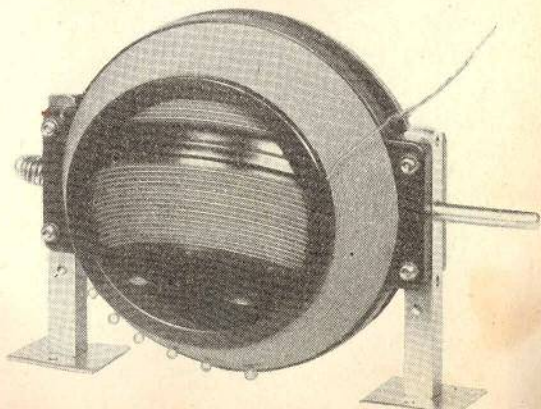
"Chi-Rad" No. A-2, Unmounted... 2.00

Shipping weight, 1 1/2 lbs. each.

Remler No. 503, shpg. wt. 2 lbs... \$5.40

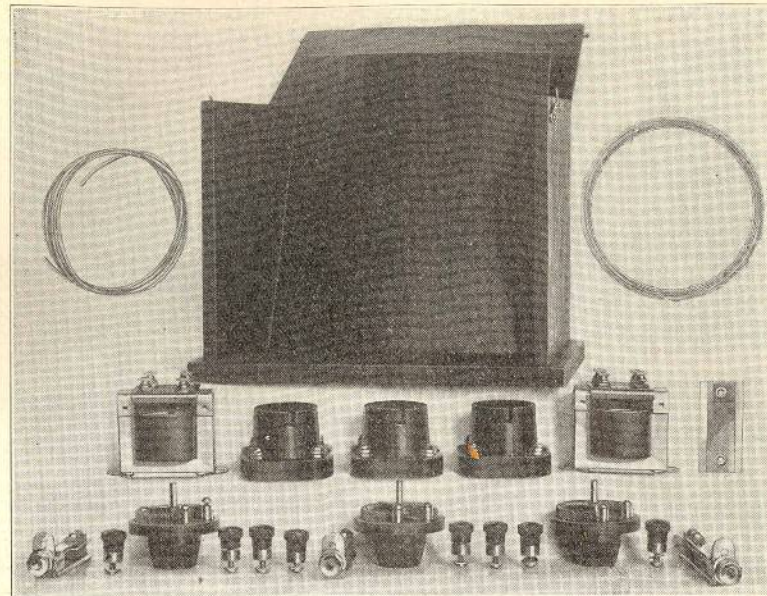
R. P. M., Molded Bakelite..... 6.50

Shipping weight, 2 lbs.



R. P. M. Variocoupler (Molded Bakelite)

# "Chi-Rad"



## Knockdown Layout

Build your own radio detector and amplifier with these carefully selected parts. Illustrated above is a knockdown layout for 2 stage detector and amplifier. The cost of this combination of parts is far less than the total cost of each part when purchased individually..... \$20.00

	Per Doz.
6/32 Brass Hexagon Cap Nuts, N. P. ....	\$0.30
8/32 Brass Hexagon Cap Nuts, N. P. ....	.30
Aver. shipping weight, per doz., 2 oz.	

## Antenna Wire

No. 14 Bare Copper Wire, 80 ft. to the lb., price per 100 ft. . .	\$.40
7 Strands No. 22 Copper Wire, 80 ft. to the lb., price per ft. . .	.01
7 Strands No. 22 Tinned Copper, 80 ft. per lb., price per ft. . .	.012
Lead-in Wire, No. 14 W. P., wt. 5 lbs. per C ft., price per ft. . .	.015
Ground Wire, No. 6 R. C., wt. 15 lbs. per C ft., price per ft. . .	.05

## Brass Hexagon Nuts

	Per Doz.
6/32 Brass Hexagon Nuts . . . . .	\$0.10
8/32 Brass Hexagon Nuts . . . . .	.15

## Miscellaneous Wires and Cords

Annunciator or Bell Wire, Gauge No. 18, per lb. . . . .	\$.65
Annunciator or Bell Wire, Gauge No. 18, per 1/2 lb. . . . .	.35
Tinned Copper Connector Wire, Gauge No. 16, per C ft. . . . .	1.00
Tinned Copper Connector Wire, Gauge No. 14, per C ft. . . . .	1.00
Pig Tail Wire, 24 strands, No. 36, 585 ft. per lb., per ft. . . . .	.01
Pig Tail Wire, 24 str'ds, rubber cov'd, No. 36, 585 ft. lb., ft. . . . .	.015
Single Conductor Battery Cord, Green, 3 lbs. per C ft., per ft. . . . .	.02
Double Conductor Battery Cord, Green, 5 lbs. per C ft., per ft. . . . .	.03

## "Chi-Rad"

### Magnet Wire Prices

Size	Sgl. Cotton Covered		
	¼ lb.	½ lb.	1 lb.
16	\$0.26	\$0.44	\$0.72
18	.26	.46	.78
20	.28	.48	.86
22	.30	.52	.96
24	.32	.58	1.08
26	.36	.66	1.24
28	.42	.76	1.40
30	.50	.92	1.74
32	.60	1.12	2.44
34	.74	1.42	2.74
36	.96	1.86	3.60

Size	Dbl. Cotton Covered		
	¼ lb.	½ lb.	1 lb.
16	\$0.26	\$0.46	\$0.76
18	.28	.50	.88
20	.30	.54	.98
22	.38	.68	1.26
24	.42	.76	1.44
26	.48	.90	1.70
28	.56	1.04	1.98
30	.70	1.30	2.52
32	.88	1.70	3.28
34	1.08	2.10	4.08
36	1.44	2.82	5.52

We also carry a full line of the above sizes in Enameled Wire. Enameled Wire prices are the same as those for Single Cotton Covered.

In estimating weights for parcel post shipments, use One Pound for ¼ and ½ pound lots, and Two Pounds for 1 lb. lots. If you desire prompt service be sure to comply with these instructions.

### Brass Rods

	Price Per Ft.
1/16" Round, wt. 80 ft. per lb.	\$0.05
5/32" Round, wt. 12 ft. per lb.	.08
3/16" Round, wt. 8 ft. per lb.	.10
¼" Round, wt. 5 ft. per lb.	.15
3/16" Square, wt. 8 ft. per lb.	.10
¼" Square, wt. 5 ft. per lb.	.15
6/32 Threaded Brass Rod, 18 ft.	.25
8/32 Threaded Brass Rod, 12 ft.	.30
10/32 Thr'd Brass Rod, 10 ft.	.30

We carry in stock in lengths of 6, 7, 8, 9, 10, 11 and 12" only.

### Formica Panels

Size in Inches	Weight	Price of ¼" Panel	Weight	Price of ⅝" Panel
6x7	.267	\$0.63	.340	\$0.84
6x14	.533	1.26	.780	1.68
6x18	.685	1.62	1.027	2.16
6x21	.800	1.89	1.200	2.52
7x9	.400	.95	.600	1.26
7x12	.533	1.26	.780	1.65
7x14	.622	1.47	.933	1.96
7x18	.800	1.89	1.200	2.52
7x21	.933	2.20	1.400	2.94
9x14	.800	1.89	1.200	2.52
9x21	1.200	2.84	1.800	3.78
12x21	1.600	3.78	2.400	5.04
14x18	1.600	3.78	2.400	5.04

Approximate size of full size sheet, 36"x42".

½"x36"x42"—9.6 pounds.

⅝"x36"x42"—14.4 pounds.

### Nickel Plated Brass Screws

In 6/32 and 8/32 threads. Your choice as to round or flat heads. In ordering please specify length, style of head and thread.

Per doz.

Lengths ¼", ½" and ¾".....\$0.20

Lengths 1", 1¼" and 1½"..... .25

Shipping weight, per dozen, 4 oz.

### Crystal Detectors

	Each
Fada .....	\$2.00
"Chi-Rad" Style S-24, wt. 4 oz. ....	.90
Murdock, wt. 4 oz. ....	1.00
Paragon, wt. 4 oz. ....	1.25
M't'd Crystals, Tested Galena ..	.30
M't'd Crystals, Tested Silicon ..	.30
Unm't'd Crystals, Tested Galena ..	.25
Unm't'd Crystals, Tested Silicon ..	.25

Weight of crystals, 1 oz. each.

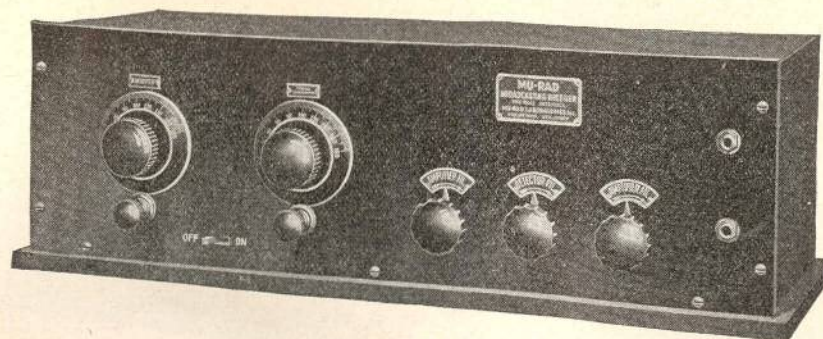
### Ground Switches and Lighting Protectors

	Shpg. Wt.
Ground Switch, 100 Amps., 600 Volts. ....	\$3.60 4 lbs.
Brach Vacuum Gaps, Indoor, No. 200... ..	2.50 1 lb.
Brach Vacuum Gaps, Outdoor, No. 223... ..	3.00 1½ lbs.

### Insulators

	Shpg. Wt.
4" Ins., Electrose.....	\$0.45 12 oz.
10" Ins., Electrose.....	.90 1 lb.
Glass Ins., including Bracket .....	.30 1½ lbs.
Porcelain Ins., 2½" ..	.15 8 oz.
Lead-in Ins., Black Composition .....	1.20 10 oz.

## Mu-Rad Receivers



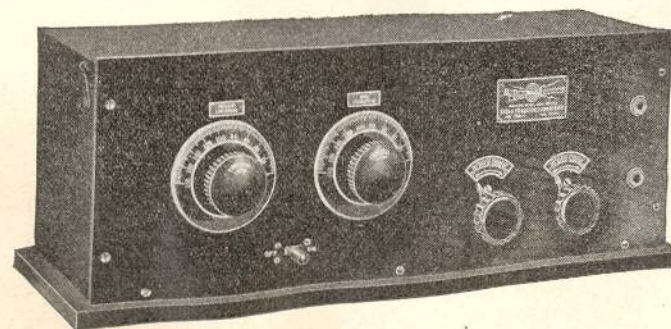
Mu-Rad MA-13

The sensitiveness of these receivers is not twice or ten times as great as that of the very best sets heretofore available; it is hundreds of times greater. This result is obtained by patent circuits and transformers employed in the three stage radio frequency amplifier portions of the sets. Both receivers have a conservative range at all seasons of the year of 300 miles from broad-casting stations, such as that of the General Electric Company at Schenectady, New York, using a small 4-inch diameter coil as "pick-up" without any aerial whatever. They may be used with a larger loop if greater range is desired or with an antenna for extreme distances of the order of 1500 miles or greater. With a 1 ft. square loop, the Type MA-13 will bring in music and reports from broadcasting radiophone stations of the usual type several hundred miles distant with sufficient intensity to

operate a loud speaker so that the signals are intelligible throughout a large room or hall.

In construction, these receivers follow the highest engineering standards. Special metal adjustment dials are used which are grounded to prevent external capacity effects. One dial is provided for tuning, while a second dial controls a patent circuit unit useful for stabilizing the receiver and controlling the strength of the received signals. Rigid wiring results from the use of tinned copper bus wire. The cabinets are of solid mahogany, varnished, and given a piano finish. The panels are of polished black Radion. All metal parts within the cabinets have a white satin-nickel finish.

The operation is extremely simple. All tuning is accomplished by a single variable air condenser. Stability of the circuits and signal inten-



Mu-Rad MA-12

## Kennedy Receivers

a range of wave lengths somewhat more comprehensive than provided by the ordinary short-wave instrument. It operates with high efficiency over a tuning range of 200 to 3,200 meters.

Maximum effectiveness with a high degree of selectivity on all wave lengths within its range is assured by the design of this receiver, which makes use of the accepted principles of the best radio engineering practice, including the exclusive use of inductively coupled circuits; the avoidance of the possibility of high resistance contact in electrical circuits; the elimination of resonance in unused inductance sections and the minimizing of energy losses by proper electrical and mechanical arrangement.

### Specifications for Type 220

**Cabinet:** Selected walnut, highly polished. Hinged cover; interior easily accessible.

**Panel:** Polished Formica, machine engraved.

**Indicating Dials:** Beveled brass dials, satin silvered and heavily lacquered, are recessed into the panel. Kennedy type, fluted Bakelite knobs.

**Circuit:** Fundamental Armstrong regenerative, combining tuned and tickled plate circuit. Antenna circuit is inductively coupled to the secondary circuit. Coupling may be progressively varied over 180 degrees range. Wide latitude in antenna design is permitted by means of a continuously variable antenna condenser which may be placed in shunt or series by a multiple switch.

Self-contained vacuum tube control.

Tube mounted inside the cabinet and easily observed through screened window.

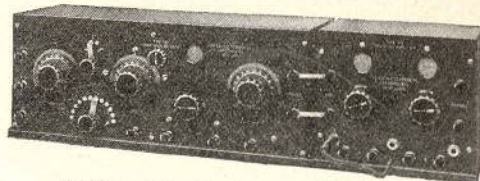
Condensers: See Type 110.

Inductances: See Type 110.

Type 220 Intermediate Regenerative Receiver. . . . . \$150.00

Type 525 Amplifier. . . . . 85.00

### Type 281 Short-Wave Receiver With Type 521 Amplifier



Radio enthusiasts—particularly amateurs and relay men—undoubtedly will be greatly interested in the Type 281 receiver, with an effective tuning range of 175 to 900 meters, especially if they are anxious to obtain highly efficient reception on the wave lengths licensed for regular and special amateur work. This set also is in great favor among those in the novice class because its tuning range covers all wave lengths used in present-day broadcasting, although less comprehensive than that of Types 110 and 220.

With the vacuum tube control unit incorporated, this set provides a complete self-contained receiver in one cabinet, designed along mechanical and electrical lines identical with those employed in other Kennedy receivers of more extensive tuning range.

While made to sell at a lower price, Type 281 embodies the same high standard of manufacture so pronounced in all Kennedy equipment. Specifications for Type 281 are very similar to those of Types 110 and 220, except that dials and knobs are somewhat different in design, and the cabinet is of highly polished solid mahogany with hand-rubbed finish.

Type 281 Short Wave Regenerative Receiver . . . . . \$90.00

Type 521 Amplifier. . . . . 55.00

### Paragon Dials

4" (black molded composition) \$1.75  
 3" (black molded composition) 1.00  
 2" (black molded composition) .90

### Paragon Rheostats

Paragon rheostat . . . . . \$1.50

## Amrad



### Short Wave Radio Frequency Receiver

The demand for more consistent and dependable performance in long distance broadcast reception is responsible for this new Radio Frequency Receiver—Amrad's premier development of the 1922-23 season.

Radio Frequency—that distance-piercing form of pre-amplification—has heretofore been fickle and erratic in operation, particularly on the shorter wavelengths used by most broadcasting stations. Patient research, carried on deliberately over a period of months, has produced a Radio Frequency Receiver which functions uniformly and efficiently at all times in the hands of skilled or unskilled operators.

For everyday home-use Amrad Radio Frequency Receiver 3380 combines all features and characteristics demanded by a household of varying and exacting tastes. Music lovers delight in its purity of reproduction. Critical radio enthusiasts find keen satisfaction in manipulating the conveniently grouped controls which cover continuously the shortest wavelengths (3400 meters) employed by present or contemplated broadcasting stations. Individuals with an eye for the artistic are ever satisfied with the trim lines, faultless finish, selected mahogany cabinets and dull finished nickel trimmings.

Nothing in performance, appearance, or utility has been sacrificed to meet a popular price.

No. 3380 R. F. Receiver . . . \$125.00

### Transformers

Amrad . . . . . \$6.00

### Variocouplers

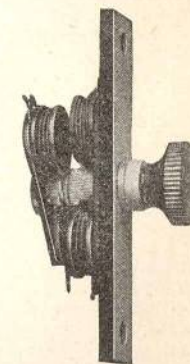
No. 2614, (Shpg. wt. 2 lbs.) . . . \$7.50

No. 2613, (Shpg. wt. 2 1/2 lbs.) . 8.50

### Amrad Vernier Variometer

A miniature variometer providing a range of inductance approximately equal to the difference between two scale divisions on a standard dial controlling an average variometer. Unlike a vernier condenser this device will not introduce capacity, which reduces impressed potentials, in the grid circuit.

Mounting to any panel 1/8, 3/8, or 1/2 inch thick is easily accomplished. Three holes only need be drilled and to install it is not necessary to disassemble the device which occupies an internal space 3" long by 1 5/8" wide and 1 3/8" deep. Flexible leads, not illustrated, provide connections. Knurled control knob is 3/4" diameter.



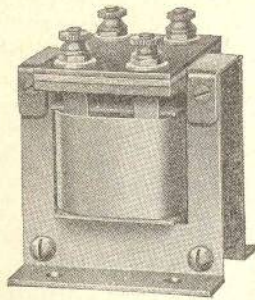
No. 2610. Vernier Variometer \$2.50

No. 2607. Variometer . . . . . 6.50

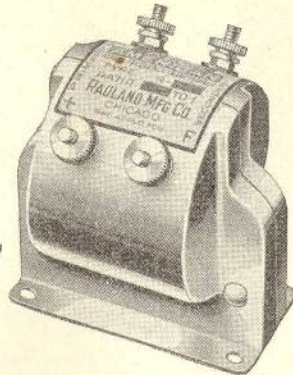
Shipping weight, 2 1/2 lbs.

## Rauland-Thordarson

### Audio Frequency Transformers



Thordarson



### Radio Frequency Transformers



All American

All American Amplifying Transformers are completely shielded in a highly polished, nickel plated brass case which makes it possible to mount the transformers extremely close to one another without inductive disturbance or distortion. They are designed to work efficiently on wave lengths of 150 to 550 meters. The coils are wound on automatic winding machines with No. 40 B. & S. gauge enameled magnet wire. Each layer in the windings is insulated with a wrap of treated paper that eliminates any possibility of short circuited turns. Coils are impregnated by the vacuum process, which drives out all moisture.

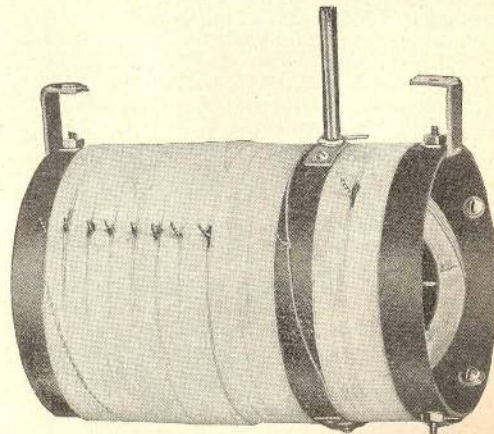
Besides the regular 3 1/2-1 Thordarson, a new 6-1 transformer has been manufactured. The usual high Thordarson standard has been maintained throughout.

- Acme A-2 .....\$7.00
- Acme A-2S ..... 5.00
- All American—10 to 1, M'd.. 4.50
- All American—10 to 1, Unm'd 3.50
- All American—10 to 1, Sh'd'd 4.75
- All American— 3 to 1, M'd.. 4.25
- All American— 3 to 1, Unm'd 3.35
- All American— 3 to 1, Sh'd'd 4.50
- All American— 5 to 1 ..... 4.50
- All American— 5 to 1, Sh'd'd 4.75
- R. C. A.—U. V. 712..... 7.00
- Thordarson, 3 1/2-1 ..... 4.50
- Thordarson 6-1 ..... 5.00
- Shipping wt., any transformer, 2 lbs.

These transformers successfully overcome the high capacitance effects of domestic vacuum tubes. The capacitance, too, of these transformers themselves has been reduced to a degree heretofore unattained. As a result a very high step-up ratio is secured, cutting down the number of stages necessary for over-all amplification.

- Acme R-2 and R-3.....\$5.00
- All American ..... 4.50
- Radio Corp. U. V. 1714..... 6.50

### All-Wave Coupler



An excellently constructed All-Wave Coupler. It is bank wound on a Bakelite Core and tunes from 150 to 3,000 meters. Pigtail connections. All Wave Coupler.....\$9.00

## Carter Accessories

### Tu-Way Plug



The Carter Tu-Way Plug takes two or more head sets at same time—takes all types of tip terminals—fits all jacks.

Extra heavy connecting terminals make contact full length of the cord-tip, insuring positive connection and holding tips in proper alignment.

Insulating washer so designed that terminals cannot twist together; hence no short circuits.

Insulation between tip and sleeve is undercut. This prevents collection, on the insulation, of particles of brass which reduce the phone circuit efficiency by causing partial short circuit.

No small screws used anywhere. No springs to weaken or rust out. All metal parts are brass. Handle made of special non-breakable insulating material. No metal parts exposed to contact with

the hand; therefore body capacity cannot affect the Tu-Way Plug.

Tu-Way Plug.....\$1.50

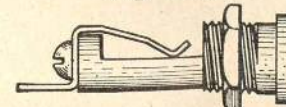
### Imp Plug



"Imp" Plug takes tinsel phone cord or wire without soldering. When used with "Imp" jack, provides a quick means of connecting antenna, ground, and battery wires. Cut full size.

"Imp" Plug.....\$0.15

### Imp Jack

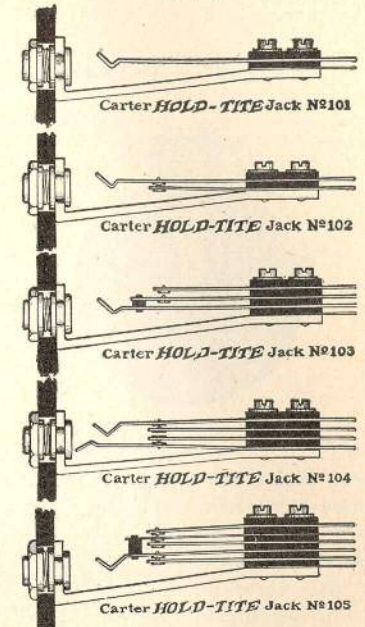


"Imp" Jack replaces binding post for

phone cord; provides easy method of connecting any circuit using standard phone cord-tips or "Imp" plugs. Nickel plated. Phosphor-bronze spring. Mounts in 3/8" hole. Cut full size.

"Imp" Jack.....\$0.35

### Jacks



Self-adjusting lock nut eliminates spacer washers in mounting these jacks on panels of varying thickness. A jack thimble provides at all times a fixed distance between shoulder of plug and contact tip of jack spring. Perfect connection of plug in the jack always thus assured.

Insulation is Westinghouse "Micarta" tested to withstand 1000 volt break-down test. No leakage.

Frame, nickel plated and polished on all sides, is tapered and so shaped that usual troublesome high insulation stack-up between frame and springs is totally eliminated. Springs are long, tapered, phosphor-bronze. Contact-points are pure silver. Wide-spaced tinned terminals facilitate soldering.

- No. 101 Carter Jack.....\$0.70
- No. 102 Carter Jack..... .80
- No. 103 Carter Jack..... .90
- No. 104 Carter Jack..... 1.00
- No. 105 Carter Jack..... 1.10



### Books on the Subject of Radio Telegraphy

**Radio Telephony**, by Alfred N. Goldsmith, Ph. D.

This complete text book on Radio Telephony is used by Radio Engineers, Radio Electricians in the Navy and Signal Corps and by men in the Aviation Service who handle Radio Equipment. It is fully illustrated with wiring diagrams, etc. The book treats the subject very exhaustively. 247 pages, shipping weight 2 pounds. Postage is extra. Price \$2.50

**Practical Amateur Wireless Stations**, by J. Andrew White.

This little book does not pose as a text book in any sense of the word, but does represent the practical collective experience of leading Radio experimenters. This is the book you want if you wish to secure a firm grasp upon this fascinating subject without going into it in a technical or exhaustive manner. Shipping weight 1 pound. Postage is extra. Price \$0.75

**Practical Wireless Telegraphy**, by Elmer E. Bucher.

A text book which treats each subject separately and in a thorough manner. It is a progressive study of Radio from first principles to expert practice. The 240 illustrations form a complete diagrammatic impression upon the reader's mind. Handsomely bound in full cloth. Shipping weight 2 pounds, Postage extra. Price \$2.25

Price \$2.25

## Dubilier

### Micadons Type 600



With grid leak mounting—grid leak not included.

- Capacity, .0001 mfd. ....\$0.75
- Capacity, .00025 mfd. .... .75
- Capacity, .0005 mfd. .... .75
- Grid leak mounting separately.. .35

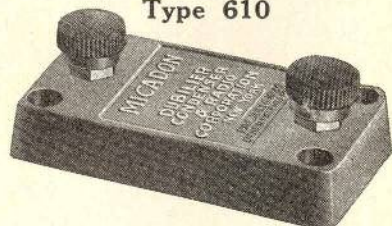
### Without Grid Leak Mounting



A highly efficient Mica Condenser sealed in a moulded composition case. Capacity will not change under service conditions. Every condenser accurately measured and marked.

- Capacity, .001 mfd. ....\$0.75
- Capacity, .002 mfd. .... .75
- Capacity, .0025 mfd. .... .75
- Capacity, .003 mfd. .... 1.00
- Capacity, .004 mfd. .... 1.00
- Capacity, .005 mfd. .... 1.00

### Type 610



These Micadons have the same general characteristics as type 600, but are a trifle larger and are especially recommended for capacities .003 mfd. and upwards.

- Capacity, .001 mfd. ....\$0.75
- Capacity, .002 mfd. .... .75
- Capacity, .0025 mfd. .... .75
- Capacity, .003 mfd. .... 1.00
- Capacity, .004 mfd. .... 1.00
- Capacity, .005 mfd. .... 1.00
- Capacity, .01 mfd. .... 1.25
- Capacity, .02 mfd. .... 1.50

## Frost Accessories

### Phones



In Frost Fones the Permanent Magnets are built on the laminated principle, and are produced from Tungsten Magnet Steel. This insures absolute permanency and prevents the diminishing of magnetic strength with consequent weakening of receptivity.

The Coils are wound with No. 40 enameled magnet wire. This enables us to secure the maximum number of turns in a minimum space. The cores are made of soft Norway iron, which are reannealed after the blanking and forming process in order to insure its non-magnetic qualities. These cores are then ground to insure uniformity and to obtain the proper and permanent distance between the pole pieces and diaphragm. The Standard Five Foot Black Mercerized Receiver Cord is used.

- No. 162, 2000 Ohms, Double, Complete .....\$5.00
- No. 163, 3000 Ohms, Double, Complete ..... 6.00
- No. 164, 1000 Ohms, Single, Complete ..... 2.75
- No. 165, 1000 Ohms, Single, With Cord ..... 2.50
- No. 166, 1000 Ohms, Single, Less Cord ..... 2.00

- No. 167, 1500 Ohms, Single, Complete .....\$3.25
- No. 168, 1500 Ohms, Single, With Cord ..... 3.00
- No. 169, 1500 Ohms, Single, Less Cord ..... 2.50
- Federal Phones, 2000 Ohms.. 8.00

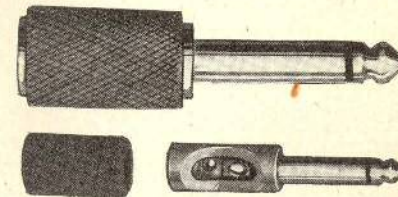
### Plugs

Frost Plugs are standard telephone plugs that have been specially adapted for radio use. The plug tip is threaded and then riveted to the needle, which is made out of steel so as to prevent wear. The tip is formed so as to "grip" the jack springs and thus insure a perfect electrical connection. The plug is handsomely finished with non-breakable polished hard rubber sleeve.

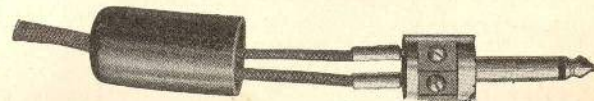
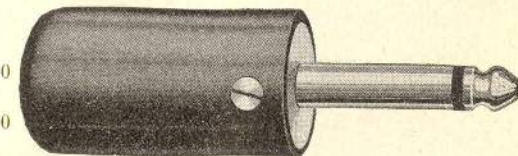
- No. 131, Double Circuit Jack...\$0.90
- No. 133, Open Circuit Jack... .65
- No. 134, Closed Circuit Jack... .75
- No. 135, Filament Control Jack 1.00
- No. 136, Filament Control Jack 1.25
- No. 132, Standard Plug, panel design ..... 1.00
- No. 137, Cord-Tip Plug ..... 1.25
- No. 138, Multi-Phone Plug ..... 2.50
- Federal Universal ..... 1.75

### Jacks

- No. 131, Premier .....\$0.90
- No. 133, Premier ..... .65
- No. 135, Premier ..... 1.00
- No. 136, Premier ..... 1.25



No. 132

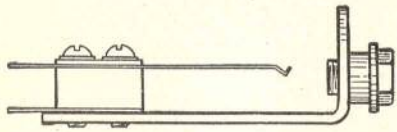


No. 137

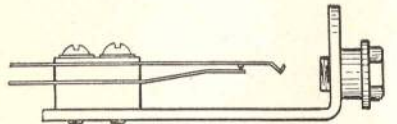


## Frost-Federal

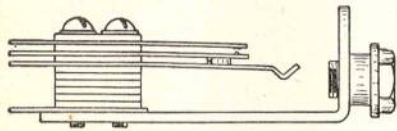
### Jacks



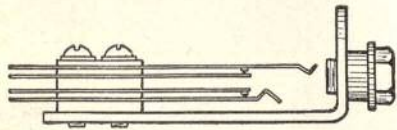
Federal 1421-W .....\$0.70  
 Frost 133 ..... .65  
 Shipping weight 4 oz.



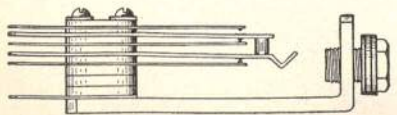
Federal 1422-W .....\$0.85  
 Frost 134 ..... .75  
 Shipping weight 4 oz.



Federal 1435-W .....\$1.00  
 Frost 135 ..... 1.00  
 Shipping weight 6 oz.

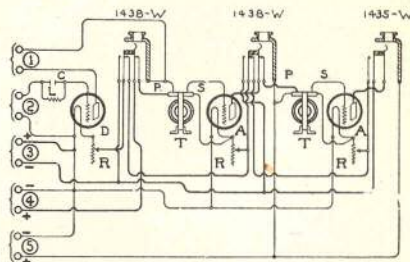


Federal 1423-W .....\$1.00  
 Frost 131 ..... .90  
 Shipping weight 6 oz.



Federal 1438-W .....\$1.20  
 Frost 136 ..... 1.25  
 Shipping weight 8 oz.

### Circuit with Jacks



DETECTOR & 2 STAGE AMPLIFIER USING FILAMENT CONTROL JACKS

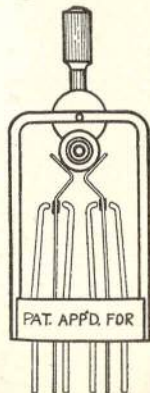
NOTE  
 1 - TO TICKLER COIL C - 3581-W GRID CONDENSER T (226-W TRANSFORMER)  
 2 - TO SECONDARY D - DETECTOR TUBE  
 3 - TO "A" BAT. 6 VOLTS L - 230-W 2 MEG GRID LEAK  
 4 - TO "B" BAT. 16 TO 30 VOLTS A - AMPLIFIER TUBES  
 5 - TO "B" BAT. 40 TO 60 VOLTS R - RHEOSTAT

# 3667

Telephone Jack and Plug equipment is a necessity to the Radio experimenter who desires to construct an amplifier of multiple stage type, as it enables him to connect the phones directly to the detector or any of the succeeding stages of the cascade while at the same time it cuts out the stages in the circuit which are not being used.

The adjacent diagram shows some of the uses to which Radio Jacks may be put.

### Federal Anti-Capacity Switch



Federal 1424-W .....\$3.35  
 Shipping weight 10 oz.

## Electrical Research Laboratories

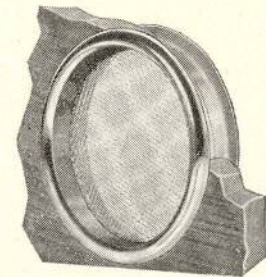
### Plug



Erla Plugs are well made. They give positive connection of all standard jacks. Efficiently insulated against body capacity effects.

Erla Plug .....\$1.00

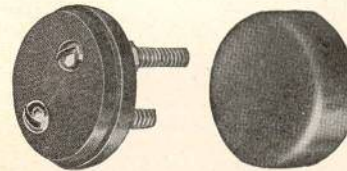
### Bezel



The Erla Bezel is 1 1/2" in diameter from highly nicked brass. It will fit a 1 1/2" hole in any 1/8" to 1/4" panel. These screened bezels greatly add to the neatness and attractive appearance of the panel of any radio cabinet.

Erla Bezel .....\$0.20

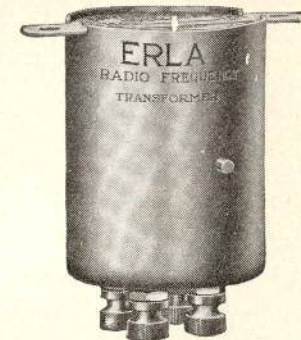
### Variable Grid Leak



The Erla Variable Grid Leak is of the pencil-mark type. The resistance may be varied exactly as needed.

Erla Variable Grid Leak .....\$0.20

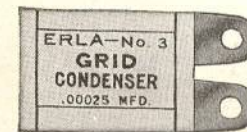
### Radio Frequency Transformer



Erla Radio Frequency Transformers have produced results. They amplify and do not distort. The incoming signals are clear and distinct.

Erla R. F. Transformer .....\$4.00

### Grid Condenser



These Grid Condensers are excellently insulated—the capacities are accurate.

Erla Grid Condenser .....\$0.10

## Willard—Chelsea

### Willard



These Willard Batteries are standard threaded Willards that have been specially adapted for use with the rapidly becoming famous W. D. 11 tubes.

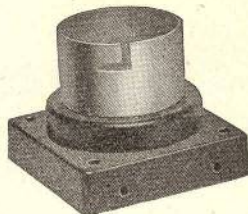
The cells have been strapped together in parallel so as to deliver the 2 volts required by W. D. 11 tubes. One battery will last 70 hours on three W. D. 11 tubes and approximately three times as long on a single tube—an unusual record for efficiency.

The battery can be recharged from an ordinary home charger by use of a series resistance that will deliver current at a rate of about 1½ amperes.

These batteries embody all the standard features of Willard construction—they are guaranteed to give satisfactory service.

- 8 volt, regular, dry state .... \$5.00
- 8 volt, regular, charged ..... 6.00
- 2 volt, W. D. 11 dry state..... 7.00
- 2 volt, W. D. 11 charged..... 7.50

### Vacuum Tube Sockets



Chelsea

These vacuum tube sockets are all excellently constructed and are guaranteed to serve satisfactorily.

- No. 60. Chelsea ..... \$1.00
- No. 75. Signal ..... 1.00
- Crosley, Porcelain..... .50
- U.R. 156. Radio Corporation. 1.00
- Shipping weight, single socket, 8 oz.

### Condensers

#### Table Type Condensers

	Plates	Cap.	
No. 1.	43	.001	\$5.00
No. 2.	21	.0005	4.50

#### Panel Type Condensers

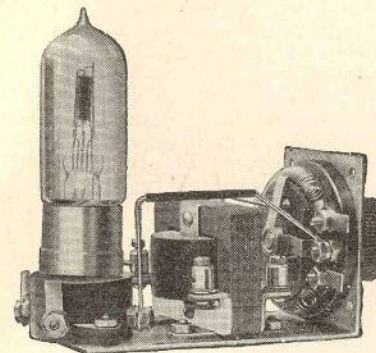
	Plates	Cap.	
No. 3.	43	.001	\$4.75
No. 4.	21	.0005	4.25

Shipping wt. each, 2 lbs.



## General Radio Co.

### Amplifier Unit



The recent tendency in radio has been towards the simplifying of instruments, yet retaining the same distance range. The WD-11 tube is a striking example of this.

This unit is self contained except for power sources and receivers. It is already for connection to your detector set, be it a tube or a crystal unit. No storage battery is required. A single dry cell serves for the filament battery, and a single unit such as the Eveready Type 763 for the plate battery.

This unit is so mounted that it may be used on a table or mounted behind a panel. When mounted behind a panel only the rheostat knob is visible in the front of the panel. The unit has mounting holes provided for either panel or table installation.

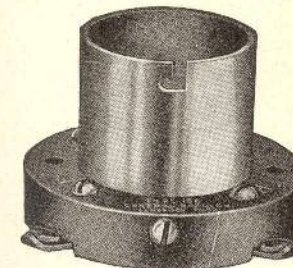
The parts of this unit amplifier are Type 282 Socket built for the WD-11 tubes, Type 255 Rheostat, and Type 231-A Amplifying Transformer, which is particularly well adapted to the WD-11 tubes. All necessary wiring has been provided. The mounting bracket is of heavy brass with a white nickel finish.

For persons building their own sets these units are particularly convenient because of the panel mounting feature. It is only necessary to screw the unit to the panel—no auxiliary brackets are required. Two or more of these units may be used to obtain multi-stage amplification.

If required these units may be supplied with a socket to take the ordinary four-prong vacuum tubes. The price of these special units would be fifty cents more than the standard WD-11 tube unit, weight 1½ lbs.

Type 300-A Amplifier Unit... \$7.50

### Vacuum Tube Socket



A vacuum tube socket must be more than a tube mounting device. It must meet with the rigid requirements of radio. The best features of socket design are incorporated in this Type 156 vacuum tube socket.

The base is of heavy molded bakelite providing adequate insulation. The springs are of bronze, nickel finished. They are so arranged as to make positive contact on the sides of the tube prongs. As a wiping, spring contact is made, a clean, positive connection is assured.

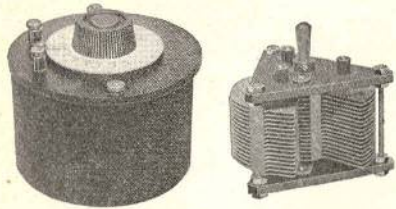
These contact springs are heavy enough to carry, without arcing or heating, the heavy filament current of the 5-watt oscillator tubes.

The tube and terminals of this socket are adapted to any of the standard American four-prong tubes; including those transmitting tubes which have the locating pin placed 45 degrees away from normal. Weight, 4 oz.

Type 156, Socket..... \$1.25

## General Radio Co.

### Variable Air Condenser



Experimental radio receiving sets require condensers whose quality is high and whose price is reasonable. It is easy to manufacture low-priced condensers as is evidenced by the large number now available. It is more difficult, however, to construct a condenser which is electrically and mechanically good, and yet at the same time to keep the cost of construction low.

For many years the subject of dielectric losses and condenser design has been studied in the Research Laboratory of the General Radio Company. This study has been carried on primarily in order to obtain data for the design of special condensers built to the exacting standards of scientific research work. With this information available, and with their experience in the design of laboratory instruments, they have been able to design a condenser of unusual merit for radio work and, at the same time, to keep its cost of construction remarkably low.

The value of a good condenser in a receiving set is not always fully appreciated. The dielectric losses of the condenser are equivalent to adding a series resistance in the oscillating circuit. To add a series resistance in the oscillating circuit means loss of energy which, in turn, means broad tuning and diminished signal strength. It is thus important that the dielectric losses in condensers be kept low. In this condenser these losses are kept low by using only a high-grade hard rubber for the solid dielectric. They are further kept low by using only a small quantity of this dielectric and so placing it with respect to the electrostatic field that the dielectric hysteresis losses are kept a minimum.

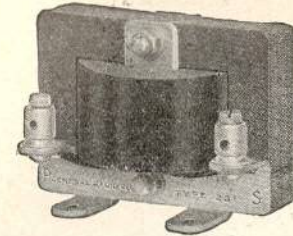
In addition to the regular degree graduations of the etched metal dial, this dial has marked on it a scale showing capacities in micromicrofarads. The zero capacity of this condenser is approximately 20 micromicrofarads. This low value makes a wide range of wavelengths possible. The plates are of heavy sheet brass adequately spaced to prevent short-circuiting. In order that the plate resistance may be kept constant and that the capacity always will remain the same the plates of each unit of the condenser are soldered together. A positive control throughout the entire range of the condenser is provided by attaching a gear and pinion. By a single setting a finer adjustment is now possible than with the older two-adjustment vernier combination.

- 247A, 1000 MMF., Mounted.  
Without gear ..... \$6.00  
Dimensions, 5"x5"x4 1/2".  
Weight, 1 3/4 lbs.
- 247B, 1000 MMF., Unmounted.  
Without gear ..... 3.75  
Dimensions, 4"x4"x4 1/8".  
Weight, 1 lb.
- 247C, 1000 MMF., Mounted.  
With gear ..... 7.75  
Dimensions, 5"x5"x4 1/2".  
Weight, 2 lbs.
- 247D, 1000 MMF., Unmounted.  
With gear ..... 5.50  
Dimensions 4"x4"x4 1/8".  
Weight, 1 1/8 lbs.
- 247E, 500 MMF., Mounted.  
Without gear ..... 5.50  
Dimensions 5"x5"x4 1/2".  
Weight, 1 3/4 lbs.
- 247F, 500 MMF., Unmounted.  
Without gear ..... 3.25  
Dimensions 4"x4"x4 1/8".  
Weight, 1 lb.
- 247G, 500 MMF., Mounted.  
With gear ..... 7.25  
Dimensions 5"x5"x5 1/8".  
Weight, 2 lbs.
- 247H, 500 MMF., Unmounted.  
With gear ..... 5.00  
Dimensions 4"x4"x4 1/8".  
Weight 1 1/8 lbs.

Knob and dial, without capacity graduations, and indicator button for use with unmounted condenser. \$0.50  
Gear, pinion, pinion shaft and mounting supports, per set. .... 1.75

## General Radio Co.

### Transformers



In order to get the maximum of results with audio frequency amplification, the impedance of the grid circuit of the amplifier tube must be adjusted to the impedance of the previous detector or amplifier tube output circuit. This can best be accomplished by means of a suitably designed transformer. Type 231A transformer was built specifically to meet this situation. The primary receives the maximum amount of energy and delivers it undistorted in wave-form and at the correct potential to the grid of the amplifying tube.

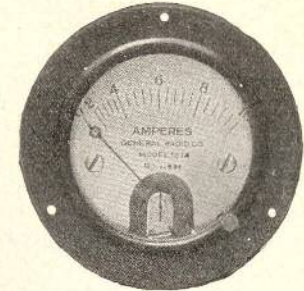
The core construction is such that there is little tendency for the setting up of external fields, with the resultant howling in the audio frequency circuit. The distributed capacity of the secondary is low, so that the maximum potential is obtained on the grid of the tube.

The primary has a direct current resistance of 1,100 ohms, an alternating current resistance at 1,000 cycles of 11,000 ohms, and a reactance at this frequency of 66,000 ohms. These figures for the secondary are 5,500, 130,000 and 700,000 ohms respectively.

Aside from its excellent electrical characteristics, this transformer is well designed mechanically. It is compact, and by means of the four projecting feet, each with a screw hole, may be mounted in any position. The core and coil are finished in black, while the brackets and binding posts are nicked. Particular attention is called to the accessibility of both the binding posts and the mounting brackets. Weight 1 pound.

Type 231A, Amplifying Transformer ..... \$5.00

### Ammeters



In spark transmitting stations a radiation ammeter is a great convenience; in continuous wave stations it is almost a necessity. It is also desirable to know the filament current of vacuum tubes. This is particularly true of transmitting tubes. The charging rate of storage batteries should be known. These requirements of experimental radio stations make it necessary to possess an ammeter equally accurate on direct currents and on currents of radio frequency. Such a meter should have low impedance. It should be rugged and reliable. The Type 127 Hot Wire Ammeters were built to meet these requirements. During the recent war the U. S. Army and Navy used large numbers of these meters.

The expanding strip in these meters is of thin platinum, so as to prevent oxidation. It is so proportioned that it works at a low temperature and is of low resistance. These are two highly desirable features, since the former permits reasonable overloading without burning out, and the latter minimizes the losses.

The type of multiplying action is such that a more uniform scale is obtained than with many hot wire meters. These meters have been corrected for temperature so that there is very little shift of zero. Any necessary correction may be made by adjusting a knurled screw.

These instruments are made in three types, the flush mounting for use on panels, the front-of-board mounting for use on switchboards, and the por-

## General Radio Co.

table type for general use. In mounting the flush type of meter an opening in the panel  $2\frac{5}{8}$  inches in diameter should be provided.

In mounting the front-of-board type allowance should be made for a case 3 inches in diameter. The flush type meters are mounted in metal cases finished in black japan, while the front-of-board and portable types have cases of moulded bakelite.

### Type 127-C, Portable

Range		
100 Milli-Amps	.....	\$10.00
$\frac{1}{4}$ Amp	.....	9.00
$\frac{1}{2}$ Amp	.....	9.00
1 Amp	.....	9.00
2.5 Amp	.....	9.00
5 Amp	.....	9.00
10 Amp	.....	9.00
Galvanometer	.....	8.50

Dimensions 3"x4"x1  $\frac{1}{2}$ "  
Weight 10  $\frac{1}{2}$  oz.

### Filament Rheostat



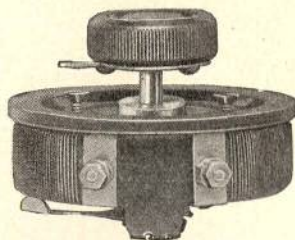
For those who desire a rugged, smooth operating, yet inexpensive filament rheostat.

Like the larger rheostat the base is of moulded bakelite. The wire is wound in helical form and fits tightly in a groove in the base. The rheostat may be mounted either on the front or back of a panel. Terminals have been placed at each end of the resistance element so that the direction of rotation will be correct for either mounting. An off position is also provided.

The resistance is 6 ohms and the current carrying capacity 1.25 amperes. This combination is suitable for the UV-200, UV-201 and WD-11 tubes. Weight, 4 oz.

Type 255 Rheostat.....\$1.00

### Rheostat



This rheostat is made in two types, 214A for back of panel mounting, and 214B for front of panel mounting and portable use. The illustration shows the back of panel type. In this type when mounted, only the knob and pointer project through the panel. The shaft may be adjusted for any thickness of panel up to  $\frac{3}{8}$ ". Ruggedness of construction and smoothness of operation make this rheostat especially adapted for laboratory and radio use. There is no grating or clicking of the contact arm.

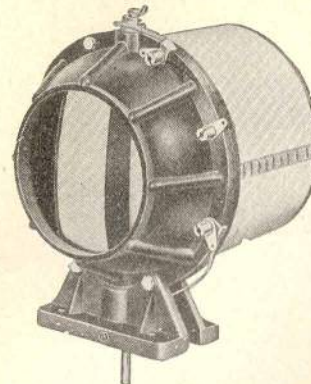
This rheostat is made for three general classes of service. The first type is for the regulation of receiving tube filament currents. This rheostat has a resistance of 7 ohms and a current carrying capacity of 1.5 amperes. The second type is for the regulation of filament currents of 5 watt transmitting tubes. This rheostat has a resistance of 2 ohms and a carrying capacity of 2.5 amperes. It is sufficient for the regulation of a Radiotron UV202 tube on as high as a 12 volt supply source.

The third type of rheostat is the high resistance type. When equipped with a third binding post with connection to the switch blade, this rheostat makes a very excellent potentiometer for biasing grids of detector tubes and for other purposes. Weight 7 oz.

Resistance	Current	Price
2 ohms,	2.5 amp	.....\$2.25
7 ohms,	1.5 amp	..... 2.25
80 ohms,	0.3 amp	..... 2.75
400 ohms,	0.1 amp	..... 2.75
80 ohms,	Potentiometer	..... 3.00
400 ohms,	Potentiometer	..... 3.00

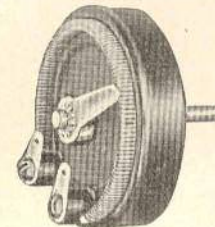
## Gilfillan Accessories

### Variocoupler



Moulded of genuine highest grade brown bakelite. Wound for 150-700 meters wave length. Rotor carried on  $\frac{3}{8}$  inch brass shaft, supported in bronze bushings. Supports for mounting are moulded separately, making the instrument adaptable for either panel or table mounting. R-125. Variocoupler.....\$9.00

### Filament Rheostat



Moulded of genuine bakelite and wound with best grade resistance wire. Centershaft  $\frac{3}{8}$  inch diameter. Resistance 6 ohms. Carrying capacity, 1  $\frac{1}{2}$  amperes.

R-525. Filament Rheostat....\$1.00

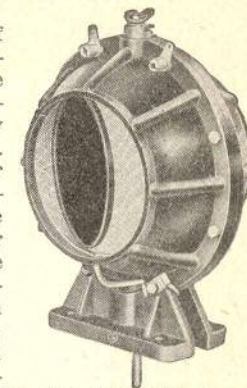
### Knobs



Made of moulded black bakelite, and furnished with brass bushing, with  $\frac{3}{8}$ -inch hole. There is sufficient material in bushing to allow for reaming to fit  $\frac{1}{4}$ -inch shaft.

R-200. 1  $\frac{3}{8}$ -inch knob.....\$0.20  
R-600. 1-inch knob..... .17

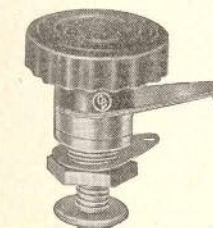
### Variometer



Moulded of genuine highest grade brown bakelite — highly polished. Wound for 150-700 meters wave length. Rotor of genuine bakelite, carried on  $\frac{3}{8}$  inch brass shaft, supported in bronze bushings. Supports for mounting are moulded separately, making the instrument adaptable for either panel or table mounting. Not for use on patented circuits.

R-100 Variometer.....\$9.00

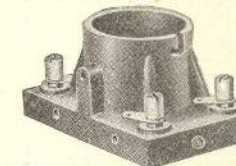
### Panel Switch



Knob is moulded of highest grade black bakelite. All brass parts of massive construction, nickel plated and highly polished—also a solder lug provided for attaching wire connection.

R-225. With 1  $\frac{3}{8}$ -inch Knob.\$1.00  
R-625. With 1-inch Knob... .60

### Tube Socket

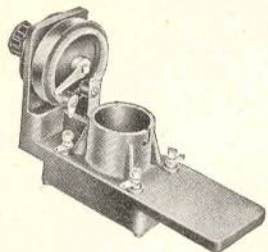


Moulded of genuine brown bakelite. Will take any standard amplifier or detector tube, as well as smaller sizes of power tubes. Positive contact springs of phosphor bronze. Equipped with binding posts and solder lugs—each terminal plainly marked for proper connection. Construction is such that socket can be used for either panel or table mounting.

R-300 Tube Socket.....\$1.00

## Gilfillan-Howard-Klosner

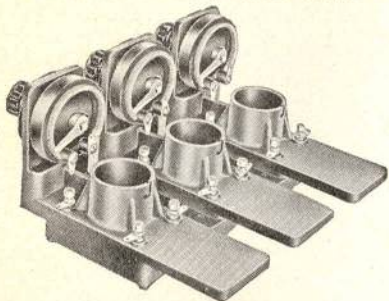
### Detector Unit



R-475

Moulded of brown bakelite heavily ribbed and exceptionally rugged. Designed for panel mounting. Comprises tube socket, rheostat, dial and knob, grid condensers, by-pass condenser, binding posts and solder lugs. R 475. Detector Unit.....\$5.00

### Detector Amplifier Unit



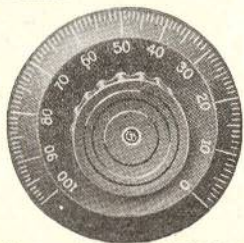
R-550

Moulded of brown bakelite heavily ribbed; the three units being mounted on specially designed bakelite plate. Designed for panel mounting.

R 550. Detector-Amplifier Unit .....\$15.00

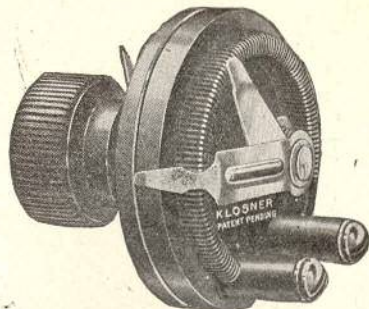
### Dials

Moulded of genuine black bakelite—best quality, highly polished. Graduations and numerals moulded in dial and filled with a lasting white material that will not discolor or wear off.



R 150. 3 inch Dial.....\$0.75  
(With 1 3/8-inch Knob)

### Rheostats

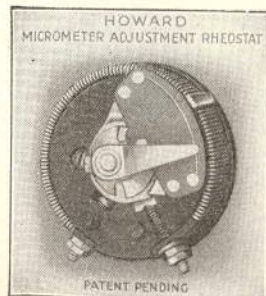


Klosner Vernier Rheostat

These panel type rheostats are especially designed for filament control of vacuum tubes operating on from 4 to 6 volts. They permit a low starting current, preventing sudden strain and thereby prolong the life of the tube.

The Klosner and Howard are provided with micrometer attachment for critical adjustment of detector tubes. A single knob controls both the rough and the vernier adjustments. The Micrometer portion is carried along with the main adjustment control and comes into operation whenever the desired adjustment is exceeded on the main control. Unequaled for simplicity and efficiency.

Klosner Vernier Adjustment..\$1.50  
Howard, Micrometer Adjustment ..... 1.50  
DeForest ..... 1.20  
Attachment and Key..... .50  
Shipping weight, any rheostat, 8 oz.



PATENT PENDING

## Homchargers

### DC Homcharger

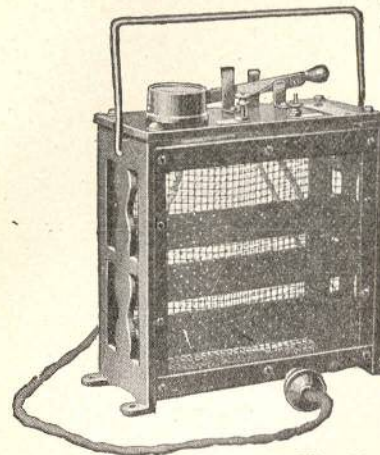


Fig. 11

An entirely different type of Homcharger is required on direct current circuits. Unfortunately, this type of charger cannot be made self-polarizing, so that care must be used when connecting battery. Where charging receptacle is used, this can be of the polarized type, which will prevent improper connection.

These chargers are of very compact design and built of the very best material in a factory specializing in the manufacture of battery charging equipment.

The resistance consists of a special wire, wound on insulating tubes and the whole covered by a baked on vitrious enamel. This construction protects wire from corrosion and provides a resistance unit which is practically indestructible.

An automatic self-closing switch arranged to open charging circuit upon failure of power and to automatically reclose when power is restored, can be applied to any Charger at an extra cost of \$10.00.

### Type S-A Portable Charger

This Rheostat is designed for portable and stationary use. The handle illustrated in Fig. 11 may be readily detached and the Charger mounted

permanently upon the wall. This Charger is very compact in size and measuring but 4x8x9 inches overall. It is equipped with a 5-ft., flexible cord and attachment plug.

Volts	No. Cells	Amps.	Price
32	3-12	2-4-6	\$18.50
110	3-12	2-4-6	18.50
220	3-12	1-2-3	18.50

### AC Homcharger



The Radio Homcharger De Luxe is a modification of the standard Homcharger especially designed and adapted for the Homcharging of radio A and B batteries.

It employs the same perfect operating principle, and is constructed of standardized Homcharger parts. All parts are entirely enclosed within a pressed steel frame, which is equipped with rubber feet.

The vibrator panel is constructed of moulded Bakelite, mounted upon rubber silencers, making the Radio Homcharger De Luxe practically silent in operation.

A special ammeter manufactured by the Jewell Instrument Company is employed, which indicates accurately the value of charging current delivered.

The Radio Homcharger De Luxe is beautifully finished in rich antique mahogany and dull gold. It is unquestionably the handsomest and most efficient rectifier ever produced. Furnished complete with attachment cord and plug, charging cable and battery clips. Will fully charge any A or B radio battery overnight.

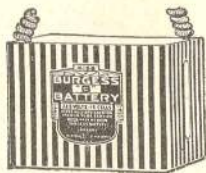
Homcharger De Luxe.....\$18.50

# Vesta-Burgess

## Burgess



No. 2156BP



No. 4156

For perfect satisfaction in the reception of Radio signals, a dependable "B" Battery is essential. Nothing is more annoying than the zizzling, frying noises commonly found in inferior "B" batteries.

Burgess "B" Batteries combine noiselessness and high capacity with moderate price. For real "B" battery satisfaction we can recommend the Burgess highly.

No. 536. 4.5V. 4 oz. .... \$0.40  
Size—2 7/16"x13/16"x2 5/8".  
Service Capacity—3.0 M.A., 200 hrs.

No. 4156. 22.5V. 1 lb. .... \$1.75  
Size—3 3/8"x2"x2 1/2".  
Service Capacity—3.0 M.A., 100 hrs.

No. 2156BP. 22.5V 5 lbs. .... \$3.00  
Tapped 16 1/2-18-19 1/2-21-22 1/2 volts.  
Size—6 5/8"x4"x3".  
Service Capacity—3.0 M.A., 1200 hrs.

No. 2306BP. 45V. 3 1/2 lbs. .... \$5.50  
Size—5"x4 1/2"x2 7/8".  
Service Capacity—3.0 M.A., 250 hrs.

## Vesta

Two to four years service can be expected from Vesta Radio batteries if kept watered as needed and re-charged whenever gravity goes below 1200 degrees.

Vesta Radio batteries have been produced in the same painstaking fashion which has made the Vesta Battery a by-word for Quality and Service.

Every effort has been made to meet the demand for a quality battery at a low price. Production in quantity which their large automobile battery business makes necessary enables them to work efficiently in producing these Radio batteries at low cost without sacrificing quality.

### R6EA

This battery is encased in a one piece rubber case with cover and convenient handle. The sturdy rubber case insures it against possible leakage and also prevents leakage of current which happens with wood case battery, if it gets acid soaked.

R6EA9. 100 A.H. .... \$29.40

### V6EA



This battery has same plates and separators and difference lies only in its box and finish.

V6EA7. 80  
A. H. .... \$22.60

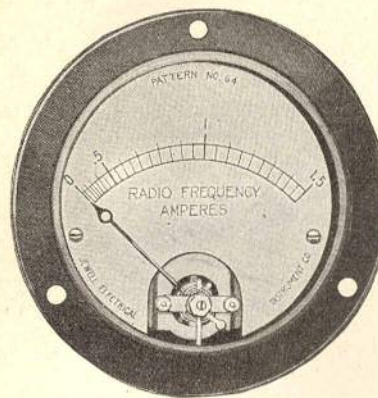
### 6EA

A battery with all of its value in its plates and separators finished as in ordinary battery practice. Hard wood box.

6EA5. 60 A.H. .... \$17.50  
6EA7. 80 A.H. .... 21.00  
6EA9. 100 A.H. .... 24.15

# Jewell Meters

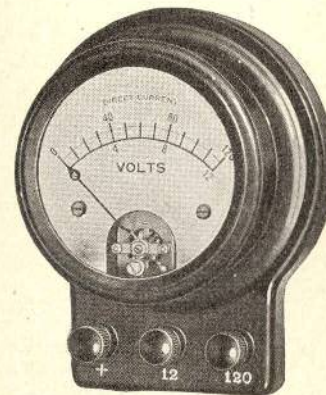
## Jewell No. 64



Pattern No. 64 instruments are guaranteed to stand an overload of 35% continuously, and they should not be used on direct current, but will read accurately on any alternating current from 60 cycles up through all radio frequencies in common use.

No. 64 Jewell meter — High frequency ..... \$12.00

## Jewell Nos. 57, 67, 77



The Jewell Co. is one of the oldest and largest manufacturers of electrical equipment in the U. S. Their meters are unequalled.

The scale length on Pattern No. 64 instruments is 2 1/4 inches.

Accuracy is guaranteed to be within 2% of full scale value.

The cases are of drawn steel for both the front-of-board and flush type and are beautifully finished with a baked black rubber enamel. This instrument is supplied with a special thermo couple welded to a heater wire through which the high frequency current passes. The millivoltage produced is impressed on the direct current movement, which is calibrated to read in terms of the current in the heater wire. Much research work has been done to perfect the thermo couple and heater assembly in order to give it ample overload capacity, to eliminate entirely changes due to different ambient temperatures and to secure an assembly which is quick acting and has very little lag. The result of this research work is a thermo couple instrument which is second to none on the market today.

The front connected portable instrument shown above consists of a standard 3-inch back connected instrument, mounted on a black enameled base, and can be supplied in the same range as the standard instruments. For laboratory work and general all-around testing they are extremely useful, especially where the higher accuracy of the more expensive portable instruments is not necessary.

The range shown in the cut, 0-12-120 volts, is particularly useful for radio work where the lower range is used for testing the storage battery and the higher range for the dry cells used in the plate circuit.

Prices on application.



### Books on the Subject of Radio Telegraphy

**The Wireless Experimenter's Manual**, by Elmer E. Bucher.

A complete treatise on Radio Telegraphy which has found favor as a text book with a great many schools. It contains both elementary and technical information. Shipping weight is 2 pounds. Postage is extra.

Price \$2.25

**Vacuum Tubes in Wireless Communication**, by Elmer E. Bucher.

This volume shows over 140 different circuits for the practical use of vacuum tubes as detectors or audio frequency amplifiers. The two, three and four element oscillation valves are described in detail together with the circuits used in daily practice. Cascade amplifiers of the latest type for long distance reception are comprehensively treated. A series of graphic charts in the appendix reveals the functions of the vacuum tube in a manner easily understood. Fully illustrated. Bound in red cloth. 174 pages. Shipping weight 2 pounds. Postage is extra.

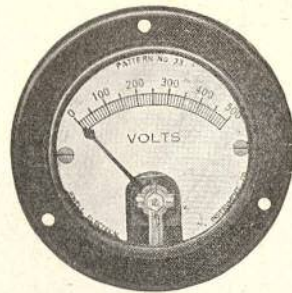
Price \$2.25

**The Armstrong Super-regenerative Circuit**, by Geo. J. Eltz, Jr.

A complete treatise on the subject of Super-regeneration with numerous illustrations and circuits showing construction. A very comprehensive volume. Shipping weight 1 pound. Postage extra.

Price \$1.00

## Jewell Meters



The Pattern No. 33 instrument is supplied in both flush and front-of-board types. The front-of-board type has a base diameter of 3 1/8 in. and an extension of 1 7/8 in. Flush type instruments have a body diameter of 2 1/2 in. and a flange diameter of 3 1/4 in.

The scale length on this instrument is 1 7/8 in.

Pattern No. 33 instruments are supplied with a modified movement in which the pole pieces are forged in one piece with the magnet. The moving element is light and properly proportioned for an instrument of this small size, so that its moment of inertia is not too great and it can be properly controlled by the magnet.

This instrument is furnished as an ammeter with self-contained shunts up to and including 40 amperes full scale. Center zero ammeters, such as are used on battery charging panels, farm light plants and similar devices are furnished at the same price as end zero instruments. Voltmeters are furnished with internal resistance up to and including 80 volts; above this value external resistors are supplied. Inasmuch as this is the smallest D'Arsonval type instrument in common use, it is very popular for small charging panels and other direct current work, including testing devices of various sorts. Both flush and front-of-board instruments are supplied with drawn steel cases with durable baked black enamel finish.

(Prices on application).

## Kellogg Switchboard and Supply Co.

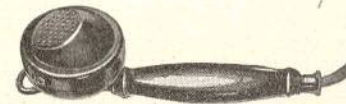
### Head Sets



The value of extremely light and very small head sets in Radio receiving is most evident when using Kellogg head receivers, which, however, have proved as sensitive and thoroughly efficient as they are light in weight and small in size. The band, too, is especially adaptable and the simple receiver holders, which are held in place on the lower part of the head band by the spring tension of the metal, can be instantly adjusted so as to place the receivers over the ears for the best hearing.

No. 69A Head Set 2400 ohms. \$10.00  
No. 69C Head Set 2000 ohms. 8.00

### Microphone



Standard Microphone. Super-sensitive. The result of twenty-five years experience.

Microphone ..... \$8.90

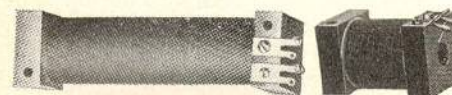
### Tube Socket

All Bakelite Tube Socket. Takes all standard tubes. "The Standard Socket".



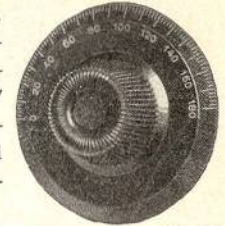
No. 1 and No. 2 Tube Sockets.. \$0.75

### Choke Coils



Iron Core Choke Coil Air Choke Coil  
5 millihenrie air choke coil. \$1.00  
10 millihenrie air choke coil. 1.00  
100 millihenrie iron core choke 1.35  
1 henrie iron core choke... 1.35

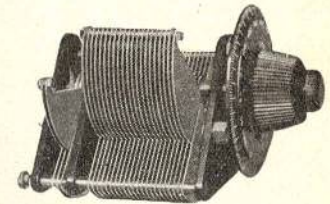
### Dials



All Bakelite. Non-warping, reinforced construction. 5/8" shaft with bushings for 1/4" and 3/8" shafts included.

No. 501. 3" Dial.....\$1.00  
No. 502. 4" Dial..... 1.25

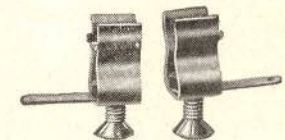
### Condenser



Decrementer type, 11, 23, and 43 plate with and without vernier. Standard capacities. With this variable condenser the dial scale can be correctly calibrated. The amount of increase or decrease of the plate surface variation is always constant.

No. 601. 11 plate with 5 plate Vernier. Knob—4" Dial... \$6.75  
No. 603. 23 plate with 5 plate Vernier. Knob—4" Dial... 7.75  
No. 605. 43 plate with 5 plate Vernier. Knob—4" Dial... 8.75

### Clips



1 Set No. 501 Clips  
Clips for mounting grid leaks and condensers.  
No. 501. Per set.....\$0.20



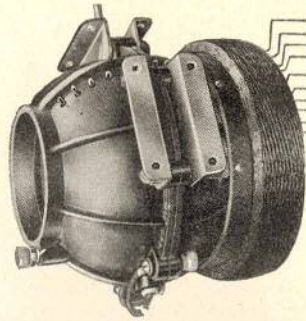
### A Handy Wire Table

Approximate Number of Turns Per Inch, Per Layer

B. & S. Gauge	Diam. Inches	Enam. Wire	Single Silk	Single Cotton	Double Cotton
6	.1620			6.0	5.8
8	.1285	7.6	7.4	7.4	7.0
10	.1019	9.6	9.2	9.2	8.7
12	.08081	12.0	11.7	11.7	11.1
14	.06408	15.1	14.2	14.2	12.8
16	.05082	18.9	18.1	18.1	16.6
18	.04030	23.7	22.4	22.4	20.0
20	.03196	29.7	29.7	27.8	25.0
22	.02535	37.2	36.9	34.0	29.9

## Kellogg

### Variocoupler



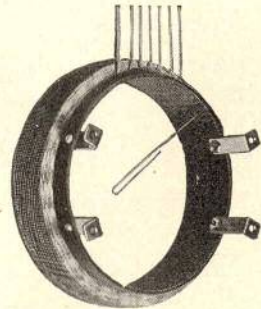
The Kellogg variocoupler is made of moulded Bakelite, with reinforced construction. The stator has eleven taps, bringing the induction value from .1 to 1.4 Millihenrie.

For increasing the wave length from 50 to 2500 meters, the Kellogg standard wound induction is added to the variocoupler or variometer, the combination resulting in a single circuit tuner.

It is arranged for either panel or base mounting.

No. 501. Variocoupler.....\$9.00

### Tuner Coil



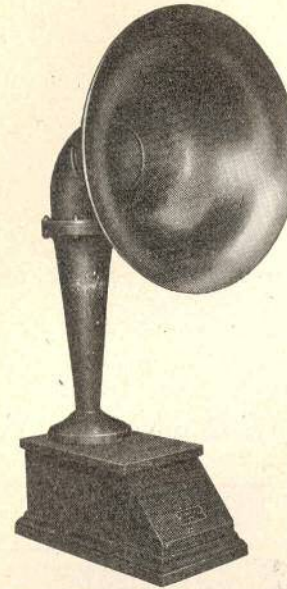
This diamond wound tuner coil is an unusual piece of work. Only high grade insulated wire is used and great care is exercised in the winding.

It is shown above attached to No. 501 Variocoupler.

No. 502 Diamond Wound Tuner Coil.....\$3.00

## Loud Talkers

### Thorophone



The Thorophone has a pure, exquisite tone, originating in a mica diaphragm perfectly controlled and correctly amplified in a scientifically constructed horn resonator.

Thorophone.....\$45.00

### Ekko



The Ekko makes it possible for a roomfull of people to listen in with an ordinary receiving set. It may be used with any make of radio head

phones and makes use of both phones. It is not necessary to buy extra receivers or horn. Greater and more efficient sound amplification is produced through the use of the Ekko. It saves using an unsightly separate horn. The tone may be varied by using the tone control on the phonograph, as for a record. The use of Ekko subdues the troublesome noises caused by static and interference. Phones cannot fall off as they are held rigidly in the proper place by suitable springs. The Ekko gives a pure, mellow tone.

Ekko Loud single.....\$1.75  
Ekko Loud double..... 2.75

### Timmons Talker



The Timmons Talker is a loud speaker that is different and better. Not just a headset with horn amplification, but a scientific method of amplification that brings out a rich volume of tone without distortion. No batteries are necessary. Built in a handsome solid mahogany case that looks well with any receiving set.

Timmons Talker.....\$35.00

### Magnavox

R-3 Magnavox.....\$35.00  
R-2 Magnavox..... 60.00  
2-Stage Amplifier Magnavox.. 55.00  
3-Stage " " 75.00



## Murdock-Brandes

### Head Sets



Brandes

The clear, distinct signals when using a Brandes phones are due to the matching of the tones in both receivers. This toning enables the user to catch long distance as well as the nearer signals easily and distinctly. The cases are of hard drawn aluminum, the ear caps of hard rubber, the magnets of tungsten steel, and the cores of annealed Norway iron are wound with pure annealed copper wire.

- Brandes-Navy Type, 3200....\$14.00
- Brandes Superior, 2000.... 8.00
- Murdock, 3000.... 5.50
- Murdock, 2000.... 5.00
- Baldwin Type "C", 2000.... 12.00
- Baldwin Type "C", Single... 6.00.
- Shipping weight, any head set, 2 lbs.



Murdock

### Mesco Head Sets

- Mesco, 3000 ohms.....\$7.00
- Mesco, 2000 ohms..... 6.00

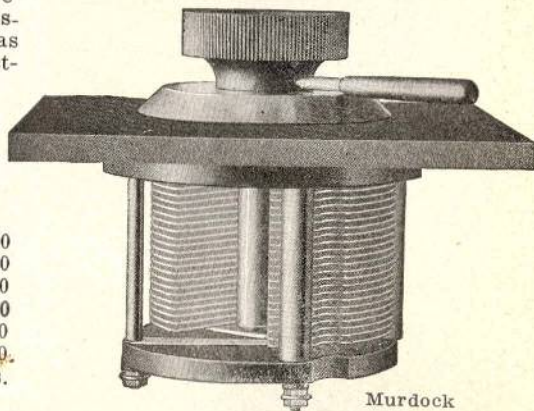
### Rheostats

- Murdock .....\$1.00

### Vacuum Tube Sockets

- Murdock V. T. Socket.....\$1.00

### Condensers



Murdock

These condensers, with handle and table types are celebrated for their sturdy construction and freedom from leakage and direct short circuit.

#### Table Type Condensers

	No.	Cap'y	Plates	
Murdock,	367	.001	43	\$4.50
Murdock,	368	.0005	21	4.00

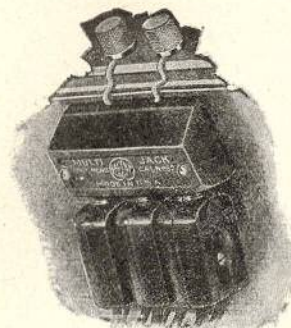
#### Panel Type Condensers

Murdock,	3660	.001	43	\$4.00
Murdock,	3680	.0005	21	3.25
Signal,	R-76	.001	43	4.50
Signal,	R-77	.0005	21	3.50
Signal,	R-78	.00025	11	3.00

Shipping weight, 2 lbs. each.

## Pacent Accessories

### Multi-Jack



The Pacent Multi-Jack, when screwed to the side of a receiving outfit, will allow three sets of phones to be plugged in, or two sets of phones and a loud speaker. It may also be screwed to the table or the testing board.

The Multi-Jack is shaped in such a way that two or more of them can be placed end to end. All standard plugs can be used with the Multi-Jack; but, of course, the Pacent Plug is best.

Although the Multi-Jack takes the place of three jacks, it sells for the price of one. Every radio experimenter will find a great number of uses for it.

- Pacent Multi-Jack .....\$1.50

### Universal Plug



A telephone cord can be attached to the Pacent Plug in a jiffy. It is only necessary to take out a single screw which at once exposes the connecting springs. The springs are pinched together with the fingers and the cord tips inserted. When the pressure on the springs is released, the tips are held firmly. The elec-

trical connection established with the Pacent Plug is a perfect one. The cord tips may be taken out of the plug as easily as they are put in. It is only necessary to pinch the springs together, which at once releases the tips. The Pacent Plug is constructed in such a way that any pulling up to and beyond the breaking point of the cord, will only tighten the grip. The springy metal used in the plug cannot become weak through manipulation.

- Pacent Universal Plug.....\$1.00

### Twin Adapter



Often times a receiving outfit is provided with only one jack, and in such cases the Pacent Twin Adapter will allow a single jack to accommodate two Pacent Universal Plugs. In this way two pairs of phones can be used or one pair of phones and a loud speaker. Thus the receiver can be tuned with the phones and the loud speaker can be plugged in later.

The contacting members of the Twin Adapter are powerful and lasting. The electrical contact established with the plugs is guaranteed to give no trouble.

- Pacent Twin Adapter.....\$1.50



## A Few Radio Definitions

**Capacity:** Power of containing. A condenser has unit capacity (farad) when a charge of one coulomb creates a difference of potential of one volt between its terminals. This farad, being too large for practical purposes, the microfarad (one millionth of a farad) is used.

**Continuous Waves:** Abbreviation C. W. Electromagnetic waves having constant amplitude, which travel through the ether without losing their form. Also called "Undamped Waves."

**Frequency:** The number of waves that pass a given point in a second, or, in other words, the number of complete cycles the wave goes through in one second.

**Henrie:** The unit of inductance. A circuit has an inductance of one henrie when a current changing at the rate of one ampere per second induces an E. M. F. of one volt in the circuit.

**Ohm's Law:** A method of expressing the relationship existing between the E. M. F., current and resistance, and practically the basis of most electrical computations. It is expressed as follows: Current flow equals the electromotive force divided by the resistance.

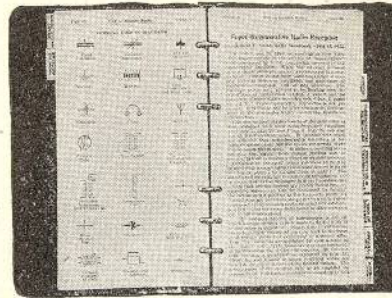
**Oscillations:** High frequency alternating currents. "Radio frequency oscillations" is an arbitrary designation for current whose frequency exceeds 10,000 cycles per second. Audio-frequency is below this margin.

**Radio Frequencies:** Oscillations whose frequency is above 10,000 cycles per second. Such frequencies correspond to vibrations not normally audible.

**Volt:** The unit of electromotive force. The force required to send one ampere of current through one ohm resistance.

**Watt:** The electrical unit of power. The power to do work when one ampere passes through one ohm resistance under a pressure of one volt. 746 watts equals one horsepower (H.P.)

## Lefax



### Lefax Handbook

Lefax Radio Handbook instructs the radio enthusiast in a comprehensive knowledge of radio principles, methods and apparatus and continues to instruct him in constant step with the march of radio progress. To every purchaser Lefax Radio Handbook carries with it a perpetual follow-up service of additional loose-leaf sheets keeping him always informed.

The present trend in radio apparatus and hook-ups is toward radio-frequency amplification. In accordance with this present development, supplementary loose-leaf sheets showing various tested radio-frequency diagrams are now being mailed to owners of the Handbook. These new pages, covering new discoveries, new applications, etc., as fast as they occur are being sent free to every purchaser for one year. Only by owning a Lefax Handbook with its accompanying follow-up service can you have a Complete Radio Library—the cream of Radio Research—in handy form, always at your finger tips—a library of radio information that never becomes out of date.

Nearly 20,000 copies of the Handbook have already been sold since July, 1922.

Lefax Handbook .....\$3.50

## Western Electric

### Loud Speaking Telephone Outfit

This outfit consists of a Loud Speaking Receiver with curved horn and a 2-stage Vacuum Tube Amplifier, equipped with three vacuum tubes (Type 216-A).

This outfit, when connected to a well designed vacuum tube radio receiving set and supplied with the necessary current, will reproduce and amplify all forms of broadcasted speech and music with the highest degree of clarity and tone quality.

#### Loud Speaking Receiver

The No. 518-W Loud Speaking Receiver is of the balanced armature type, of attractive design and highest efficiency.

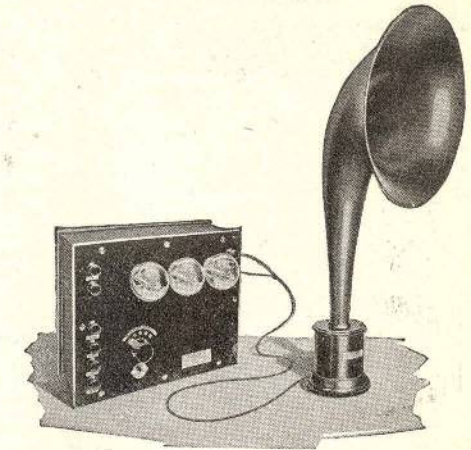
The magnet system and moving parts are designed to obtain high sensitivity and at the same time to operate with comparatively large amounts of voice current energy without causing distortion of the reproduced sound.

The receiver is mounted in a metal housing. The curved horn, which is of a molded composition, is specially designed to give adequate volume and pure tone.

#### Amplifier

The No. 7-A Amplifier consists of a wooden cabinet approximately 12½ by 10 by 4½ inches, supporting a panel of approved insulating material. Upon this panel are mounted in convenient positions a battery key to control the filament circuit, a multi-contact switch to control the loudness of sound, sockets for the vacuum tubes and the necessary binding posts for the input and output connections, batteries, etc.

The amplifier, which has two stages of amplification, employs three No. 216-A vacuum tubes. One tube is used for the first stage of amplification; the other two, connected on the differential principle, for the second stage. The differential con-



No. 7-A Amplifier 10-D Receiver

nection of the tubes for the second stage insures faithful reproduction of sounds without overloading; also, by employing the particular scheme of connections used, the circuit is compensated in a manner to secure the highest degree of faithfulness in tone and speech reproduction.

The input transformer of the amplifier is connected in the terminals marked "IN". The impedance of the primary winding of the transformer is such that the "IN" terminals of the amplifier may be connected directly to those terminals of the radio receiving set usually employed for the head telephones.

The transformers, grid battery, switches, etc., are secured to and mounted on the under side of the insulating panel.

The transformers used in the construction of this amplifier are specially designed for use with the Western Electric loud speaking receiver No. 518-W; their efficiency is remarkably uniform over a wide frequency range. This insures faithful reproduction by the loud speaking receiver of all the frequencies used in the talking and musical ranges, including those of the highest and lowest register.



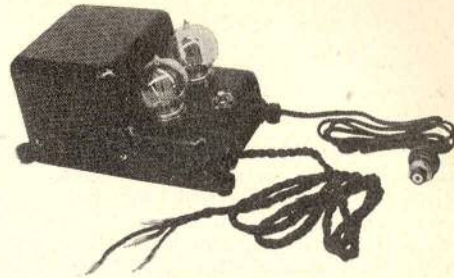
**Conventional Signals**

To be used for all general public service radio communication

- Period -----
- Semicolon -----
- Comma -----
- Colon -----
- Interrogation -----
- Exclamation Point -----
- Apostrophe -----
- Hyphen -----
- Bar indicating fraction -----
- Parenthesis -----
- Inverted Commas -----
- Underline -----
- Double Dash -----
- Distress Call -----
- Attention call to precede every message -----
- General inquiry call -----
- From (de) -----
- Invitation to transmit -----
- Warning—high power -----
- Question (please repeat after.....) interrupting long messages -----
- Wait -----
- Break -----
- Understand -----
- Error -----
- Received (O. K.) -----
- Position report -----
- End of each message (cross) -----
- Transmission finished (end of work) (conclusion of correspondence) -----

**Western Electric**

**Current Supply Set**



Feeds a 10-A Amplifier direct from the house lighting service. Cannot be used on an ordinary 2-stage amplifier. This outfit eliminates both "A" and "B" Batteries for 10-A Talker.

Current Supply Set.....\$71.00

**Vacuum Tubes**

Western Electric vacuum tubes make use of a special oxide coated filament temperature. This feature, under normal operating conditions, insures long life and minimum filament power consumption.

When in operation the filaments of Western Electric tubes should glow dull red.

Western Electric VT 1.....\$8.00

**Other Vacuum Tubes**

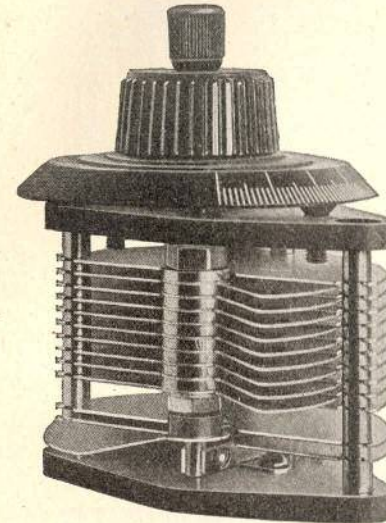
- Radiotron U V 200.....\$ 5.00
- Cunningham C. 300..... 5.00
- Radiotron U V 201..... 6.50
- Cunningham C 301..... 6.50
- Radiotron U V 202..... 8.00
- Cunningham C 302..... 8.00
- Radiotron U V 203..... 30.00
- Cunningham C 303..... 30.00
- Radiotron U V 204.....110.00
- Myer's Tubes High Mu..... 5.00

**Western Electric Head Set**

- Western Electric 2000 ohm....\$12.00
- 522 Phonograph Adapter.... 10.00

**Walmart—Radio Mat**

**Walmart Variable Condensers**



A dependable highly efficient condenser for quick accurate tuning. The aluminum measures .026" in thickness and is far superior to the thin plates often used which bend out of shape and short circuit so easily.

Spacing between stator plates is not dependent upon washers, poured lead or other makeshift methods but the studs have milled slots into which the plates are pressed and locked. That is why Walmart condensers stay in adjustment. The spacing between stator plates is guaranteed accurate within one and a half thousandth inch. The studs are securely fastened in highly polished bakelite end plates.

The Walmart Vernier type is recommended for fine tuning. It consists of an extra plate mounted on a solid brass shaft which turns thru a hollow brass shaft holding the rotor plates. Both vernier and

rotor knobs are furnished on these condensers. Use Walmart 3-plate fine tuning condenser in connection with a regular forty-three plate whenever maximum efficiency is required in tuning.

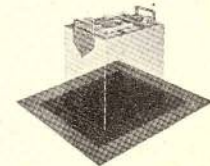
All screws and shafts are nickel plated, including those furnished for attaching condenser to panel. Each condenser before shipping is carefully inspected, given an electrical breakdown test and packed in a neat cardboard box. They are guaranteed trouble-proof.

A template to enable user to accurately lay out holes in panel is furnished with each condenser.

Plate	Mf. Cap.	Plain Type	Vernier Type
3	.00006	\$1.50	\$...
5	.00010	1.65	....
13	.00025	2.25	4.25
23	.0005	3.25	5.00
43	.001	4.00	6.00

Bakelite Dials furnished on all Vernier Type condensers.

**Radio Mat**



The Radio Mat is made of high-grade rubber fabric which is guaranteed to withstand battery acid. Put your storage battery on the Radio Mat and assure absolute protection for your floors and rugs.

Radio Mat.....\$2.00

## C. W. Power Transformer



These transformers permit operation from a 50/60 cycle alternating current source for (1) continuous wave telegraphy, on either a self-rectification circuit, or a Kenotron rectified A. C. circuit (2) interrupted continuous wave telegraphy, with or without Kenotron rectified A. C., (23) radio telephony.

The use of alternating current provides an excellent and flexible means of supplying power for continuous wave telegraph and telephone sets.

Type UP-1368 transformer has sufficient capacity to handle safely one to four Type UV-202 Radiotrons as oscillators. Type UP-1016 will supply one or two Type UV-203 Radiotrons as oscillators. A winding is provided for lighting the filaments and a winding for the plate source. In addition, a filament winding for the Kenotron filaments is supplied.

### Type UP-1368

Plate Winding: Output 175 watts, 1,100 volts between outside wires, midtap at 550 volts.

Radiotron Filament Winding: Output 75 watts, 7.5 volts, with midtap at 3.75 volts. The capacity of this transformer will supply filament current to four radiotrons Type UV-202 (5-watt tubes).

Kenotron Filament Winding: Output 75 watts, 7.5 volts, with midtap at 3.75 volts. Windings insulated for 1,100 volts. The capacity of this transformer will supply filament current to four kenotrons Type UV-216.

Primary Winding: For operation

from a 50/60-cycle supply with voltage from 102.5 to 115 volts. Provision is made for voltage adjustment in steps of 2.5 volts between 102.5 and 115 volts. This is accomplished by means of taps brought out from the primary winding of the transformer to studs on a dial switch. This feature eliminates the need of filament rheostats, since it provides filament voltage adjustment in steps of approximately 2.5 volts.

### Type UP-1016

Plate Winding: Output 450 watts, 3,000 volts between outer wires with midtap at 1,500 volts.

Radiotron Filament Winding: Output 140 watts, 10.5 volts between outer wires with midtap at 5.25 volts. The capacity of this transformer will supply current for two radiotrons Type UV-203 (50-watt tube).

Kenotron Filament Winding: Output 140 watts, 10.5 volts between outer wires with midtap at 5.25 volts. The capacity of this transformer will supply filament current for two kenotrons Type UV-217.

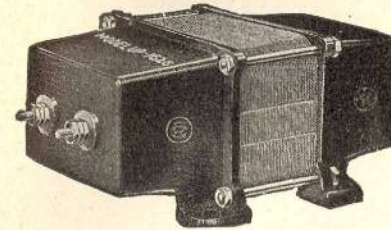
Primary Winding: Operation from a 50/60-cycle supply at a voltage from 102.5 to 115 volts. Provision is made for voltage adjustment in steps of 2.5 volts between 102.5 and 115 volts, eliminating the need of separate rheostats.

### Price

UP-1368, 325 Watts,  
Size  $9\frac{3}{4} \times 5\frac{11}{16} \times 4\frac{1}{4}$  in. . . . . \$25.00  
UP-1016, 750 Watts,  
Size  $9\frac{1}{2} \times 7\frac{3}{8} \times 6$  in. . . . . 38.50

## Filter and Plate Circuit Reactors

### Filter Reactors



When the plate circuit of a valve transmitting set is energized by high voltage rectified A. C., using kenotron valves and power transformers, a suitable filter unit, to smooth out the rectified pulses must be provided. It has been customary heretofore to provide a relatively small inductance unit in combination with a group of condensers of rather large capacity. It is more economical, however, to provide a large inductance unit and a relatively small group of condensers, and as a consequence the two special reactors here listed have been specially developed for the purpose.

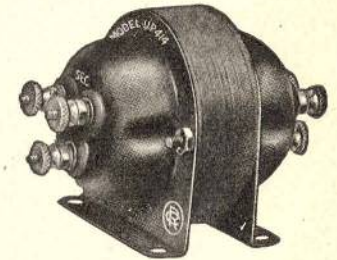
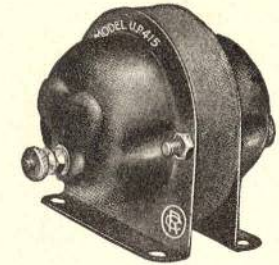
These filter reactors are of the "iron-clad type," designed for use with the kenotron rectifier sets. Liberal copper allowance insures the minimum of losses and no change in value through use. Particular attention has been given to its insulation.

Type UP-1626, 160 milliamperes, is designed to operate with any circuit, either A. C. or D. C., employing from one to four 5-watt power tubes, radiotron Type UV-202. It can be used in connection with filter condensers, on any kind of a circuit within the specified voltage and power rating.

Type UP-1627, 300 milliamperes, is designed to operate on any circuit, either A. C. or D. C., employing from one to two 50-watt power tubes, radiotron Type UV-203. It can be used in connection with filter condensers on any kind of a circuit within its voltage and power rating. It may also be used as a "smoothing-out" reactance. For 50-watt tubes, one will suffice; for 250-watt tubes, two in series should be employed.

UP-1626—160 Milliamperes,  
Size  $7\frac{31}{32} \times 5\frac{1}{16} \times 4\frac{1}{8}$  in. . . . . \$11.50  
UP-1627—300 Milliamperes,  
Size  $9\frac{5}{8} \times 5\frac{1}{4} \times 4\frac{1}{8}$  in. . . . . 15.75

### Plate Circuit Reactor UP-415



Standard radio telephone circuits using one or more tubes as oscillators and one or more additional tubes as modulators require a reactor in series to the plate circuit to maintain the D. C. supply voltage to the plate at constant value, even though the output of the set is modulated at audible frequencies.

Reactor UP-415 was designed for this purpose and for circuits using 5-watt radiotrons. It is intended primarily for use in the common positive plate lead to the oscillating and modulating tubes, and as stated above, provides a constant current system of modulation. This unit has an inductance of 1 henry at audio frequencies. The D. C. resistance is approximately 640 ohms.

Test voltage between winding and core 1300 volts at 60 cycles.

UP-415, Size  $2\frac{3}{4}$  in. long;  $2\frac{3}{4}$  in. high; base  $2 \times 2\frac{3}{4}$  in. . . . . \$5.75



## Frequency and Wave Length Tables

W. L.—Wave Lengths in Meters. F.—Number of Oscillations per Second. O. or  $\sqrt{L.C.}$  is called Oscillation Constant. C.—Capacity in Micro Farads. L.—Inductance in Centimeters. 1000 Centimeters = 1 Microhenry.

W.L.	F.	O. or $\sqrt{L.C.}$	L.C.
50	6,000,000	.839	.7039
100	3,000,000	1.68	2.82
150	2,000,000	2.52	6.35
200	1,500,000	3.36	11.29
250	1,200,000	4.19	17.55
300	1,000,000	5.05	25.30
350	857,100	5.87	34.46
400	750,000	6.71	45.03
450	666,700	7.55	57.00
500	600,000	8.39	70.39
550	545,400	9.23	85.19
600	500,000	10.07	101.41
700	428,600	11.74	137.83
800	375,000	13.42	180.10
900	333,300	15.10	228.01
1000	300,000	16.78	281.57
1100	272,730	18.45	340.40
1200	250,000	20.13	405.20
1300	230,760	21.81	475.70
1400	214,380	23.49	551.80
1500	200,000	25.17	633.50
1600	187,500	26.84	720.40
1700	176,460	28.52	813.40
1800	166,670	30.20	912.00
1900	157,890	31.88	1016.40
2000	150,000	33.55	1125.60
2100	142,850	35.23	1241.20
2200	136,360	36.91	1362.40
2300	130,430	38.59	1489.30
2400	125,000	40.27	1621.80
2500	120,000	41.95	1759.70
2600	115,380	43.62	1902.60
2700	111,110	45.30	2052.00
2800	107,140	46.89	2207.00
2900	103,450	48.66	2366.30
3000	100,000	50.33	2533.20
4000	75,000	67.11	4504.00
5000	60,000	83.89	7038.00
6000	50,000	100.7	10130.00
7000	41,800	117.3	13630.00
8000	37,500	134.1	18000.00
9000	33,300	151.0	22820.00
10000	30,000	167.9	28150.00
11000	27,300	184.8	34150.00
12000	25,000	201.5	40600.00
13000	23,100	218.3	47600.00
14000	21,400	235.0	55200.00
15000	20,000	252.0	63500.00
16000	18,750	269.0	72300.00

## Magnetic Modulators



One of the most important inventions brought forth in the field of amateur radio telephony during the past year is the magnetic modulator. The same fundamental principle of the Alexanderson Magnetic Amplifier has been adopted in the three magnetic modulators described, and for the first time the amateur experimenter has at his disposal a simple yet thoroughly reliable means of modulating the antenna oscillations of any low-power vacuum tube radio telephone set.

Once connected to a radio telephone set, these modulators positively require no further adjustment or attention. This assures the experimenter that at all times he is obtaining the best possible results from his apparatus. It makes possible practical and reliable radio telephone transmission from a tube transmitter even on the part of an experimenter having a very limited knowledge of radio telephone operation.

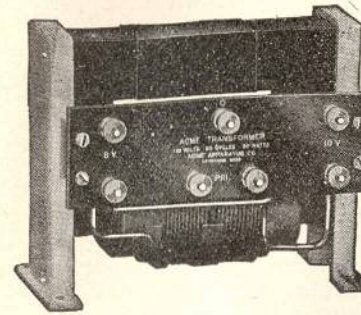
The great advantage of the magnetic modulator over other methods of modulation is that it gives the best and only non-distorting method of controlling the output of a single tube for radio-telephony.

The magnetic modulator is designed specially for the amateur to fill the long desired place for a simple non-destructive and fool-proof device to make a C. W. set into a radiophone set without the use of more tubes or other delicate or costly apparatus. For outputs above 5 amperes, two or more of the Type UT-1367 may be used in parallel.

UT-1643,  $\frac{1}{2}$ — $1\frac{1}{2}$  amperes. \$ 9.50  
 UT-1357,  $1\frac{1}{2}$ — $3\frac{1}{2}$  amperes. 12.50  
 UT-1367,  $3\frac{1}{2}$ —5 amperes. 17.00

## Filament and Oscillation Transformers

### Acme Filament Heating Transformer



When using vacuum tubes for the transmission of radio telegraphy and telephony it is not essential to have the filaments heated by battery current, as it is when using tubes for receiving, as the use of low commercial frequencies at the transmitting station does not affect the reception of signals at the receiving station.

These transformers have been developed for filament heating, will operate on 110 volts 60 cycles and deliver two secondary voltages 8 and 10 in order to care for tubes requiring different voltages for proper operation. A center tap is provided on the secondary or filament winding in order to connect the grid circuit to a point whose potential does not alternately change from plus to minus. These transformers are supplied both mounted and unmounted, the former having supports, bakelite panel, nickel-plated fittings and binding posts. These transformers will supply rated load continuously without undue heating.

Fully mounted, 50 watt. . . . \$12.00  
 Core and coils assembled, 50 watt . . . . . 9.00  
 Fully mounted, 150 watt. . . . 16.00  
 Core and coils assembled, 150 watt . . . . . 13.00

### Oscillation Transformer

This transformer is for use in circuits utilizing Radiotrons as generators of radio frequency oscillations and in any set-up using conductively coupled circuits, such as an oscillation transformer coupling the primary and secondary circuits in spark transmitters.

The transformer consists of 25 turns of .060 in. x  $\frac{3}{8}$  in. copper strip, nickel-plated, with edges rounded, mounted on a wooden base which includes four binding posts, to three of which are secured flexible conductors and clips for selecting tap points on the transformer.

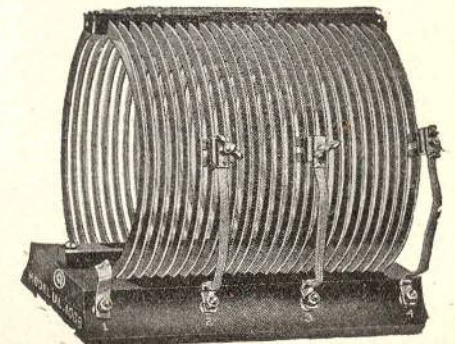
The clips supplied for tapping on the transformer are readily connected to or taken off the turns of the transformer and when secured to it by tightening the wing nut are positive in holding their position on the coil. These clips were developed primarily for use with commercial transmitters.

All metal parts of the transformer are nickel-plated. The base has a polished black finish, and the overall appearance of the unit is very pleasing.

The coil is liberally designed to withstand the potentials developed in circuits utilizing Radiotrons. Holes are provided in the base to permit mounting the transformer in any desired place.

Size  $7\frac{7}{8}$  in. x  $6\frac{1}{4}$  in. x  $9\frac{3}{8}$  in.

Type UL-1008 . . . . . \$11.00



## Condensers

### Condensers C. W. Transmitting Sets



UC-1803



UC-1015

UC-1806



The use of radiotrons as generators of radio frequency oscillations in radio telegraphy and telephony has brought about the need for comparatively small transmitting condensers, which will stand continuous operation with the voltages used on such tube sets.

Four types are now available: Type UC-1014, rated at 3,000 volts effective, has a capacity of .002 mfd. This condenser was developed primarily for use as a grid condenser, radio frequency by-pass condenser or blocking condenser for circuits utilizing radiotrons Type UV-202 and Type UV-203.

Type UC-1015, rated at 7,500 volts effective, has three capacities, .0003, .0004 and .0005 mfd., and a current-carrying capacity of 4 amperes at 200 meters maximum. At lower or higher wave lengths the current-carrying capacity is greater or less, respectively. This condenser is applicable as a series antenna condenser and an intermediate circuit condenser in circuits using radio-

trons Type UV-202, or Type UV-203.

Both of the above condensers find numerous other applications in the great number of circuits available for C. W. transmission. Their capacities are exact within 2 per cent. and their losses are negligible. They are built with mica dielectric and include the most recent developments in high voltage condenser design.

Type UC-1803 is intended for use as a blocking or coupling condenser, as shown in the various diagrams in this Catalogue. It is rated at 10,000 volts and has a capacity of .000025 mfd. It is the only compact condenser on the market satisfactory for these purposes.

Type UC-1806, rated at 6,000 volts effective, has a capacity of .002 mfd., and is intended for use as a by-pass condenser in circuits in which the voltages rise to 6,000 volts.

Type	Size	Price
UC-1014	2 1/4 x 1 1/2 x 7/8 in.	\$2.00
UC-1015	2 1/4 x 1 1/2 x 7/8 in.	5.40
UC-1803	3 x 3 x 4 in.	5.00
UC-1806	2 1/4 x 1 1/2 x 7/8 in.	7.00

### Filter Condensers



These filter condensers are manufactured especially for kenotron rectifier sets. They are intended for use with reactors Type UP-1626 and Type UP-1627, or similar instruments.

UC-1631—750 V.	
Capacity 0.5 Mfd.	\$1.35
UC-1632—750 V.	
Capacity 1.0 Mfd.	1.85
UC-1634—1750 V.	
Capacity 0.5 Mfd.	1.50
UC-1635—1750 V.	
Capacity 1.0 Mfd.	2.00
Size 4 3/4 x 5 1/4 x 1 1/8 in.	

## Chopper—Grid Leaks

### Motor-Driven Chopper PX-1638

#### For C. W. Tube Transmitters

The rotary chopper has been developed primarily for I. C. W. It may, however, be used in numerous circuits for this or other purposes where an interrupter is required. When used to secure I. C. W. telegraphy, the motor-driven interrupter, or rotary grid chopper, has the following inherent advantages over the other methods:

- Gives positive interruption requiring no adjustment. The note obtained can be varied to any desired pitch by changing the driving motor speed.
- This system of securing damped wave trains does not require modulating tubes, the interrupter being used in series with the transmitting key and functioning in the same circuit as the transmitting key.
- The system inherently gives 100 per cent. modulation, since oscillations can be completely started and stopped at audio frequencies.
- The output obtained from a given number of oscillators is in general greater than if some of the tubes are used as modulators.

The equipment includes the following parts:

- Interrupter Wheel.
- 2 Bushings, so that the wheel may be mounted on motor shafts 1/4 in., 5/16 in., or 3/8 in. diameter.
- Brush Holder and Brush.

No motor is included with this equipment unless specifically requested. If motor is desired, three suitable types are listed below.

The interrupter wheel is built with 34 conducting and 34 insulating segments, making 34 interruptions per revolution. The insulating segments are molded in a single piece, eliminating the possibility of these segments becoming displaced.

PX-1638, Size 4x1 3/4 in.	\$7.25
Shaft Bushing for 1/4 in.	
Motor Shaft	.20
Shaft Bushing for 5/8 in.	
Motor Shaft	.20

### Transmitting Grid Leaks

The purpose of these grid leaks is to limit the potential accumulating on the grid of an oscillating tube and thus govern the output to the antenna and also the character of the antenna oscillations.

These resistors consist of a conductor wound upon a heat-resisting silicate compound body developed to resist sudden and extreme temperature changes without becoming cracked, weakened, or in any way injured. After being wound upon this compound it is embedded in a blue vitreous enamel which is fused to a dense, uniform, glassy structure at a temperature of about 1,000 degrees Centigrade.

A metal foot is provided at each end of the grid leak to which the resistor windings are connected, and through which external connections are made. In addition, a mid-tap is provided for securing half the resistance of the whole unit.

UP-1719. For use with 5-watt Radiotrons. Resistance — 5,000 ohms, with mid-tap at 2,500 ohms. Size 5x1 1/4 in.	\$1.10
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UP-1718. For use with 50-watt and 250-watt Radiotrons. Resistance—5,000 ohms, with mid-tap at 2,500 ohms. Size 8 1/2 x 1 1/2 in.	1.65
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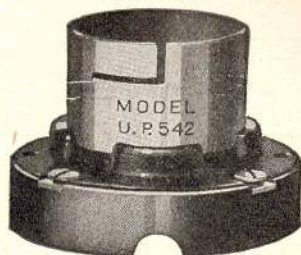


Symbols used for various quantities.

Quantity	Symbol
capacitance	C
conductance	g
coupling co-efficient	k
current, instantaneous value	i
current, effective value	I
decrement	$\delta$
dielectric constant	$\epsilon$
dielectric field intensity	OC
electromotive force, instantaneous value	E
electromotive force, effective value	F
energy	W
force	F
frequency	f
frequency x 2 $\pi$	$\omega$
impedence	Z
inductance, self	L
inductance, mutual	M
magnetic field intensity	A
magnetic flux	$\phi$
magnetic induction	B
period of complete oscillation	T
potential difference	V
quantity of electricity	Q
ratio of the circumference of a circle to its diameter, 3.1416	$\pi$
reactance	X
resistance	R
time	t
velocity	v
velocity of light	c
wave length	$\lambda$
wave length in meters work	$\lambda_m$
permeability	$\mu$
square root	$\sqrt{\quad}$

## V. T. Sockets

### Porcelain V. T. Sockets



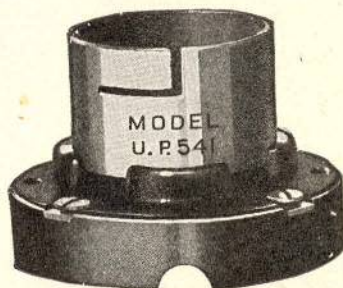
These two sockets have been specially designed to meet the need for a reasonably priced socket which should at the same time be constructed of the very best insulating material obtainable, and should bear the stamp of quality throughout. They are direct duplicates of the types used in commercial radio sets.

Porcelain is the ideal material for use in these devices, on account of its low specific inductive capacity and its high insulating qualities.

In these sockets contact with the tube prongs is made by a special wiping spring contact. The tube is merely inserted and turned through a small angle, a bayonet catch is not used but the spring contacts themselves hold the tube in position.

Type UR-542 is designed to accommodate radiotrons UV-200, UV-201, UV-202, and kenotron Type UV-216, Type UR-541, is designed for radiotron Type UV-203, the 50-watt power tube, and kenotron Type UV-217, the 150-watt rectifier tube.

UR-542. Size 2 1/4 x 2 in. . . \$1.00  
 UT-541. Size 3 3/8 x 2 3/4 in. . . 2.50

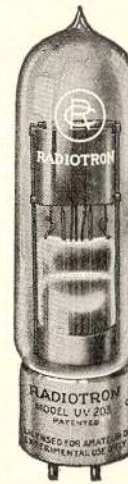


## Radiotron Vacuum Tubes

### Radiotron Vacuum Tubes



UV-204



UV-203



UV-202

Continuous wave telegraphy and telephony is now universally recognized as the best method of transmission. The difficulty of clear transmission through static and interference is greatly overcome by the use of this type of signal. Prior to the introduction of the vacuum tube, the generation of continuous waves was extremely difficult. The introduction on the market of the tube above illustrated has simplified and rendered possible this extremely valuable method of communication.

Type UV-202 is designed for use in small continuous wave telegraph sets, self rectifying sets, and telephone sets. Delivering an output of 5 watts, the combination of two or three of these tubes permits of reliable communication over distances up to 50 miles.

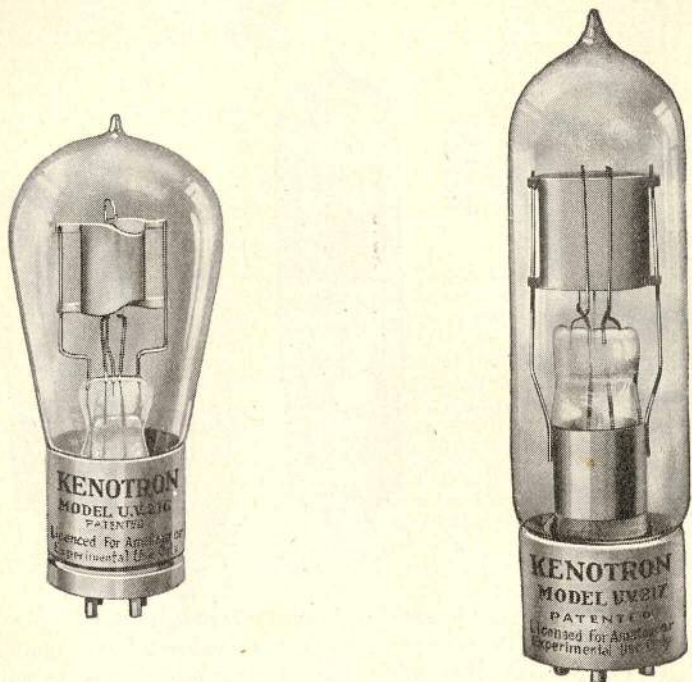
Type UV-203 may be used for the same purposes as the smaller tube. Delivering as it does an output of 50 watts, communication, when using 2 or more of these tubes, may be carried on over distances as great as 1500 miles.

In addition to the two tubes listed above, we are prepared to furnish a larger size tube, Type UV-204. This tube delivers an output of 250 watts. It is suitable for any of the purposes outlined above and is recommended where communication over a greater distance than 1000 miles is required.

UV-204 . . . . . \$110.00  
 UV-203 . . . . . 30.00  
 UV-202 . . . . . 8.00

## Kenotron Rectifying Tubes

### Kenotron Rectifying Tubes



Vacuum tube Type UV-216 is especially designed for the rectification of alternating current and the production of direct current for use with Type UV-202 5 Watt transmitting tubes. This tube is similar in construction to Type UV-202, the grid being eliminated and the only elements being the filament and plate. Two of these tubes, when used in conjunction with the C. W. transformers illustrated in this manual, will give a source of direct current suitable for a small C. W. or radio telephone set.

Type UV-216 20 Watt Kenotron \$7.50

Vacuum tube Type UV-217 is similar in construction to radiotron Type UV-203, the construction being the same in principle as kenotron Type UV-216 above. The tube is intended for the rectification of alternating current and supplies the direct current necessary for the proper operation of the 50 Watt radiotron Type UV-203. Two of these tubes will safely operate 4 Type UV-203 vacuum tubes used in a C. W. or radio telephone set.

Type UV-217 150 Watt

Kenotron .....\$26.50

## C. W. and I. C. W. Circuit

(Grid Chopper) For Operation from D. C. Supply With Radiotrons UV-202 or UV-203

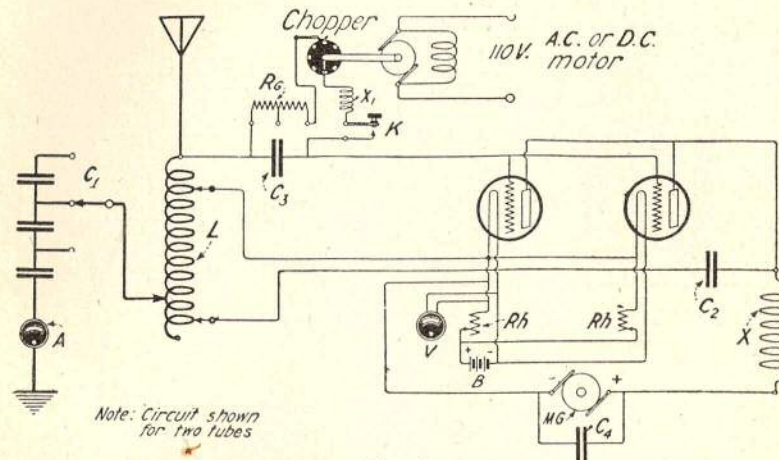


Fig. 2.

LIST OF MATERIAL		Circuit Symbol	RATING OF RADIOTRONS.			
			5-WATT TUBES		50-WATT TUBES	
			Model	Each	Model	Each
1	One or more Radiotron Power Tubes.....		UV-202	\$8.00	UV-203	\$30.00
2	One or more Radiotron Tube Sockets.....		UR-542	1.00	UT-541	2.50
3	Oscillation Transformer .....	L <sub>1</sub>	UL-1008	11.00	UL-1008	11.00
4	Antenna Series Condenser .....	C <sub>1</sub>	UC-1015	5.40	UC-1015	5.40
5	Blocking Condenser .....	C <sub>2</sub>	UC-1014	2.00	UC-1014	2.00
6	Transmitter Grid Leak .....	R <sub>g</sub>	UP-1719	1.10	UP-1718	1.65
7	Grid Condenser .....	C <sub>3</sub>	UC-1014	2.00	UC-1014	2.00
8	Transmitting Key .....	K	UQ-809	3.00	UQ-809	3.00
9	Chopper .....	Chopper	PX-1638	7.25	PX-1638	7.25
10	Radio Frequency Chokes .....	X	(See Note 1)		(See Note 2)	
11	D. C. Filament Voltmeter .....	V	0-15 Volts		0-15 Volts	
12	Filament Rheostat .....	Rh	PR-535	3.00	PT-537	10.00
13	Filament Battery .....	B	10 Volts		12 Volts	
14	Protective Condenser .....	C <sub>4</sub>	UC-1632	1.35	UC-1635	2.00
15	Motor Generator .....	MG	(See Note 3)		(See Note 3)	
16	Antenna Ammeter .....	A	UM-530	6.00	UM-533	6.25
17	Radio Frequency Choke .....	X <sup>1</sup>	(See Note 1)		(See Note 1)	

NOTE 1:—0.5 Mil-Henry Radio Frequency Choke  
Approximately 90 turns No. 30 B. & S. (cotton or silk insulation) on a tube 2 1/4 in. diameter, length of winding 2 in., inductance 0.5 mil-henry at 1,000 cycles.

NOTE 2:—2.2 Mil-Henries Radio Frequency Choke  
Approximately 260 turns No. 30 B. & S. (cotton or silk insulation) on a tube 2 1/4 in. diameter, length of winding 3 1/2 in., inductance 2.2 mil-henries at 1,000 cycles.

NOTE 3:—Rating of Motor Generators

UV-202			UV-203		
No. of Tubes	Watts M. G.	Plate Volts	No. of Tubes	Watts M. G.	Plate Volts
1 or 2	100	350	1	200	750-1000
2 or 4	200	350	2 or 3	500	750-1000

In general a grid chopper gives the same kind of a signal at the receiving station as a spark set gives, and generally over much greater distances.



## Diagram Low Power Radio Telephone Set

Using Constant Current Modulation System with 5 or 50 Watt Radiotron Power Tubes Operating from 110-Volts A. C. Supply

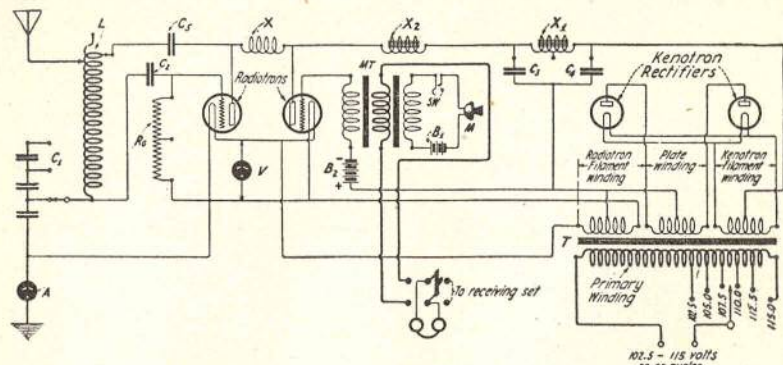


Fig. 4.

LIST OF MATERIAL	Circuit Symbol	RATING OF RADIOTRONS			
		5-WATT TUBES		50-WATT TUBES	
		Model	Price	Model	Price
1 Two RADIOTRON Power Tubes.....		UV-202	\$16.00	UV-203	\$60.00
2 Two Power Tube Sockets .....		UR-542	2.00	UT-541	5.00
3 Power Transformer .....	T	UP-1368	25.00	UP-1016	38.50
4 Oscillation Transformer .....	L	UL-1008	11.00	UL-1008	11.00
5 Two KENOTRON Rectifier Tubes .....		UV-216	15.00	UV-217	53.00
6 Two KENOTRON Tube Sockets.....		UR-542	2.00	UT-541	5.00
7 Radio Frequency Choke Coil .....	X	(See Note 1)		(See Note 2)	
8 Plate Reactor .....	X <sup>2</sup>	UP-415	5.75	UP-415	5.75
9 Filter Reactor .....	X <sup>1</sup>	UP-1626	11.50	UP-1627	15.75
10 Filter Circuit Condensers .....	C <sup>3</sup> C <sup>4</sup>	(See Note 3)	5.55	(See Note 3)	10.00
11 Microphone Transformer .....	MT	UP-414	7.25	UP-414	7.25
12 Microphone Transmitter .....	*M	284-W		284-W	
13 Microphone Battery .....	*B <sup>1</sup>	6 Volts		6 Volts	
14 Microphone Switch .....	SW	S.P.S.T.		S.P.S.T.	
15 Grid Bias Battery .....	‡B <sup>2</sup>	44 Volts		44 Volts	
16 A. C. Filament Voltmeter .....	V	0-15 Volts		0-15 Volts	
17 Transmitter Grid Leak .....	Rg	UP-1719	1.10	2 UP-1718	3.30
18 Antenna Series Condenser .....	C <sup>1</sup>	UC-1015	5.40	UC-1015	5.40
19 Antenna Ammeter .....	A	UM-530	6.00	UM-533	6.35
20 Blocking Condenser .....	C <sup>2</sup>	UC-1014	2.00	UC-1014	2.00
21 Grid Condenser .....	C <sup>3</sup>	2-UC-1014	4.00	2-UC-1014	4.00

NOTE 1:—0.5 Mil-Henry Frequency Choke  
Approximately 90 turns No. 30 B. & S. (cotton or silk insulation) on a tube 2 1/4 in. diameter, length of winding 2 in., inductance 0.5 mil-henry at 1,000 cycles.

NOTE 2:—2.2 Mil-Henries Radio Frequency Choke  
Approximately 260 turns No. 30 B. & S. (cotton or silk insulation) on a tube 2 1/4 in. diameter, length of winding 3 1/2 in., inductance 2.2 mil-henries at 1,000 cycles.

NOTE 3:— 2 UV-202 4 UV-202 2 UV-203

C3	1-UC-1632	1-UC-1632	2-UC-1635 in parallel
C4	2-UC-1632 in parallel	2-UC-1632 in parallel	3-UC-1635 in parallel

\*Four Dry Cells or 6-Volt Storage Battery.  
†Western Electric No. 284-W is recommended.  
‡Two Blocks of Burgess' Battery, 22 1/2 Volts each, No. 2156.

All of the energy of power tubes can be efficiently delivered to antenna on wave lengths of 200 meters and lower.

## Reinartz Receiver

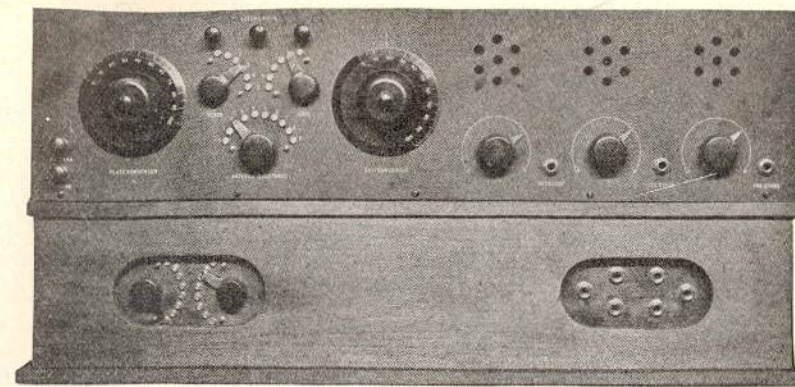


Illustration 1

### Introduction\*

The Reinartz Receiver is undoubtedly one of the simplest receivers that has yet been designed. It differs essentially from the Armstrong circuit in that instead of two variometers and a variocoupler, two condensers and a spider-web coil are used.

The unique simplicity of this receiver does not, however, in any way detract from its efficiency. In fact the range of reception of this set, if properly constructed and hooked up, includes, under good weather conditions, practically every broadcasting station in the United States.

Being one of the simplest circuits yet designed, the cost of construction is naturally very low. And because of the fact that you are making this set, the cost should be greatly less than any equally complete set that can be purchased.

The saving in cost, however, is not the only value gained in making the set. When you have completed the set, finished the wiring and all, you know what the parts mean, and how

\* Re-edited from an article in and by courtesy of the Chicago Evening American.

they function. You gain a real working knowledge into the mysteries of radio.

The hook-up as given offers you the option of using the regulation vacuum tube with storage batteries, or the new W. D. 11 tube with dry cell batteries or 2-V Storage Batteries.

Although the circuit as given is for detector and two steps of amplification, by cutting down on the amplifying steps, you can make either the detector tube unit alone or a unit with one step of amplification.

Illustration 1 shows the front of the Reinartz Receiver when completed. The upper part contains the receiver proper which is separated from the lower part by the mounting board upon which the various parts are mounted. Beneath this, or in the lower cabinet are placed the "B" Batteries and controls and jacks for five phone sets. The latter you can either reduce in number or dispense with entirely if desired.

## Reinartz Receiver

### Recommended Parts for Reinartz Receiver

One piece Bakelite or Formica, 7x28x $\frac{3}{8}$ inches for panel, per sq. inch.....	\$0.02
One piece Bakelite or Formica, $\frac{3}{4}$ x5x $\frac{3}{8}$ inches for binding, per sq. inch.....	.02
Three Howard Switches...Ea.	.50
Twenty-two Howard Switch-points .....	.03
Six switch stops.....Ea.	.04
Two plain Howard rheostats Ea.	1.10
1 Vernier Howard rheostat Ea.	1.50
Three sockets .....	.75
One variable condenser, .00025 with vernier adjustment and dial .....	4.25
One variable condenser, .0005 with vernier adjustment and dial .....	5.00
One Spiderweb coil, unmounted	3.00
Honeycomb coil, (optional) mounted .....	2.00
One Grid Leak 1 $\frac{1}{2}$ meg., variable .....	1.50
One Grid condenser, .0005 capacity .....	.35
One audio transformer 10 to 1 ratio .....	4.75
One audio transformer 5 to 1 ratio .....	4.75
Two No. 104 jacks or No. 105 if filament control is used .....	\$1.00 1.10
One No. 101 jack or No. 103 if filament control is used .....	\$0.70 .90
50 feet No. 14 Tinned Copper..	.50

### Accessories

Phones .....	\$5.00 to \$12.00
Loud Talkers .....	\$35.00 to 55.00
Batteries, Burgess "B" 45V..	5.50
Chi-Rad (Storage) \$6.00 and Plug—Carter, 2 at \$1.50....	3.00
Tubes—WD 11 .....	6.50
U.V. 200-C300 .....	5.00
U.V. 201-C301 .....	5.00
U.V. 201A-C301A.....	9.00
(Any Three)	
Antenna Wire, 7-22 Stranded, Foot .....	.01
Plain Copper .....	.80 Feet
Lead in Wire No. 14 R.C. Foot	.015
4 Insulators at 25c.....	1.00
1 Knob Porcelain .....	.05
1 Ground Clamp .....	.05
1 Radio Call Book.....	.50

### Drilling the Panel

The first step after purchasing the necessary parts is the drilling of the panel. Diagram 1 will greatly assist you in this.

Starting from the left you will notice two  $\frac{3}{16}$ " holes which are used for the antenna and ground connections. The small  $\frac{3}{32}$ " holes on the bottom of the panel are for mounting the panel to the mounting board. The measurements for the holes to support the condensers have been left out. When you have selected your condenser merely place it on the panel and bore holes that will correspond to the holes of the mounting stud of the condenser. (It is advisable to use a Vernier type condenser for the grid or tuning condenser if not used for the plate condenser. The grid condenser is fixed at .0005 capacity and a grid leak of 1 $\frac{1}{2}$  meg.)

The holes for the 3 switch levers and the switch-points are given for Howard switches and switch-points. If you prefer to use other parts here measurements should be changed accordingly. The holes for the switch-points are drilled  $\frac{3}{8}$ " apart on a radius of 1 $\frac{3}{32}$ ".

If greater wave length range is desired, such wave length as permits the reception of government signals, Arlington time, etc., a Honeycomb coil may be added if desired.

The three  $\frac{3}{16}$ " holes above the switches are for three binding posts to use with the exterior coil for these higher wave lengths. The dotted lines in diagram No. 2 show the connections that should be made to these three posts. If you do not care to add the Honeycomb coil, omit the boring of these holes and the following instructions which apply to the same.

A 300 turn Honeycomb coil with a tap about  $\frac{1}{3}$  of the inside to be connected to the center binding post or a 250 turn Spider Web coil, constructed on a 2 $\frac{1}{2}$ " center with one tap at 90 turns to be connected to

## Reinartz Receiver

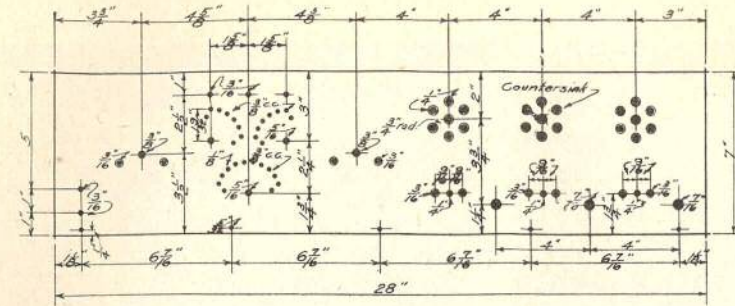


Diagram 1

### Mounting

the center post, will give very good results. When a coil is used the switch arms of the grid and antenna inductance should be turned to the switch points connected to the binding posts above. This throws part of the Spider Web coil out of the circuit and makes use of the exterior coil and the plate circuit of the set for higher wave lengths.

To the right of the tuning or grid circuit, holes have been drilled for the rheostats and jacks. It is advisable to use a Vernier rheostat on the detector, but on the first and second steps, plain rheostats can be used. The measurements and holes given on the drawing are for Howard rheostats and Carter jacks.

After you have completed the drilling, it is advisable to dull finish the panel. This can be done with fine sand paper or steel wool (always rub in the same direction), so as to remove any scratches that might have been made in drilling.

The next step after drilling the panel is to mount the various parts on the mounting board. This can be done best by following illustrations 2 and 3. Illustration 2 shows the various parts from the rear, and illustration 3 from the top. In illustration 3, the larger condenser is seen to the left mounted on the panel, next the Spider Web coil showing the wiring connections with the panel switch-points, next the smaller condenser and above that the grid leak and grid condenser, and at the right, the detector and 2 amplifying tubes in a row. Below these 3 are the 3 rheostats mounted on the panel.

Above are the 2 transformers, the 10 to 1 on the left and the 5 to 1 on the right. Above the transformers is the assembly for the binding posts.

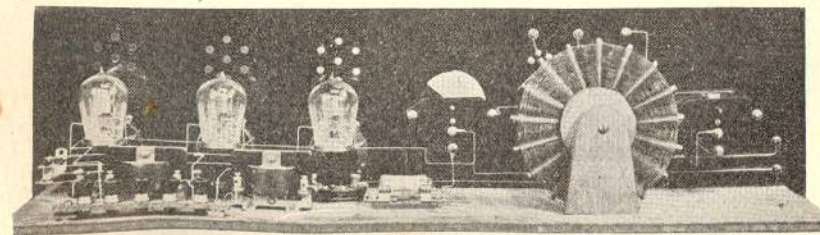


Illustration 2

# Reinartz Receiver

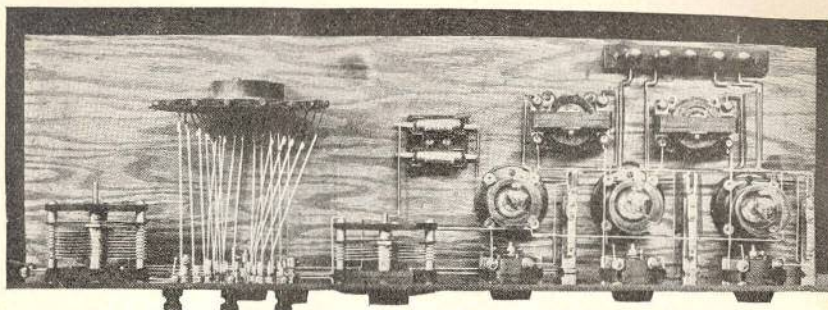


Illustration 3

## Wiring

After the mounting of these parts comes the wiring. For the wiring, consult illustrations 2 and 3 and diagram 2.

It is advisable to keep all wires free from the mounting board, with all connections being made on a bakelite or a formica strip in the rear, as wood is a slight conductor of electrical currents. The wiring can be of No 14 tinned copper, rolled between blocks of wood to make them straight before making the proper bends.

All joints should be made as good as possible and soldered. Care should be taken not to use too much soldering paste. Each joint should be well cleaned to remove any excess paste. Carelessness will prevent an otherwise well made set from giving good results.

It is important to note that grid connections in all cases should be made as short as possible and the grid leak and grid condenser should be placed near the grid connection on the detector socket.

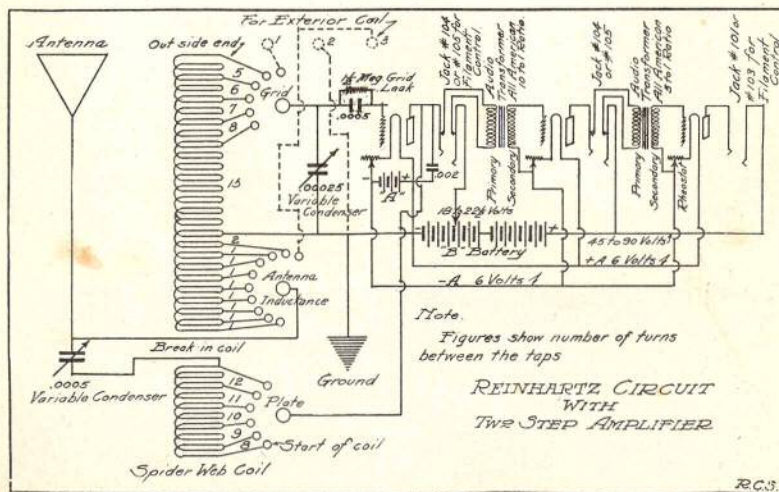


Diagram 2

# Reinartz Receiver

## Wiring the Jacks

The wiring of the Spider Web coil should be left until the last, as you will find it in the way if wired before the rest of the set.

The circuit does not show filament control jacks. This is to keep the circuit as simple as possible, but if some are wanted, it will be necessary to use the No. 105 jack in place of the 104 shown on the drawing for the detector and first step and the 103 jack in the second step.

In using the filament control jacks, the negative "A" is connected to the top of each jack, with the second connection from the top of the second step jack to the third from the top on the first step jack, with a lead off of this wire to furnish current to the second step rheostat.

The second from the top of the first step jack goes to the third from the top of the detector, with lead from this wire to the first step rheostat. The second from the top of the detector jack goes direct to the rheostat of the detector tube. This completes the wiring for the filament control.

The ground and antenna should be connected to the movable plates in place of the fixed so that the set will not be troubled with body capacity.

In connecting the transformers, the plate goes to the outside lead of the primary and the grid of the next step to the outside lead of the secondary.

## Spider Web Coil

In the following section, we give you complete instructions on how to make a Spider Web coil. If, however, you do not wish to make this coil, we can furnish you with one as listed in our complete list of parts for the Reinartz receiver.

Diagram 3 shows how to construct the Spider and how to start the wind-

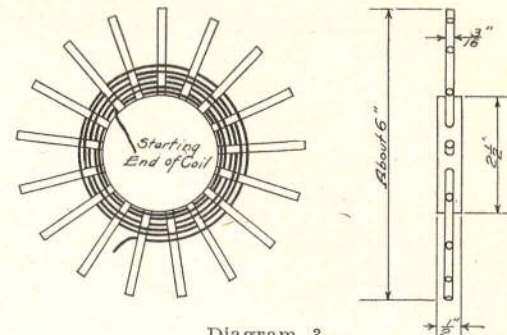


Diagram 3

ing of the coil. The Spider has an odd number of spokes, so your wire will always be on the opposite side of the spoke on the next turn. Use No. 22 double covered copper wire.

Begin the winding at the center of the Spider at the bottom of one of the spokes, leaving about 2" of wire projecting to make your first connection. Now wind the wire in and out as shown on the drawing, passing over two spokes before crossing to the other side of the Spider.

After making eight complete turns take off a tap by twisting the wire, leaving a 1" tap about 1/2" from the first tap or starting point. Continue to wind as before, taking off the taps as indicated on drawing No. 2 about 1/2" from the one before. Drawing No. 2 indicates the number of turns between each tap.

When the plate coil is finished, the wire is cut off, leaving about 2" for the tap. Now start the second or antenna inductance coil on top of the first coil. Follow drawing No. 2 for this, too. In finishing, the last tap can be held in place by passing the wire through a small hole drilled in the end of one of the spokes.

It is also advisable to arrange your taps so that they will be opposite the switch-points when the coil is finished as this will help you in wiring the set.

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