Radio and Model Engineering

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Editorial

Radio and Model Engineering is intended as a concrete indication of the interest in the success of Experimenter's work which makes the G. A. Company unique among supply houses. This bulletin of ideas is published because the men behind the G. A. Company realize that their responsibility is not limited to the furnishing of first class materials and apparatus, but ends only when the material has been made into instruments which work, or the apparatus is in satisfactory operation.

To this purpose Radio and Model Engineering will be devoted exclusively, giving only designs of apparatus actually built in the G. A. laboratories, or accurate reports of experiments made, yet the subjects treated will be confined to those of interest to the Experimenter of average understanding, means, and shop equipment.

This policy has been adopted because it is believed that even one real article is valued by Experimenters above pages of generalities and news.

M. B. Sleeper,
Editor.

P. S. Send twenty-five cents for June, July and August issues to *General Apparatus Company, Inc. 570 West 184th Street, New York City.*

A B Battery Telephone Set

This set has a range of 0.5 to 5 miles using the new 5-watt tubes in a circuit simplified to essentials.

By M. B. Sleeper

General Description. THE radio telephone set shown in Figs. 1 and 2 is a sort of Ford-Packard outfit—inexpensive, yet efficient, with an appearance equal to high-priced apparatus.

A tuned plate circuit was employed, with variable grid coupling. With the average sending antenna this set will tune from 175 to 350 meters.

Layout of the Panel. FIG. 3 shows the location and sizes of the holes in the 10x10x3/16-in. L.P.F. panel. The illustration is exactly one-half size, so that dimension can be scaled off readily. Where two circles surround an indicated center, the hole was countersunk. The 2 9/16" hole for the radiation meter was made by drilling a series of small holes in a circle.

Winding the Coils. A CONDENSITE celleron tube, 3½ ins. outside diameter was cut off and drilled as in Fig. 3. The holes for the shaft and supporting pillars were drilled carefully to insure alignment. Taps were made in the form of 3-in. loops, slightly twisted and soldered at the tube while the coil was being wound.

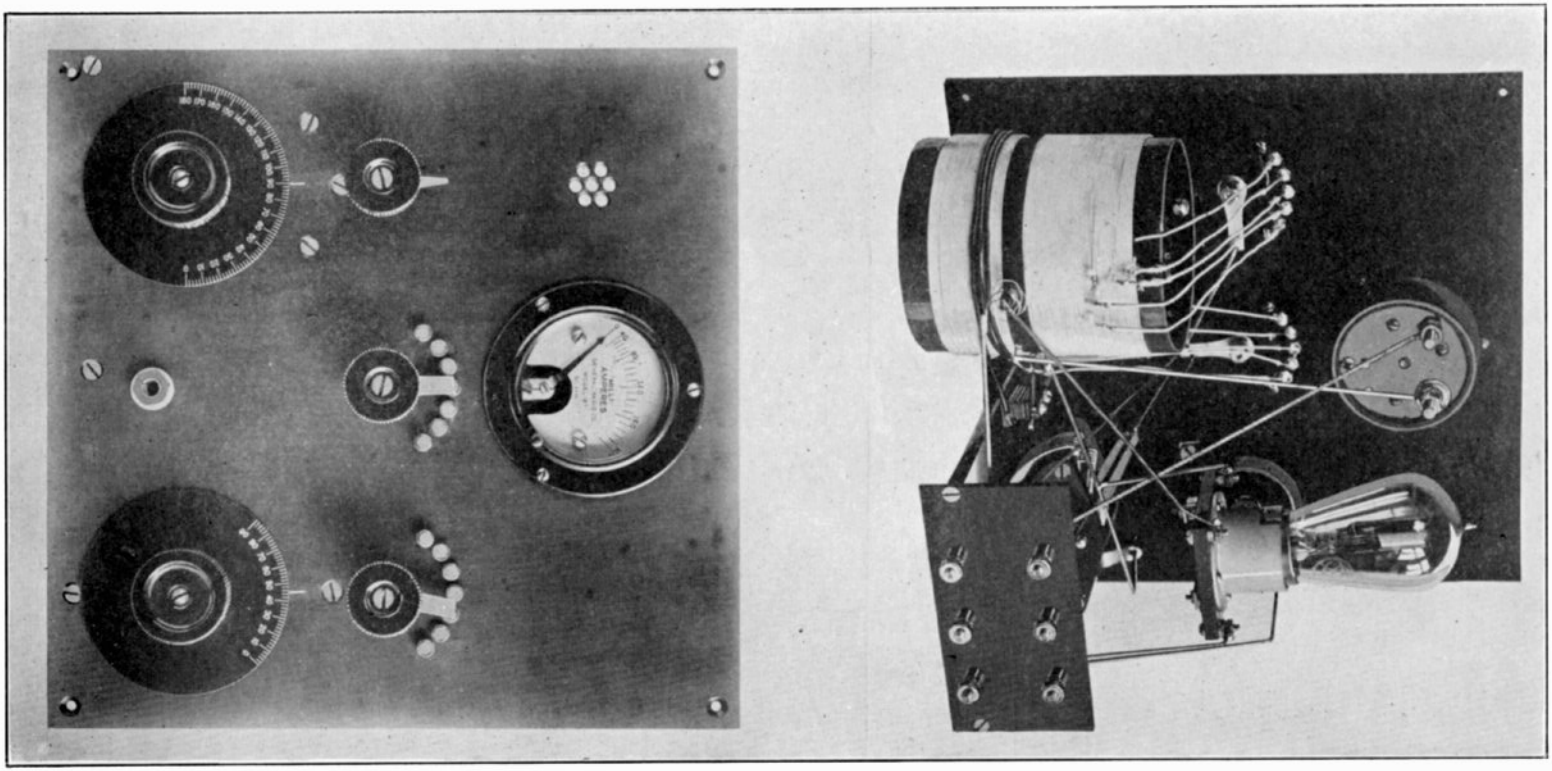
The grid coil was wound on a 3-in. ball, with 16 turns on each side, all windings being of No. 20 D.C.C. wire. One lead was soldered to the ¼-in. brass tube which served as a shaft, while the other, put thru a hole in the shaft, was brought out to the rear, insulated with a piece of Empire tubing. Flexible connections are shown in Fig. 1.

Small Parts Needed. THE variable condenser, a new G. A. Standardized type of 0.0002 mfd. capacity, is mounted on the panel by two ½-in. 8-32 flat head screws under the Amrad dial. Above is a Paragon rheostat and an Ace socket, supported by brackets of ⅜x1/16-in. brass strips, dimensions for which are given in Fig. 3.

A General Radio ammeter, 0 to 200 milliamperes, has a range sufficient for the radiation when the plate voltage does not exceed 250. Modulation is provided by an absorption coil of 3 turns of annunciator wire around the antenna inductances, connected to the open circuit Federal jack. Here a No. 329 Western Electric microphone transmitter is plugged in. In case the set is used for telegraphing, a buzzer, key, and battery can be connected in series with the absorption coil.

Connections were made to binding posts on the rear panel. This was located to fit in the new G. A. Standardized instrument case, made of L.P.F. instead of wood. The case is of ⅛-in. material, with a dull grain finish.

Assembly of the Parts. WHEN the parts were ready to assemble, the condenser, rheostat, switches, and hot-wire ammeter were put on at first, then the jack, coil, socket and connection panel. Lugs were used for soldering the wires to the binding posts, socket, and rheostat. It should be noted that the socket was mounted with the positive filament and plate terminals next to the panel.



Figs 1 and 2. The telephone set ready to talk or send music.

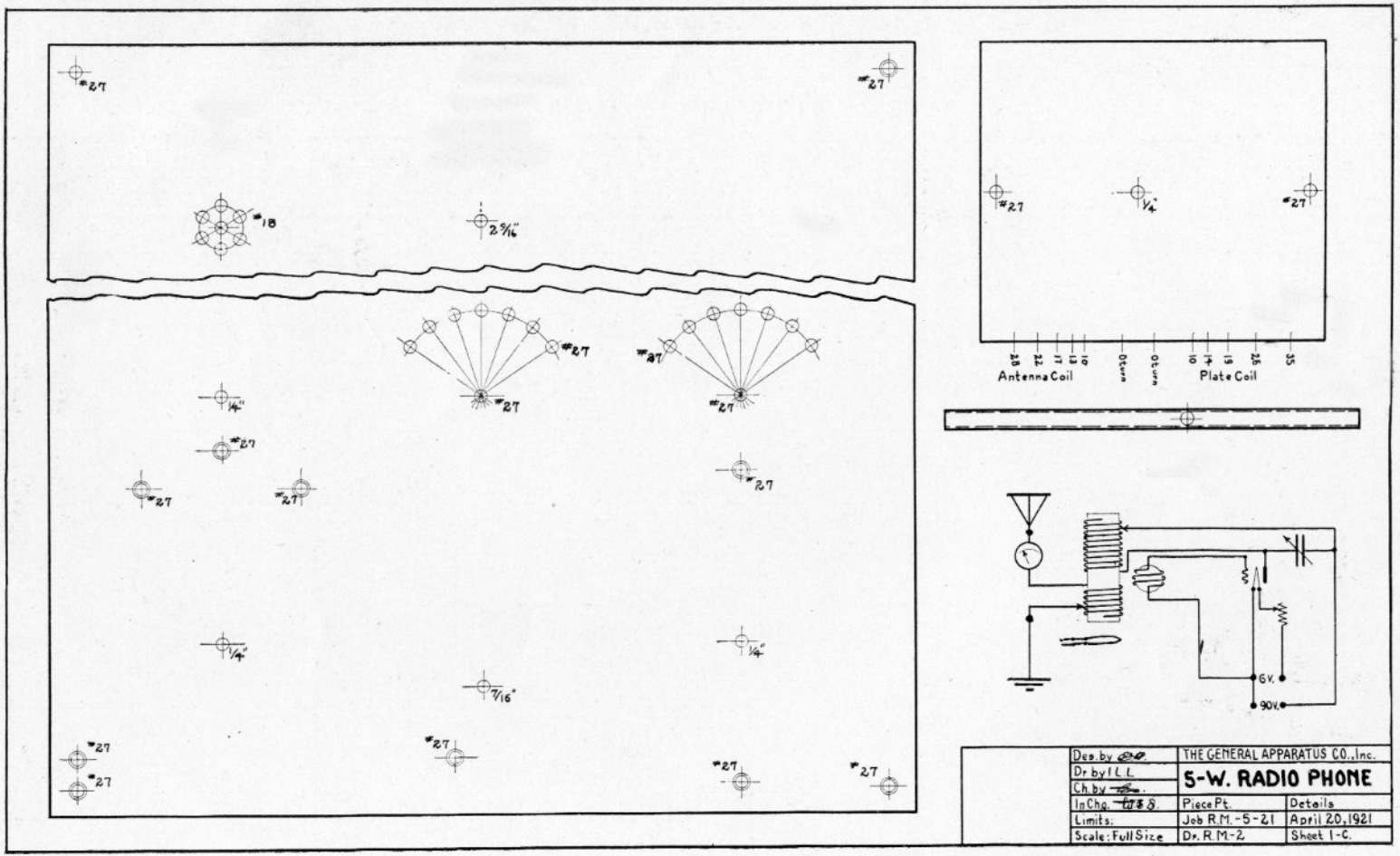


Fig. 3. ½ Size. Locations for holes in the main panel, inductance tube, and variometer shaft are shown, with a hook-up at the right.

Operating the Transmitter. ALTHO the rated voltage for the UV202 tubes is 7.5, this set was operated on a 6-volt Witherbee storage battery, with the rheostat entirely cut out. Voltages of 67 to 180 were obtained from B batteries. The most practical supply, for transmission up to 2 miles, is 90 volts, obtained from the new G. A. 45-volt batteries. These batteries have shown under test a life of six months under normal use, and, by actual computation, their cost is less than that of lighting current, at 10 cents per kilowatt-hour, to operate a motor-generator.

Prices of Parts and Materials. FOLLOWING is a list of the supplies needed for this set, and the prices at which they can be obtained from the G. A. Company.

1—L.P.F. panel, 10x10x3/16 in., for front	$2.70
1—L.P.F. panel, 4¾x2½x⅛ in., for rear	.24
2—Knob and dial, 90 or 180 degrees, per set	1.60
2—Switch, 1-in. radius, 40c ea.	.80
10—Switch points, ⅜-in. high, 6/32 thread, 4c ea.	.40
4—Stopping point, ¼-in. high, 4c. ea.	.16
1—Paragon rheostat	1.75
1—Navy type knob for rheostat	.25
1—General Radio 0-200 milliammeter	7.75
1—Open circuit jack	.70
1—Plug for microphone transmitter	2.00
1—Western Electric microphone, for bracket mounting	4.00
1—Brass strip, ⅜x1/16in., 12-in. length	.15
1—G.A.STD. condenser, 0.0002 mfd.	3.25
1—3½-in. C..C. tubing, 5 ins. long	1.66
1—No. 20 D.C.C. wire, ½ lb. spool	.90
2—3/16-in. square brass rods for rear panel supports, 20c ea.	.40
1—Soldering lugs, package of 20	.25
6—Square copper wire, No. 14 equivalent per 1-ft. length, 2c	.12
1—3-in. variometer ball	.90
2—Brass pillars to mount coil, 8c ea.	.16
1—¼-in. brass tube 1/32-in. wall, 12-ins.	.20
6—G.A.STD. binding post, polished nickel, 10c ea.	.60
1—UV 202 5-watt tube	8.00
1—10x10x5-in cabinet of dull finished L.P.F.	7.90
1—Empire tubing, per ft.	.20
1—6-32 brass hex nuts, package of 15	.20
1—½-in. 6-32 screws, nickeled, package of 15	.36
1-in. 6-32 screws, nickeled, package of 15	.54
2—G. A. Standardized 45-V. B. Battery, $5.00 ea.	10.00
1—Witherbee 40 ampere-hour storage battery (fully charged)	15.00
Complete set of parts to make the set as illustrated without B batteries cabinet or storage battery	38.90
Front panel drilled, extra	2.00
Front panel fully engraved, extra	3.25
Rear panel drilled, extra	.50
Rear panel fully engraved, extra	1.50

Such an equipment is equal in transmitting range to sets which sell at one hundred dollars and more.

Single Circuit Audion Receiver

This set, operated by two controls, tunes from 150 to 3,200 meters.

By George Hild.

Selection of Design. THE experimenter who is making up his first audion detector set, and often the advanced student who builds a stand-by outfit, is usually perplexed by the multitude of designs possible. Starting with the circuit elements, he adds one thing and another until the set becomes too awkward or too expensive.

Here is a little outfit, designed for a standardized L.P.F. cabinet, 10x5x5 ins., that brings in the signals as well as a loose coupler outfit, and is equal in efficiency and appearance to panel sets running up to seventy-five dollars in price. The simplicity of the design and circuit assures the success of the builder, for there are no tricks or catches.

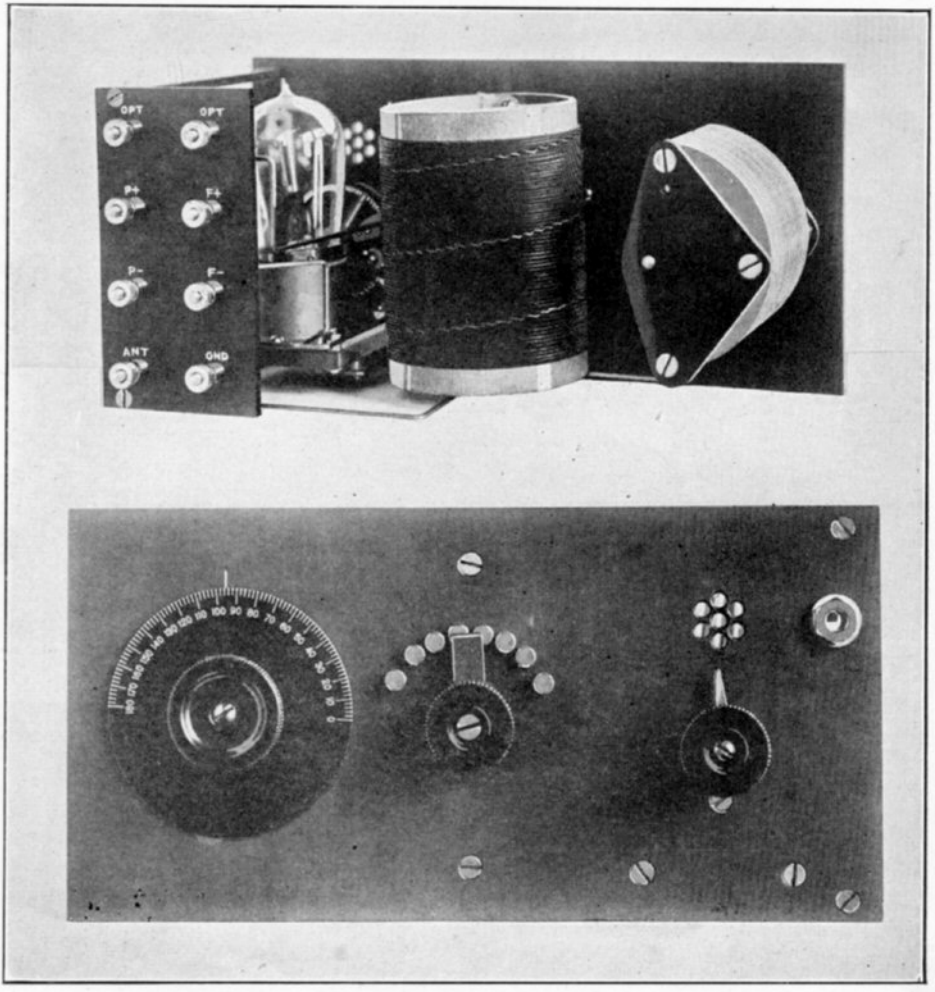
Laying Out the Panel. FIGS. 1 and 2 show the front and rear of the set, with half-size drawings of the panel, inductance tube, rear panel support rods, and socket brackets in Fig. 3. Locations for the holes can be scaled off readily

Winding the Coil. G-A-LITE tubing, 3 ins. in diameter, is used as a form for the coil. Altho condensite celleron is preferable, it is difficult to wind it with two banks. The details of the inductance and wavelength ranges are given below. These are based on the use of a G.A.STD. condenser of 0.0008 mfd.

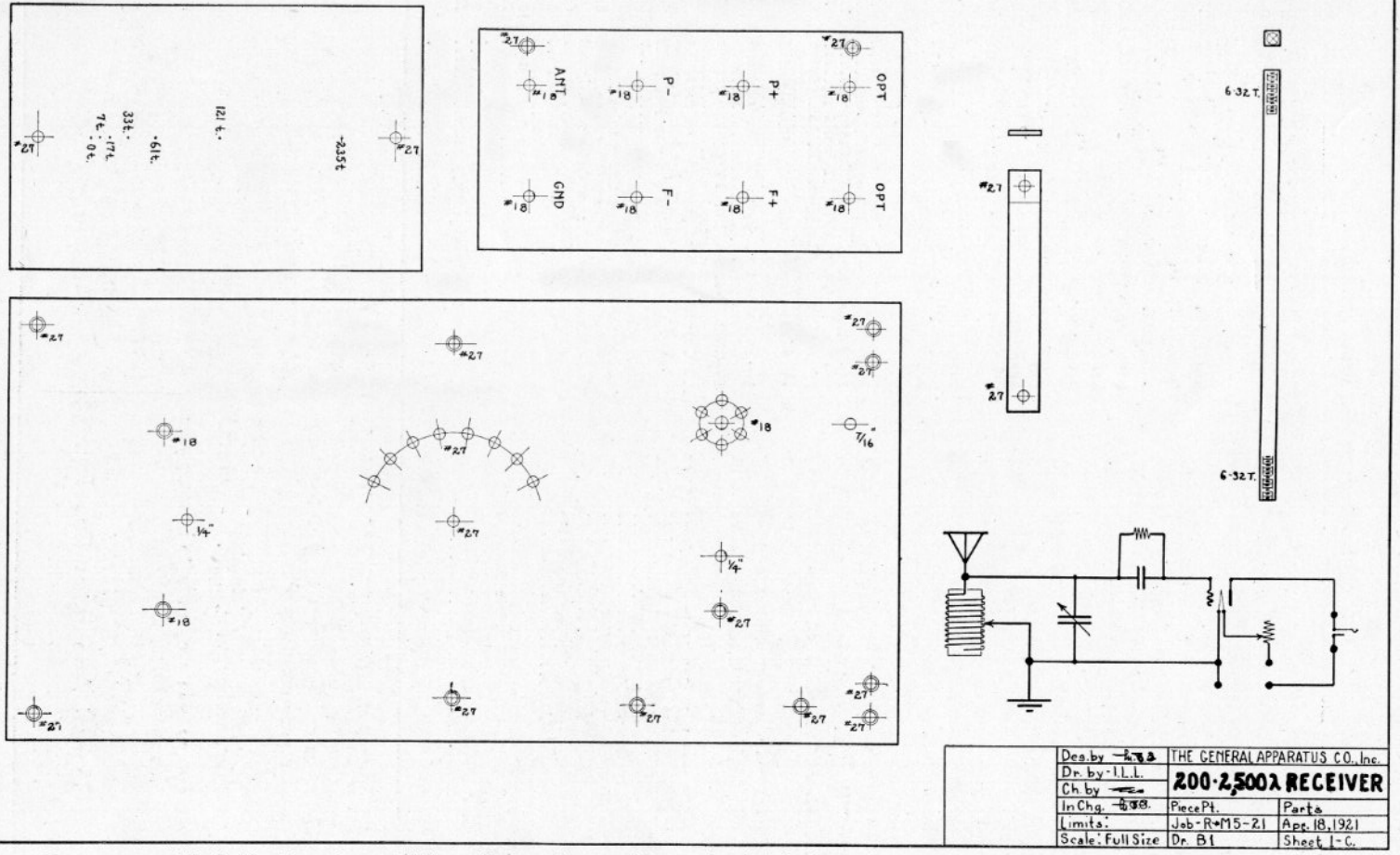
First Tap—0.02 millihenries, 0.1 in., 7 turns 146 to 267 meters
Second Tap—0.05 millihenries, 0.21 in., 17 turns 231 to 421 meters
Third Tap—0.14 millihenries, 0.41 in., 33 turns 386 to 705 meters
Fourth Tap—0.40 millihenries, 0.72 in., 61 turns 653 to 1192 meters
Fifth Tap—1.20 millihenries, 1.45 ins., 121 turns 1132 to 2065 meters
Sixth Tap—3.00 millihenries, 2.8 in., 235 turns 1788 to 3264 meters

A hint about winding the coil will save much trouble. When the wire is brought from the tube up to the top layer, it should be brought over the previous top turn and then down on top of the lower turn. Throwing up the turns in this way gives the effect noticeable in Fig. 1.

Assembling the Parts. THE coil is mounted on brass pillars 11/16 in. long, threaded 6-32 clear thru. Screws are put in from the inside



Figs. 1 and 2. Ready to receive over and range of 500 to 1,000 miles.



Des. by	THE GENERAL APPARATUS CO., Inc.	
Dr. by - I.L.L.	200-2,500λ RECEIVER	
Ch. by		
In Chg.	Piece Pt.	Parts
Limits:	Job - R+M5-21	Apr. 18, 1921
Scale: Full Size	Dr. B1	Sheet 1-C.

Fig. 3. 1-2. Above, Layout of the coil tube and connection panel; sochet hacket, and connection panel supporting rod'

of the coil, and screws thru the panel into the other ends secure the pillars and coil. If the rear panel, of ⅛-in. L.P.F., 4¾x2½ ins., is mounted on the rods as shown, the panel will fit the 10x5x5 in. STD cabinet. Having the binding posts on the rear is a great advantage because it takes all the wires from the front. The tube socket is mounted with the positive filament and plate contacts toward the panel, and the terminals of the rheostat on the right, looking at the rear. The grid leak condenser is mounted vertically behind the connection panel, supported by the wiring.

Operation of the Receiver.

A 22.5-VOLT B battery and 6-volt storage battery are needed to operate the tube. The antenna may be a single No. 14 copper wire 100 ft. long and 25 ft. high at each end, with a water pipe ground connection. However, such combinations as a gas pipe and water pipe can be substituted for the antenna and ground, or a wire soldered to a tin roof for the antenna. With the new Radiotron 200 tubes practically no resistance is needed when 6 volts are applied to the tube

List of Parts Required.

THE following list of parts will serve as a guide to the constructor, both as to the cost of the items and the things needed. These are supplied by the G. A. Company and are always in stock.

1—L.P.F. panel, 10x5x3/16 in., for front	$1.35
1—L.P.F. panel, 4¾x2½x⅛ in., for rear	.23
1—L.P.F. STD cabinet, 5x10x5 ins.	5.20
6—Switch points, 4c ea.	.24
2—Stopping points, 4c ea.	.08
1—G. A. grid leak condenser	.50
1—Amrad knob and dial, 180 degrees	.80
2—Rear panel support rods, 10c ea.	.20
8—STD nickel plated binding posts, 10c ea.	.80
1—Ace audion socket	1.50
1—Paragon rheostat	1.75
1—Brass strip, ⅜x1/16 in., per ft.	.10
1—Closed circuit Federal jack	.85
1—G. A. STD variable condenser, 0.0008 mfd.	4.30
1—Package of 20 No. 6 soldering lugs	.25
2—Coil supporting pillars, 10c ea.	.20
1—½-lb. spool No. 24 S.S.C. wire	1.25
1—3-in. G-A-Lite tube, 12 ins. long	.35
1—Package 6-32 ½-in. R. H. brass screws	.12
1—Package 6-32 ½-in. F. H. nickeled screws	.36
1—Package 6-32 ¾-in. F. H. nickeled screws	.45
3—12-in. lengths No. 14 square copper wire, 2c ea.	.06
Complete set of parts to construct this receiver, as listed above, can be assembled with the simplest tools in a few hours	18.95
Auxiliary Equipment:	
Radiotron U. V. 200 detector tube	$5.00
Radiotron U. V. 201 amplifier tube	6.50
Two-filament tubular audiotron, original type	6.00
Signal Corps, size B battery, 22.5 volts	1.25
Navy size B battery, 22.5 volts	2.00
Witherbee storage battery, 40 A H., 6 V	15.00
Federal telephone plug	2.00
Inductance, wound and tapped as shown	3.00
Front panel fully engraved, extra	2.50
Rear panel fully engraved, extra	2.10