Jan. 10, 1928.

1,655,985

F. CONRAD

WIRELESS RECEIVING CABINET

Filed April 18, 1922

5 Sheets-Sheet 1

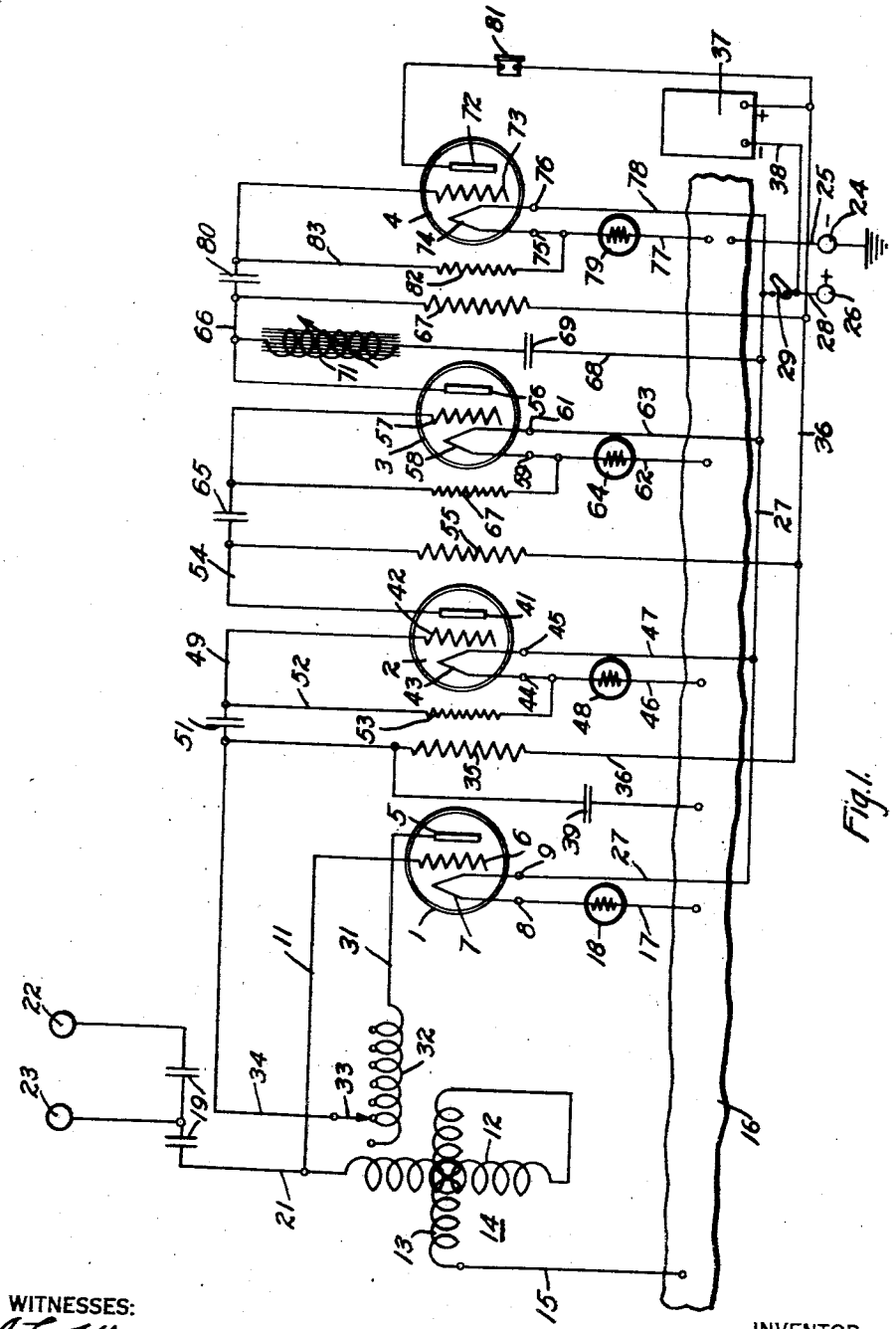


Fig. 1.

WITNESSES:

H. L. Jeffrey

H. L. Godfrey

INVENTOR

Frank Conrad

BY

Wesley G. Carr

ATTORNEY

Jan. 10, 1928.

1,655,985

F. CONRAD

WIRELESS RECEIVING CABINET

Filed April 18, 1922

5 Sheets-Sheet 2

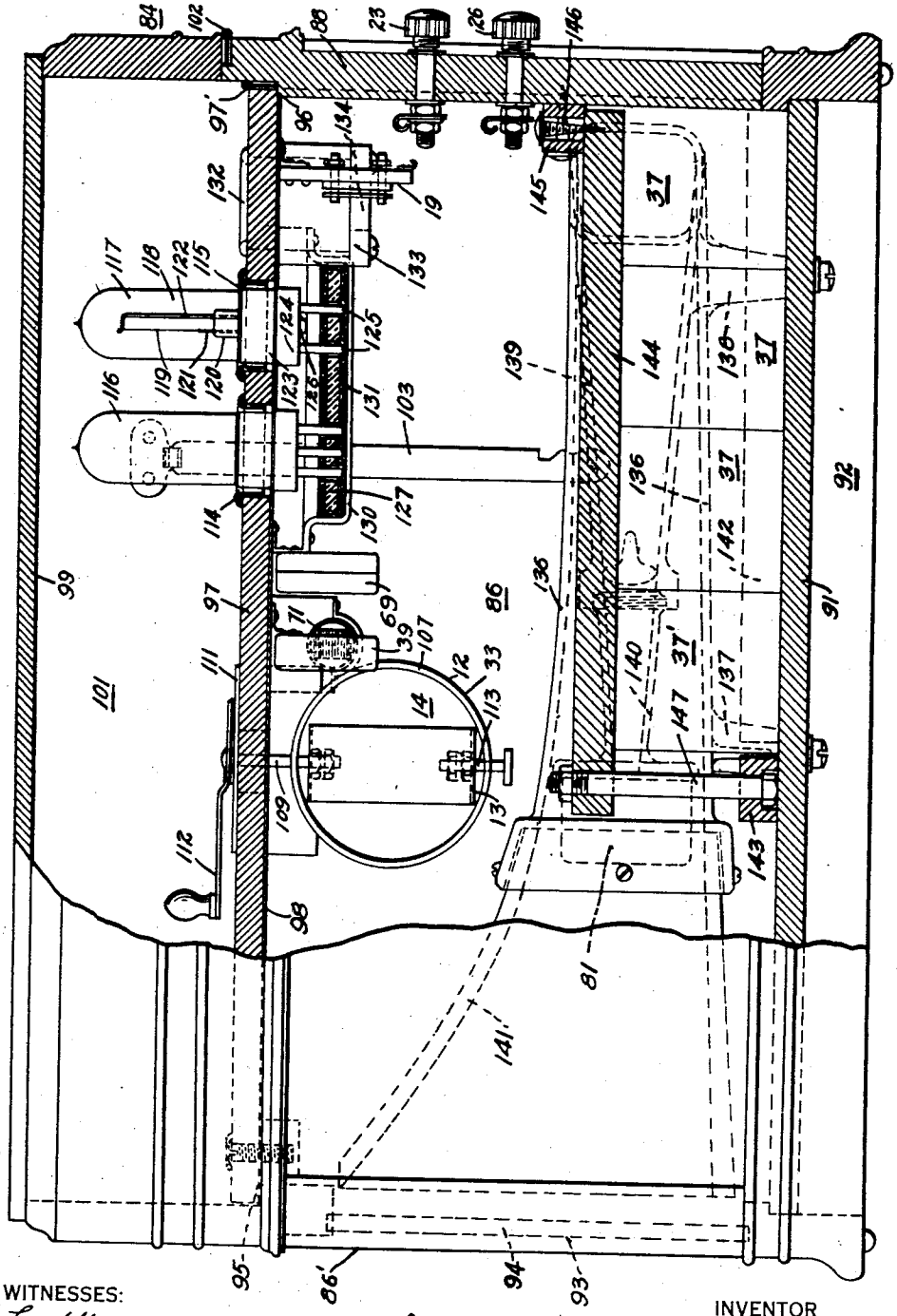


Fig. 2.

WITNESSES:

A. L. Jeffrey

H. L. Godfrey

INVENTOR

Frank Conrad

BY

Wesley G. Carr

ATTORNEY

Jan. 10, 1928.

1,655,985

F. CONRAD

WIRELESS RECEIVING CABINET

Filed April 18, 1922

5 Sheets-Sheet 3

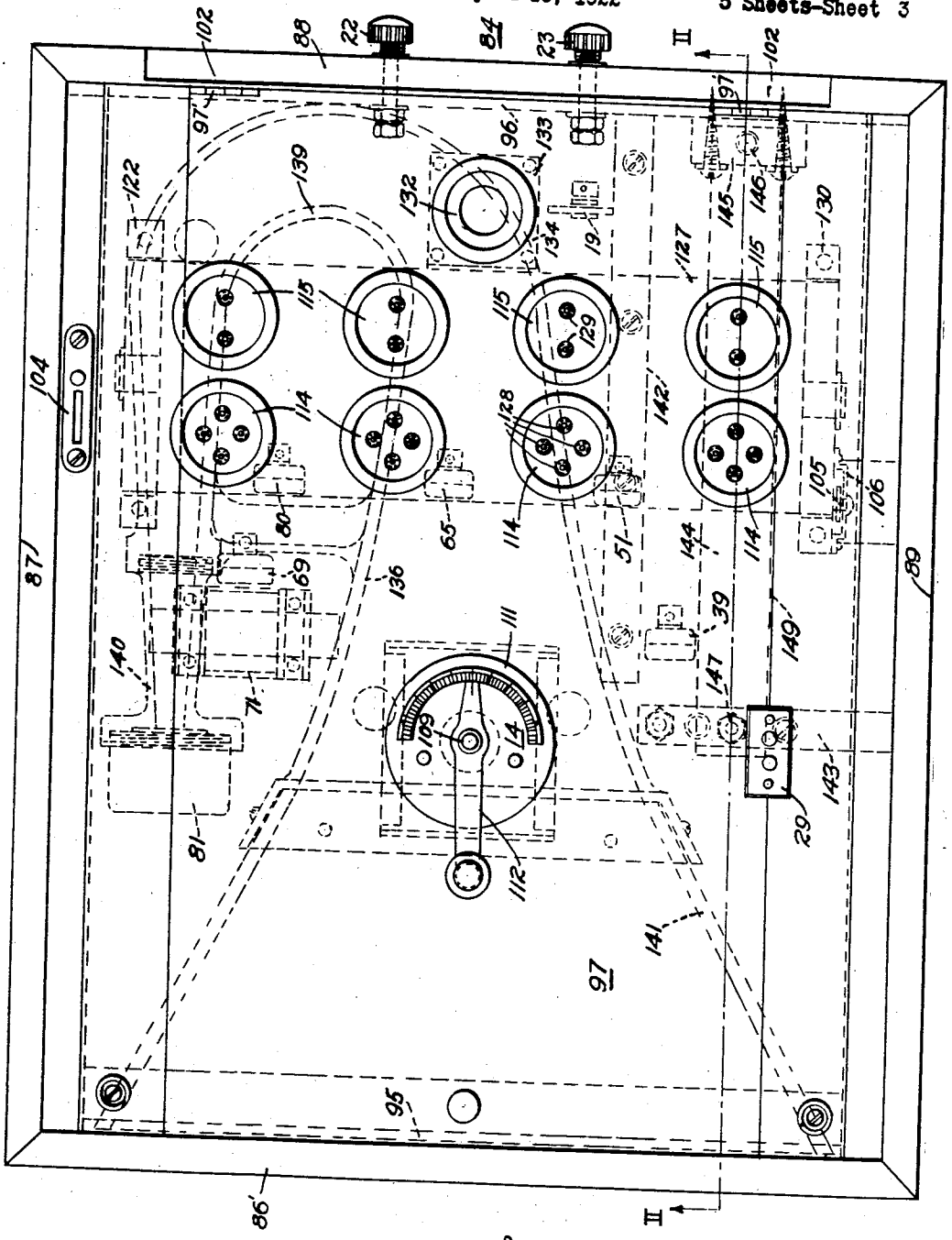


Fig. 3.

WITNESSES:

A. L. Jeffrey

H. L. Godfrey

INVENTOR

Frank Conrad

BY

Merle G. Cook

ATTORNEY

Jan. 10, 1928.

F. CONRAD

1,655,985

WIRELESS RECEIVING CABINET

Filed April 18, 1922

5 Sheets-Sheet 4

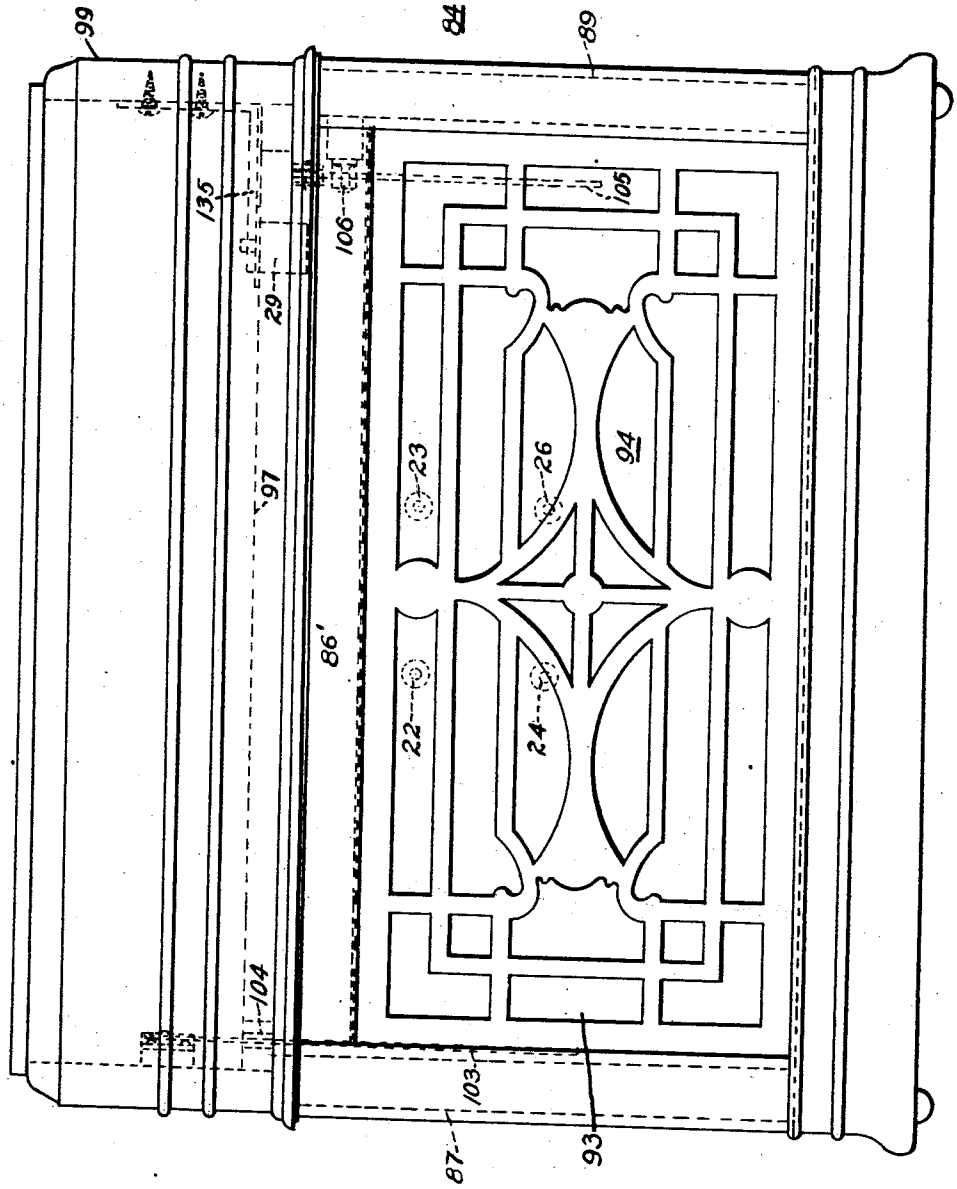


Fig. 4.

WITNESSES:
A. L. Jeffrey
H. L. Godfrey

INVENTOR
Frank Conrad
BY
Wesley G. Carr
ATTORNEY

Jan. 10, 1928.

F. CONRAD

1,655,985

WIRELESS RECEIVING CABINET

Filed April 18, 1922

5 Sheets-Sheet 5

Fig. 5.

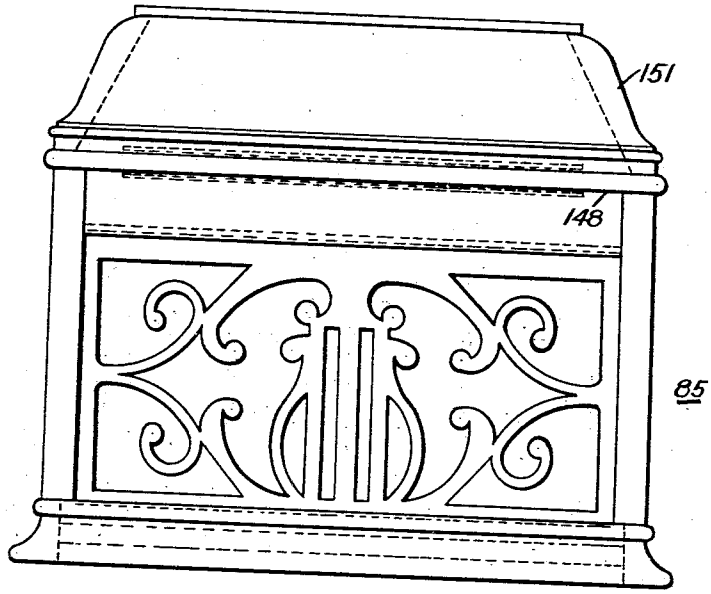
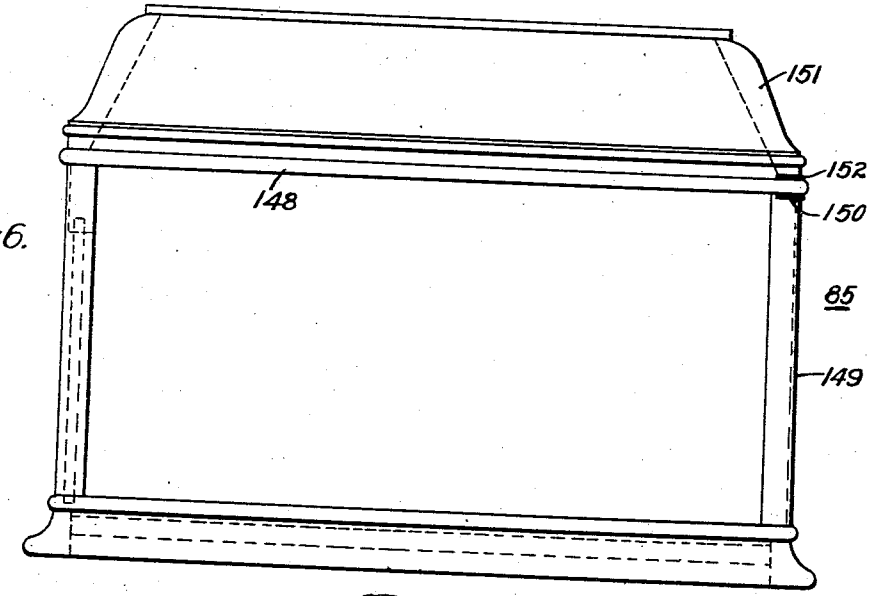


Fig. 6.



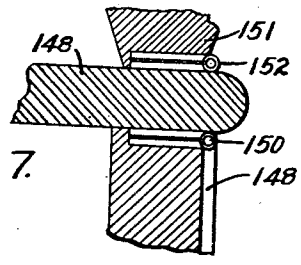


Fig. 7.

WITNESSES:

A. L. Jeffrey

H. L. Godfrey

INVENTOR

Frank Conrad

BY

Wesley G. Carr

ATTORNEY

Patented Jan. 10, 1928. 1,655,985

UNITED STATES PATENT OFFICE.

FRANK CONRAD, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

WIRELESS RECEIVING CABINET.

Application filed April 18, 1922. Serial No. 555,215.

My invention relates to wireless telegraph circuits and apparatus and more especially to cabinets adapted to embody wireless receiving systems.

In its broad aspect, the principal object of my invention is to provide a unitary structure, as, for instance, a cabinet, which is of simple, compact and rugged design, yet pleasing in appearance, and which is adapted to contain a complete wireless receiving system, together with a loud-speaking device therefor.

More specifically, another object of my invention is to dispose the customary wireless receiving apparatus in a cabinet in such manner that the various parts and circuit terminals therefor are readily accessible at all times.

Other objects of my invention will appear more fully from the following description of the nature, mode of operation and constructional details thereof.

According to my invention, I provide a cabinet comprising a chamber having a latticed opening in one wall and an antenna and battery terminal connectors in an opposite wall thereof. A lid for said chamber may be hinged to the latter wall. A hollow cover is provided for said lid in order to obtain a closed space immediately above the lid.

In one form of structure embodying my invention, the cover is hinged to the edge of said lid. In a preferred structure, however, the cover is hinged to the same wall as the lid. The cover and lid may be maintained in elevated positions by means of latches of suitable design. A sound-amplifying device, as, for instance, a horn, is so disposed in said chamber that the large end of said horn faces said latticed portion. Wave-responsive apparatus, such as is usually associated with a wireless receiving system, is supported from the under side of said hinged lid in any approved manner.

My invention further consists in the constructional details and arrangements hereinafter described and claimed and shown in the accompanying drawing, wherein

Figure 1 is a diagrammatic view of circuits and apparatus embodying my invention;

Fig. 2 is a side elevational view, shown partially in section on the line II—II of Fig. 3, and illustrating a form of cabinet adapted to contain the circuits and apparatus shown in Fig. 1.

Fig. 3 is a top plan view of the structure of Fig. 2 with the hinged cover removed;

Fig. 4 is a front elevational view of the structure shown in the previous figures, with the cover closed, and illustrating the preferred lattice work design;

Figs. 5 and 6 are front and side elevational views, respectively, of a modified cabinet design embodying my invention;

Fig. 7 is an enlarged fragmentary sectional view of the structure shown in Figs. 5 and 6, illustrating the hinge connections of the lid and the cover member to the walls of the cabinet.

In Fig. 1 is shown one type of receiving circuit, which is adapted to be employed in a receiving cabinet embodying my invention, said circuit comprising, in general, a radio-frequency amplifier tube 1, which is associated with input and output circuits coupled for regenerative action, a resistance-coupled detector tube 2 and a pair of cascade-connected resistance-coupled audio-frequency amplifier tubes 3 and 4.

The radio-frequency amplifying tube 1 comprises an anode 5, a controlling grid 6 and a hot cathode 7, the latter having external circuit terminals 8 and 9. The input circuit of the radio-frequency amplifying tube 1 extends from the grid 6 to the hot-cathode terminal 8 through a conductor 11, stationary and movable coils 12 and 13, respectively, of a variometer 14, a conductor 15, a conducting plate or so-called "shield" 16 and a conductor 17, which contains a series-connected ballast lamp 18.

The grid end of the stationary coil 12 is connected to one terminal of a wave-changing condenser 19 by means of a conductor 21. Intermediate sections of said condenser are connected to antenna circuit terminals 22 and 23, respectively, to provide short and long-wave circuit connections for the receiving system. The filament end of the movable coil 13 is connected to a grounded circuit terminal 24 through the conductor 15, the shield 16 and a conductor 25.

The filament terminal 8 is connected to the shield 16 which is connected to the ground terminal 24, which is also designed to be employed as the negative-terminal con-

nection for a filament-exciting battery (not shown), through the ballast lamp 18, the shield 16 and the conductor 25. The remaining filament terminal 9 is connected to an adjacent terminal 26, which is designed to be employed as the positive-terminal connection for said filament battery, through a conductor 27 and a conductor 28, containing a switch 29. The action of the ballast lamp 18 is to prevent the current supplied to the filament 7 from increasing beyond a predetermined value.

The output circuit for the amplifier tube 1 extends from the plate 5 to the filament terminal 9 through a conductor 31, a feedback coil 32, having an adjustable tap connection 33, a conductor 34, a resistor coupling device 35, a conductor 36, which connects the remaining terminal of said device to a positive terminal of a source of high-potential energy 37, said source of energy 37, a conductor 38, the switch 29 and the conductor 27. A condenser 39 is included in a circuit extending from the plate side of the resistor 35 to the filament 7 to provide a shunt path of low impedance around the resistor 35 and the plate battery 37 for currents of radio frequency.

The detector tube 2 comprises an anode 41, a grid 42 and hot cathode 43, terminals 44 and 45 of the latter being connected, by conductors 46 and 47, respectively, in parallel relation to the filament supply connections 16 and 27 of the tube 1. A ballast lamp 48 is included in the conductor 46 for reasons hereinbefore mentioned. The grid 42 of the detector tube 2 is connected to the plate side of the resistor 35 by means of a conductor 49 which contains a series-connected biasing condenser 51. The filament 43 of said tube 2, as hereinbefore stated, being connected in parallel with filament 7 of tube 1, potential variations across said resistor coupling device 35, incident to currents in the plate circuit of the tube 1, are impressed upon the input or grid-filament elements 42 and 43, respectively, of the detector tube 2.

A grid-leak circuit 52 extends from the grid 42 to the filament terminal 44 and contains a resistor 53 having a valve of the order of a megohm. The anode 41 is connected to the filament terminal 45 through a conductor 54, a series-connected resistance-coupling device 55, the conductor 36, the high-potential source of energy 37, the conductor 38, the switch 29, the conductor 27 and the conductor 47.

The auto-frequency amplifying tube 3 comprises an anode 56, a grid 57 and a filament 58, terminals 59 and 61, one of the latter being connected, by conductors 62 and 63, respectively, in parallel relation to the filament-supply connections 16 and 27 of the tube 1. A ballast-lamp 64 is included in the conductor 62 for reasons hereinbefore mentioned. The grid 57 of the amplifier tube 3 is connected to the plate side of the resistor 55 through a biasing condenser 65. Since the filament 58 of the tube 3 is connected in parallel relation with the filament of the preceding tube 2, it can be seen that potential variations across resistor 55, incident to the energization of the tube 2, are impressed upon the input or grid-filament elements 57 and 58, respectively, of the amplifier tube 3.

The anode 56 is connected to the filament terminal 61 through a conductor 66, a series-connected resistance-coupling device 67, the conductor 36, the source of energy 37, the conductor 38, the switch 29, the conductor 27 and the conductor 63. A grid-leak resistor 67 is connected across the terminal of the grid 57 and the filament terminal 59. A shunt circuit 68, which contains a series-connected condenser 69 and an adjustable choke coil 71, extends from the anode 56 of the amplifier tube 3 to the filament terminal 61. The purpose of the circuit 68 will be explained more fully hereinafter.

The remaining audio-frequency amplifier tube 4 comprises an anode 72, a grid 73 and a filament 74, terminals 75 and 76 of the latter being connected, by conductors 77 and 78, respectively, to the filament-supply connections 16 and 27 of the tube 1. A ballast lamp 79 is included in the conductor 77 for purposes hereinbefore mentioned. The grid 73 is connected to the anode side of the resistor 67 through a grid condenser 80. Since the filament 74 of the tube 4 is connected in parallel to the filament 58 of the preceding tube 3, potential variations across the resistor 67 are impressed upon the grid-filament elements 73 and 74, respectively, of the amplifier tube 4. The anode 72 is connected to the filament terminal 76 through a translating device shown as a telephone receiver 81, the source of energy 37, the conductor 38, the switch 29 and the conductor 78. A grid-leak device 82 may be included in a circuit 83 which extends from the grid 73 to the filament terminal 75 of the tube 4.

While I have described the several tubes as being energized from an external source of energy (not shown) through the binding posts 24 and 26, it is apparent that tubes may be employed having such low energy consumption characteristics as to admit of the employment of a long life low voltage primary battery adapted to be contained in the chamber 86, as, for instance, 37′ shown in Fig. 2. Such battery may take the form of one or more Edison-Lelande cells.

A circuit 68, which is connected in shunt relation to the input electrodes 73 and 74 of the audio-frequency amplifier tube 4, is tuned to the resonant frequency of the dia-

phragm (not shown) embodied in the telephone receiver 81. The effect of this circuit is to provide a partial by-pass for energy resonant to the frequency of said diaphragm, thereby tending to minimize the distorting effect thereof for currents of such frequency. Further discussion of the operation of this circuit may be found in a pending application of Alexander Nyman et al., Serial No. 556,834, filed April 27, 1922. Inasmuch as the operation of the receiving system embodied in the foregoing circuit arrangement is otherwise in accordance with well known principles, it will not be further described.

The circuits and apparatus of Fig. 1 may be assembled in a cabinet 84 of preferred design, as shown in Figs. 2, 3 and 4, or in a cabinet 85 of modified design, as shown in Figs. 5, 6 and 7. Referring to Figs. 2, 3 and 4, the cabinet there shown comprises a substantially rectangular chamber 86, having walls 86′, 87, 88 and 89 and a base 91 therefor. The ends of the several walls are extended below the base 91 to provide a space 92 immediately adjacent the lower side of the base 91. The cabinet is thus supported by the extended portions of the several walls.

The front wall 86′ is provided with an opening 93 adapted to receive a removable latticed portion 94 of any suitable design, as indicated in Fig. 4. The antenna binding posts or circuit terminals 22 and 23 are horizontally arranged near the middle of the rear wall 88, while the filament battery terminals 24 and 26 are similarly arranged directly beneath the same. The inner surfaces of the upper ends of the front and rear walls 86′ and 88 are provided with shoulders 95 and 96 which serve as supports for a lid 97 which is adapted to cover the chamber 86 and which is hinged to the rear wall 88 at 97′. The depth of the shoulders is preferably such as to cause the upper surface of the lid 97 to lie just below the upper edges of the several walls.

The lid 97 is composed of suitable insulating material and has a shield 98 of conducting material disposed on the under surface thereof. As is well known, the effect of such shield is to prevent the capacity effects attendant upon the presence of a person's body from unbalancing the operation of the system. A hollow cover member 99 adapted to form a space 101 immediately above said lid 97 is connected to the rear wall 88 by means of hinged connections 102. The cover 99 may be secured in an elevated position by means of a link 103, one end of which is pivotally mounted to the cover 99 and the other end of which is adapted to engage a latch mechanism 104 of suitable design mounted upon the wall 87, as shown in Figs. 3 and 4. When the cover 99 is closed, the connecting link 103 is caused to extend down into the chamber 86, as shown in Figs. 2 and 4.

The lid 97 may be similarly secured in an elevated position by means of a similar link 105, one end of which is pivotally secured to the lid 97 at one end of a panel 127, hereinafter described. The other end of the link 105 is adapted to engage a catch 106 disposed upon the wall 89, to hold the lid 97 in elevated position.

The stationary coil 12 of the variable tuning device or so-called variometer 14 is mounted upon a cylindrical member 107 which is mounted at a point on the under surface of the lid 97 substantially centrally disposed. The movable element 13 of the variometer 14 is mounted upon a cylindrical member 107 which is adapted to be rotatably supported, from its upper end, by means of a rod 109 carried by a dial plate 111 which is disposed upon the upper surface of the lid 97. A handle portion 112 is attached to the rod 109, whereby the latter may be more readily turned. A centering rod 113 extends through the lower portions of the two cylindrical members to prevent relative side motion of said members. The feed-back coil 33 is mounted upon the stationary member 107.

A portion of the lid adjacent the rear wall 88 is provided with two parallel rows of perforations 114 and 115 of such size as to admit of the insertion of vacuum tubes 116 or ballast lamps 117 therethrough. The ballast lamp 117 is of an improved design and comprises an enclosing envelope 118, having a resistor element 119 suitably supported from a press 120 by means of carrier rods 121 and 122. A base for the tube comprises a collar 123, one end of which embraces a lower portion of the envelope 118, and the other end of which embraces an insulating block 124 carrying a pair of terminal contactor pins 125 which may be of circular cross-section. The pins 125 may be connected to the carrier rods 121 and 122 in any approved manner. The outer side of the block 124 may be provided with a raised portion or boss 126, as indicated in Fig. 2.

A base socket panel 127, having contact portions 128 and 129 adapted to receive the pins of the vacuum tubes 116 and the ballast lamps 117, respectively, is suitably disposed below the perforated portions just mentioned and secured to the under side of the lid 97 by means of strap connections 130.

The contact portions 129, adapted to receive the terminal pins of the ballast lamps 117, are preferably disposed beneath the row of perforations 115 nearest the hinged portion of the lid 97. A pliable material 131, as, for instance, felt, is disposed between strap 130 and the panel 127 and serves to provide a resilient mounting for the latter.

The grid biasing condensers 51, 65 and 80 are suitably mounted on the under side of the socket panel 127 immediately adjacent their corresponding tube contact portions, as indicated in Fig. 3.

The lid 97 may be provided with an additional perforation 132 substantially centrally disposed between the walls 87 and 89 and just to the rear of the ballast lamp perforations 115. A cylindrical member 133 having a perforated base 134 is mounted on the under surface of said lid immediately beneath the perforation 132 to provide a receptacle for spare parts, as, for instance, an additional tube.

The antenna-wave-changing condenser 19 may be mounted at a point on the under surface of said lid 97 immediately adjacent the antenna-terminal connectors 22 and 23 and just to one side of the spare-part receptacle 133. The by-pass condenser 39 may be mounted on the under side of said lid at a point substantially midway between the front and rear walls 86′ and 88, respectively, and adjacent the wall 89.

The adjustable inductance device 71 and the condenser 69 may also be mounted on the under side of said lid directly opposite the condenser 39 and adjacent the wall 87. The switch 29 is of the push-button type and is mounted flush with the upper surface of the lid 97 directly opposite the tuning device 14 and adjacent the wall 89. As is standard in such switches, the operation of one push button thereof closes the circuit while the operation of the other opens the same. In order to prevent the switch 29 from being accidentally left closed, when the cover member 99 is down, and the wireless receiving apparatus is not in operation, a stop member 135 may be disposed upon said cover 99 in such position that, when the cover 99 is closed, the stop 135 automatically engages the proper push button and opens the switch 29.

A metallic amplifying horn 136 of substantially U-shape and having flaring sides is supported on the base 91 of the chamber 86 by means of supporting members 137 and 138, which are cast integral therewith, whereby the smaller end of said horn 139 may lie adjacent to the wall 87. The latter end may be provided with an extension 140 adapted to provide a support for the telephone receiver 81. The large end of the horn may be further extended to the latticed portion 94 by means of an extension 141 which also has flaring sides.

The sources of energy 37 and 37′, the latter being not shown in Fig. 1, may be disposed in one corner of the chamber 86, which is bounded by strips 142 and 143 which are secured to the base 91 of the chamber 86. A strip 144, which is secured at one end by a block 145 and a screw 146 and at the other end by a rod 147, is so disposed as to engage the upper surface of the batteries 37 and 37′, thereby holding them securely in position.

The cabinet structure 85 shown in Figs. 5, 6 and 7 distinguishes from that shown in Figs. 2, 3 and 4 merely in the specific design thereof, the receiving apparatus being arranged substantially as in the preferred design. In the modified design, it will be noted that the cabinet is provided with a lid 148 which rests upon the upper ends of the several walls of said cabinet and is hinge-connected to the rear wall 149 by means of hinges 150, which are set in recesses in the top of the wall, as shown in Fig. 7. It will be further noted that a cover member 151 is hinge-connected to the hinged end of the lid 148 by means of hinge members 152, as shown in Fig. 7. A further distinction resides in the design of the lattice portion shown in Fig. 5.

In operation, assuming the antenna connected to either of the terminals 22 and 23, the terminal 24 grounded, a source of energy for the several filaments connected to the terminals 24 and 26, the system is rendered operative upon closing the switch 29. The wave length of the receiving system may now be adjusted to resonance to incoming signal impulses by properly moving the handle 112 of the variometer 14.

While I have described a specific embodiment of my invention, for the purpose of more fully illustrating the objects, advantages and applications thereof, it is apparent that various changes and modifications may be made in the circuit arrangement and constructional details without departing from the spirit of my invention. I desire, therefore, that only such limitations shall be imposed thereon as are specifically set forth in the appended claims or are demanded by the prior art.

I claim as my invention:

1. As an article of manufacture, a cabinet comprising a chamber, a movable lid for said cabinet, a movable cover for said lid enclosing a space therebetween, means for maintaining said cover in an elevated position, said lid being provided with a perforation, a tuning device carried on the under side of said lid and having a controlling member accessible from the top of the lid, an electron tube, means for so supporting said tube that the same may extend up through said perforation, and a switching device disposed on said lid and controlling said electron tube.

2. As an article of manufacture, a cabinet comprising a chamber, a movable lid for said cabinet, a movable cover for said lid enclosing a space therebetween, means for maintaining said cover in an elevated position, said lid being provided with a perforation, a

tuning device carried on the under side of said lid and having a controlling member accessible from the top of the lid, an electron tube, means for supporting said tube that the same may extend up through said perforation, a switch in circuit with said tube disposed on said lid and means carried by said cover for co-operating with said switch in such manner that said switch is actuated into an open position when said cover is closed.

3. A mounting for a tube device comprising, in combination, a base member having a perforation large enough to receive said tube device, a tube socket device, and means for supporting said tube socket device beneath said perforation.

4. A vacuum tube device comprising, in combination, a vacuum-tube device of the three electrode type having external circuit-terminal pins therefor, a ballast-lamp device also provided with external circuit terminal pins, a base member having perforations adapted to receive said devices, a socket device adapted to receive all of said terminal pins, and means for supporting said socket device beneath said perforations.

5. In an electrical instrument box, a vacuum-tube device of the three-electrode type having external circuit-terminal pins therefor, a ballast lamp device also provided with external circuit terminal pins, a base member having perforations adapted to receive said devices, said base member constituting one of the containing walls of said box, a socket device adapted to receive all of said terminal pins, and means for resiliently supporting said socket device beneath said perforations.

6. In combination, a cabinet having a control panel constituting one of the containing walls thereof, said panel having a perforation large enough to receive a tube device, a socket device for said tube, means for supporting said socket device beneath said perforation and a movable cover for said panel enclosing a space therebetween, said supporting means being such as to cause the upper end of said tube to extend into said enclosed space.

In testimony whereof, I have hereunto subscribed my name this 28th day of March, 1922.

FRANK CONRAD.