

Jan. 4, 1927.

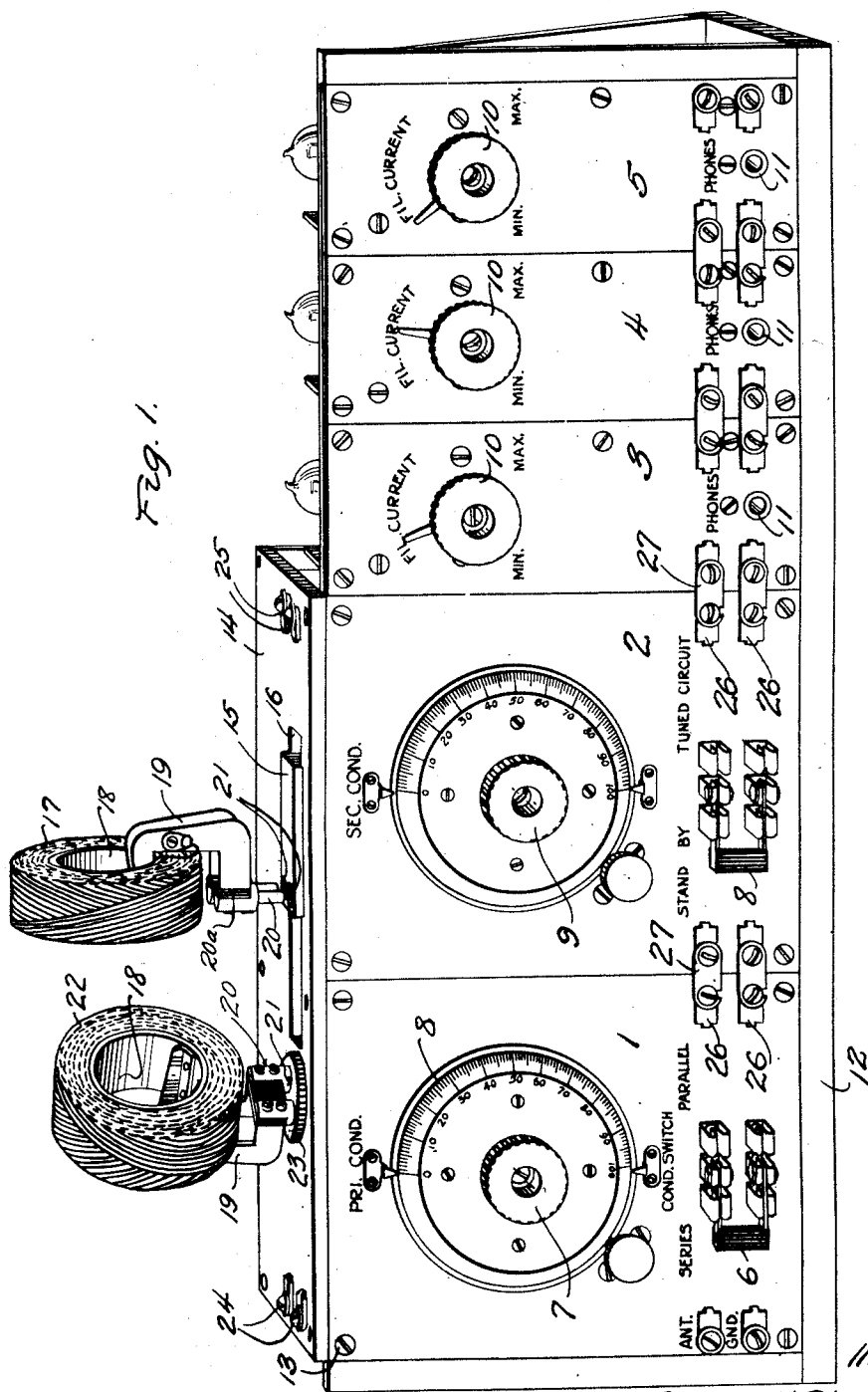
G. H. STEVENSON

1,612,952

RADIO RECEIVING APPARATUS

Filed August 24, 1921

2 Sheets-Sheet 1



Inventor:
George H. Stevenson,
by C. C. Sprague Atty.

Jan. 4, 1927.

G. H. STEVENSON

1,612,952

RADIO RECEIVING APPARATUS

Filed August 24, 1921

2 Sheets-Sheet 2

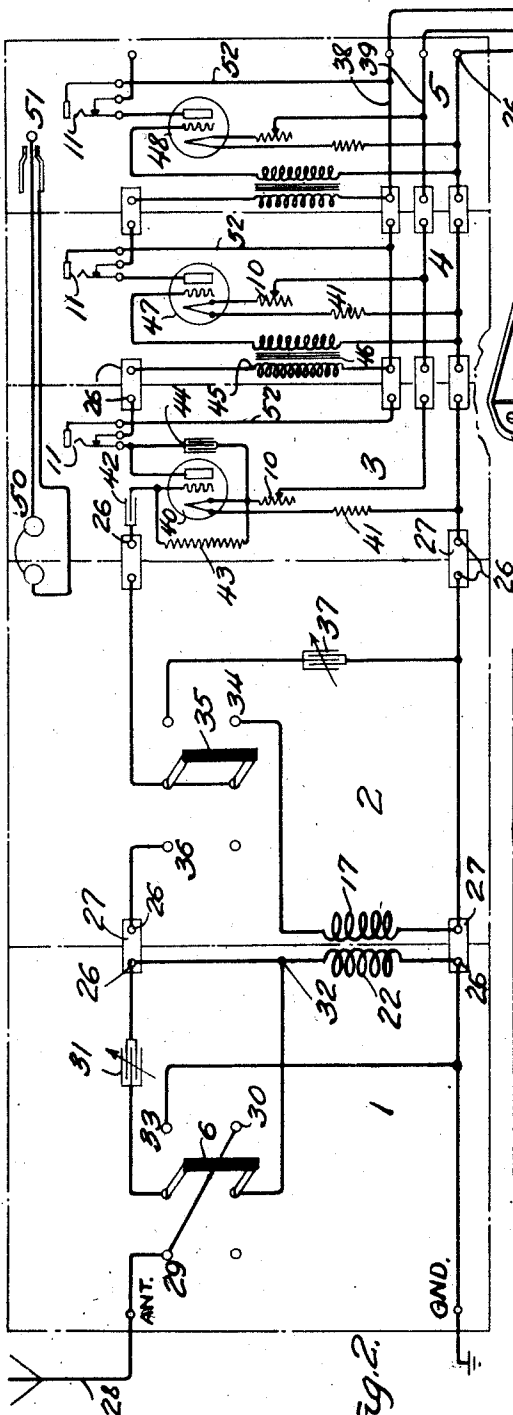


Fig. 2.

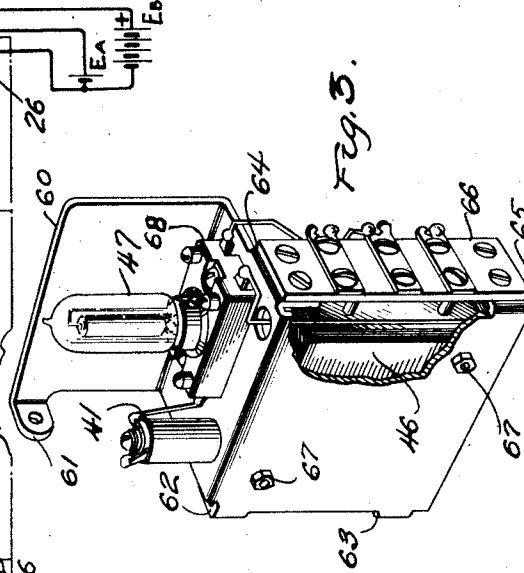


Fig. 3.

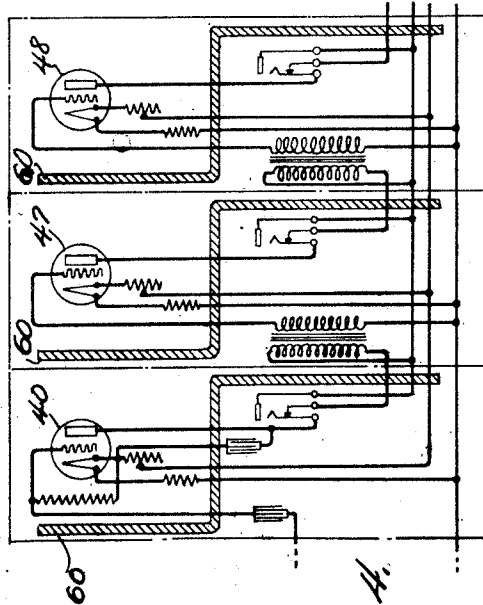


Fig. 4.

Inventor
George H. Stevenson,
by C. C. Sprague. ATT'Y.

UNITED STATES PATENT OFFICE.

GEORGE H. STEVENSON, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

RADIO RECEIVING APPARATUS.

Application filed August 24, 1921. Serial No. 495,009.

This invention relates to radio receiving apparatus.

An object of the invention is to provide a plurality of apparatus units which may be separately supplied to be connected together in different combinations to constitute a radio receiver.

Another object of the invention is to provide means for shielding a thermionic repeating device from external electrical disturbances.

A feature of the invention is a shield which serves both for protecting a thermionic repeater from disturbances and also as a portion of the mounting structure.

Another feature of the invention is a mounting for removable coils of a loose coupler.

Other objects and features of the invention will be apparent upon consideration of the following detailed description taken in connection with the accompanying drawing in which Fig. 1 illustrates in perspective, a radio receiving set embodying the invention; Fig. 2 a general schematic diagram of the circuits of the apparatus of Fig. 1; Fig. 3 a perspective of the apparatus mounted on the back of a thermionic repeater panel, and Fig. 4 a diagram of the circuits and shielding arrangements of the thermionic repeating units.

Referring to Fig. 1, a receiving set is shown consisting of five associated panel units 1, 2, 3, 4 and 5. Panel 1, which is the primary receiving circuit panel, carries the antenna and ground connection terminals, a condenser switch 6, and a condenser adjustment knob 7. Panel 2, the secondary receiving circuit panel, carries a "stand-by" switch 8 and a condenser adjustment knob 9. Panels 3, 4 and 5 belong to the thermionic repeating units and each carries a filament current rheostat 10 and jacks 11. These five panels are mounted side by side on a framework 12 to which they are attached by screws 13. Each panel is provided with aligned contact terminals 26 which may be electrically connected with similar terminals on the adjacent panels by means of connecting strips 27. A top plate 14 also attached to the framework serves as the base portion of a loose coupler for electrically coupling the primary and secondary units. A slider 15 is mounted for longitudinal movement in a slot 16 in which it is confined

in any suitable manner. A coupling coil 17 of annular form such as the well-known Coto coil is mounted on a band 18, which may consist of any suitable material such as bakelite micarta, fitting snugly within the coil. Attached to the band 18, preferably by screws, are two separate U-shaped supporting arms 19 which extend to a point beneath the coil and are connected at their lower ends to plugs 20. A lateral reinforcing strip 20^a of insulating material, extends between the plugs and serves to brace the arms 19 in lateral direction. The terminals of the coupling coil 17 are electrically connected respectively to the two U-shaped supporting arms 19 which are electrically connected to the plugs 20 by screws which extend through the reinforcing strip 20^a. The plugs 20 fit into jacks 21 in the slider 15. A similar coupling coil 22 is supported on plugs which fit into jacks in a circular plate 23 mounted for rotation about its vertical axis in the plate 14. It will be apparent that by rotating the plate 23 and moving the slider 15 any desired relative angular position and separation of these coupling coils may be obtained. Contacts 24 at one end of plate 14 and contacts 25 at the opposite end of plate 14 are respectively connected to the terminal jacks of coils 22 and 17, thus permitting substitution of any other form of transformer or coupling arrangement, if desired.

Referring to Fig. 2 in which the five units are each shown in dotted outline, the conductor 28 is connected to the antenna terminal of unit 1, and this terminal is in turn connected to the switch contacts 29 and 30 of condenser switch 6. The blades of switch 6 are connected to the opposite terminals of a variable condenser 31, the capacity of which may be varied by operation of the switch handle 7, shown in Fig. 1. One terminal of the condenser is also connected to the upper connecting terminal 26 of unit 1 and to jack 32 of the primary coupling coil 22, the other jack of which is connected to ground. The switch contact 33 of switch 6 is also directly connected to ground. It will be apparent that with switch 6 thrown to the left, the primary circuit will include the aerial conductor 28, condenser 31 and primary coupling coil 22 in series to ground. This is indicated by the label at the left of the condenser switch on the front of the

unit 1 as shown in Fig. 1. With the condenser switch thrown to the right, the condenser 31 and primary coupling coil 22 will be in parallel, forming a branched circuit from the aerial to ground. A ground connection is made to the lower contact terminal 26 of unit 1, and both the contact terminals 26 of this unit are connected by strips 27 to similar contact terminals 26 of unit 2.

The secondary coupling coil 17 of unit 2 is electromagnetically coupled with the magnetic coil 22 of unit 1 as previously described and terminates in jacks, one of which is connected to the ground contact terminal 26 and the other of which is connected to the contact 34 of "stand-by" switch 8. The two blades of the "stand-by" switch are electrically tied together. When this switch is thrown to the left to engage its contact 36, it serves merely to extend a connection from the upper and lower contact elements 26 of unit 1 to the corresponding contacts of unit 3 and to leave all the other apparatus of unit 2 idle. With switch 35 thrown to the right, a secondary circuit comprising coil 17 and variable condenser 37 is completed and connections are made from the terminals of the condenser 37 to the contacts of unit 3. Condenser 37 is arranged to be varied by the knob 9 as indicated in Fig. 1.

The three repeating units 3, 4 and 5 each have one contact element 26 connected by strips 27 to extend the ground connection. These three units are also provided with bus-bars 38 and 39 which may be continuous or may be connected through contact elements such as 26 and strips 27. The latter arrangement is illustrated. A space current source E_b , which may for example have an electromotive force of about 45 volts is connected with its positive terminals to the bus-bar 38 and its negative terminal to the ground contact terminal 26. A filament-heating current source E_a which may be of about 4 volts electromotive force has its positive terminal connected to bus-bar 39 and its negative terminal to the ground connection.

Unit 3 is arranged to serve as a demodulator. Units 4 and 5 have amplifiers for the demodulated currents. The demodulator element 40 comprises a three-element thermionic device, preferably highly evacuated, having its filament connected to the ground connection and bus-bar 39 through a fixed resistance 41 and a filament-current rheostat 10. The impedance control element or grid of the demodulator is connected to the upper contact element 26 of unit 3, through a stopping condenser 42. A high resistance 43 serves as a grid leak to connect the grid and cathode. The anode is connected to a contact element 26, through the normally closed contacts of jack 11. A capacity ele-

ment 44 of high impedance for the low frequency demodulated waves serves as a bypass for high frequency energy in the output circuit of the demodulator. The output circuit of the demodulator is coupled to the input circuit of amplifier unit 4 by means of a transformer 46. This amplifier unit comprises an electrical discharge device 47 which may be similar to that of demodulator 40 and may have its filament similarly connected to bus-bar 39 and ground. The secondary winding of transformer 46 is connected to the grid and cathode of amplifier 47, the output circuit of which is connected to the input circuit of amplifier 48 by an arrangement identical with that connecting demodulator 40 and amplifier 47. Space current is supplied to each of the thermionic devices 40 and 47 by source E_b , the positive terminal of which is connected to the various anodes through bus-bar 38 and the primary winding of a transformer. A receiver 50 is equipped with a cord terminating in a plug 51 adapted to cooperate with jacks 11. If the plug 51 be inserted in the jack 11 of unit 3, it will open the normally closed contacts of this jack, thus cutting off units 4 and 5 from the radio receiving circuit. A space current path will be completed through conductor 52. If, however, the plug 51 be inserted in the jack 11 of unit 4, unit 5 only will be cut off. If the plug 51 be inserted in the jack 11 of the last unit, it will complete a space current path through conductor 52 of that unit and all three of the thermionic repeating devices will be active.

The circuit arrangement of the apparatus is very flexible. The primary condenser 31 may be connected either in series or in parallel with the primary coupling coil 22. This primary circuit may be directly connected to the input terminals of the demodulator 40 or it may be inductively connected to the demodulator through the closed tuned circuit of unit 2. With any of these arrangements, demodulator 40 may be used alone or in conjunction with one or two of the thermionic amplifiers. These various circuit arrangements are all obtainable by operation of two switches 6 and 35, and the plug 51.

Fig. 3 illustrates the apparatus mounted on the back of a thermionic repeating panel such as 4. A chair-shaped plate 60, preferably of brass or other conducting material, is provided with integral lugs 61, 62 and 63 by which it may be bolted or otherwise attached to the panel. Seated on the plate 60 is a socket member 68 in which is mounted the thermionic repeater 47. The fixed resistance 41 of the filament circuit is also mounted on the upper side of the plate. A lug 64 extending downwardly from the horizontal portion of plate 60 and a lug 65 extending at right angles to the lower vertical portion, serve to mount a strip of insulating

material 66 upon which are carried the various bus-bars or the extra contact elements 26. The lower vertical portion of plate 60 has been broken away to show the external casing of transformer 46 which is attached thereto by bolts 67. In the case of unit 3, condensers 42 and 44 may be mounted in the position occupied by transformer 46 in the other units.

10 Referring to Fig. 4, the general arrangement of the apparatus of the repeater units with respect to the various shields 60 is shown in diagram. The thermionic discharge devices are mounted close to the chair portions of their respective shield members 15 60 which are separated by a very small space. This substantially divides the repeating units into six sections, each of which is shielded from the others. It further serves to prevent the output energy of one thermionic device from being directly impressed upon the output circuit of a succeeding device and to a degree, it enables separation of the input circuit leads and the output circuit leads of 20 an individual discharge device. By reason of the effective shielding between the individual repeater units it is possible to connect several amplifiers in tandem without producing singing or local oscillations.

25 Although the features of the invention have been disclosed as embodied in certain specific radio apparatus, it should be understood that they are capable of general application and that the invention is not to be limited to the specific arrangement disclosed, but only by the scope of the appended claims.

What is claimed is:

1. A plurality of electric repeaters connected in tandem, and chair shaped shields

of conducting material placed between adjacent repeaters upon which said repeaters are respectively mounted.

2. A repeater unit comprising a panel, a chair-shaped member attached thereto and 15 extending laterally thereacross, and a repeater mounted on the seat portion of said chair-shaped member.

3. A repeater unit comprising a panel, a chair-shaped plate of conducting material 50 connected thereto and having its principal portions substantially perpendicular thereto, and repeating apparatus mounted on said plate whereby, when said unit is associated with other similar units, its circuits will be 55 electrically shielded therefrom.

4. The combination in a repeater assembly of a plurality of repeaters, chair shaped supports, a repeater mounted on the seat portion of each support, said supports being 60 attached to insulating panels and so placed as to shield said repeaters against mutual interaction.

5. A receiving apparatus comprising a plurality of units each mounted on an individual panel, means for mounting said 65 panels in lateral alignment, a grounded supporting member on each of said panels carrying the apparatus of its respective unit, said supporting member serving to electrically shield its apparatus from that of the 70 adjacent units.

6. An electric shield of conducting material in one piece, an individual panel attached thereto and means for the attachment 75 and support of repeater apparatus on said shield and panel.

In witness whereof, I hereunto subscribe my name this 6th day of August A. D., 1921.

GEORGE H. STEVENSON.