Dec. 24, 1935. R. SCOTNEY 2,025,619

WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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Fig. 1.

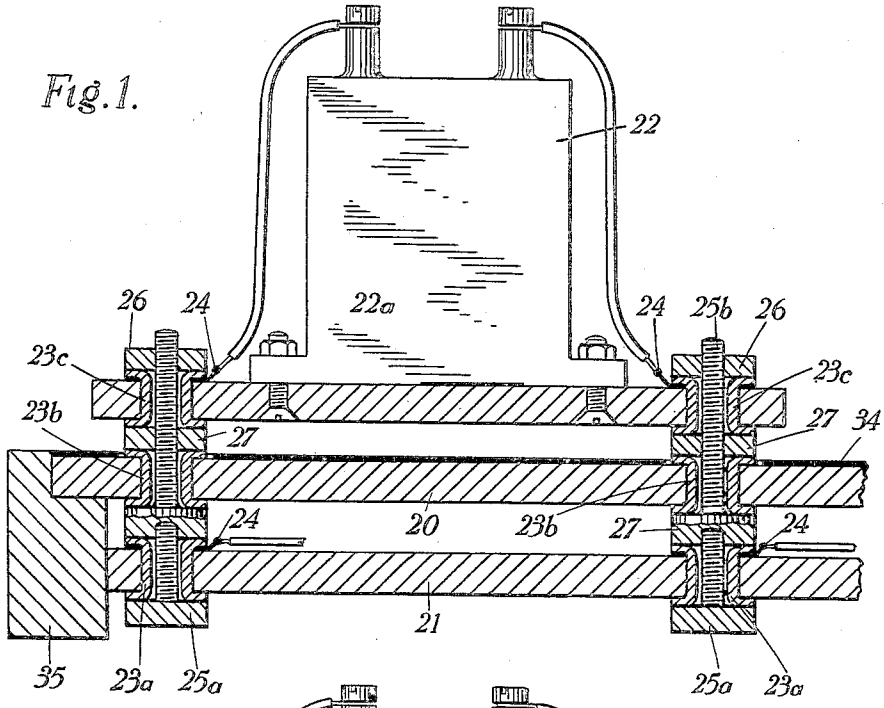
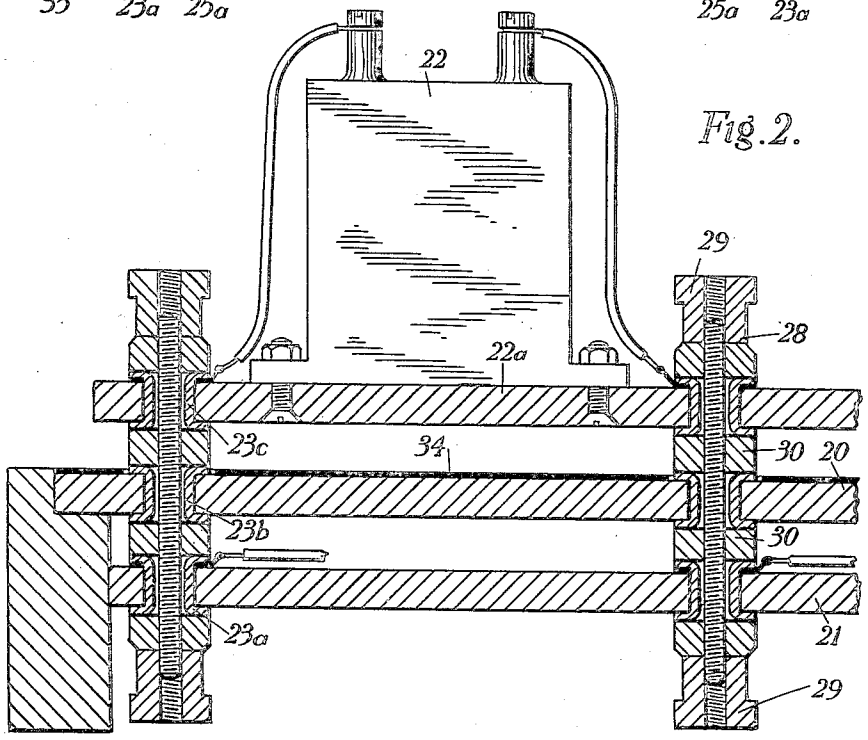


Fig. 2.



R. Scotney. Inventor.

By Parker & Collings

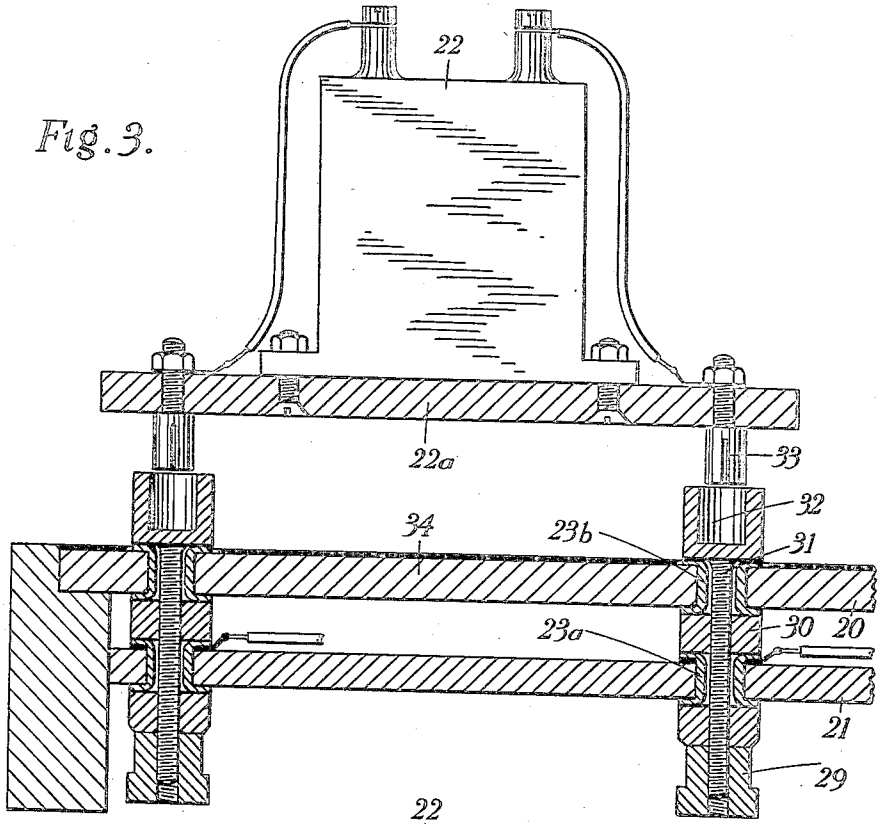
Attorneys.

Dec. 24, 1935. R. SCOTNEY 2,025,619

WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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Fig. 3.



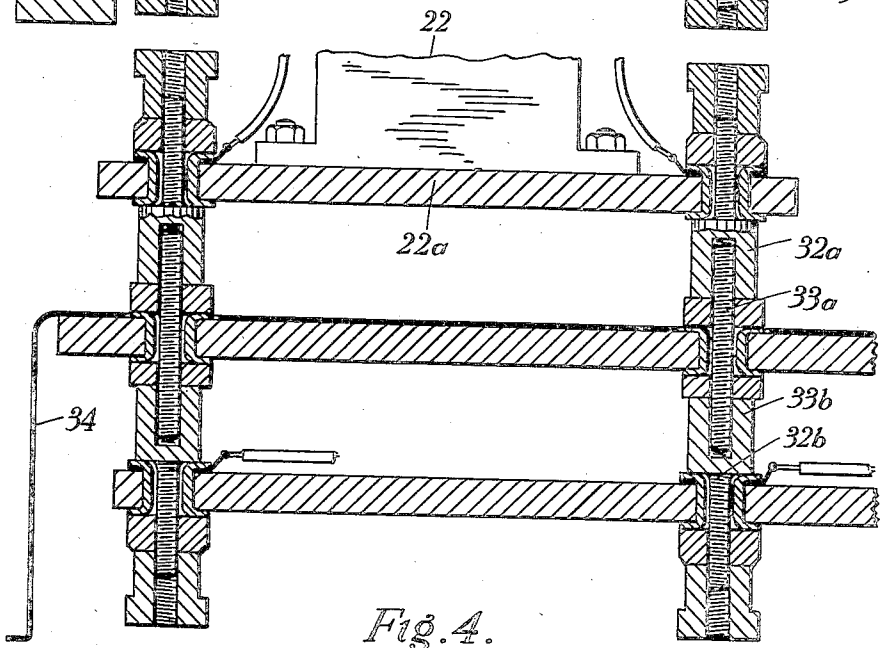


Fig. 4.

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WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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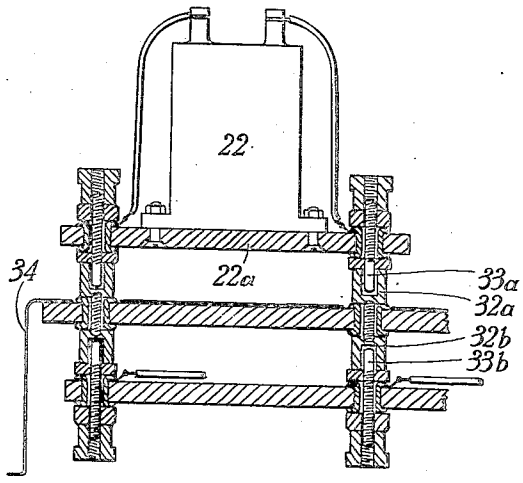


Fig.5.

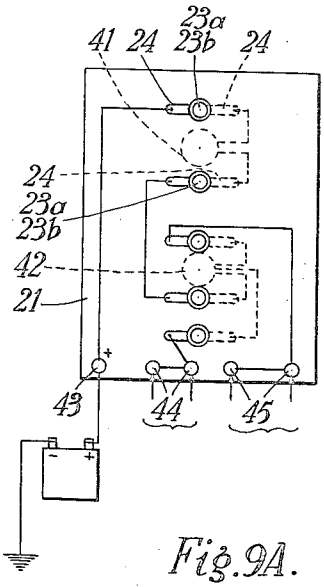
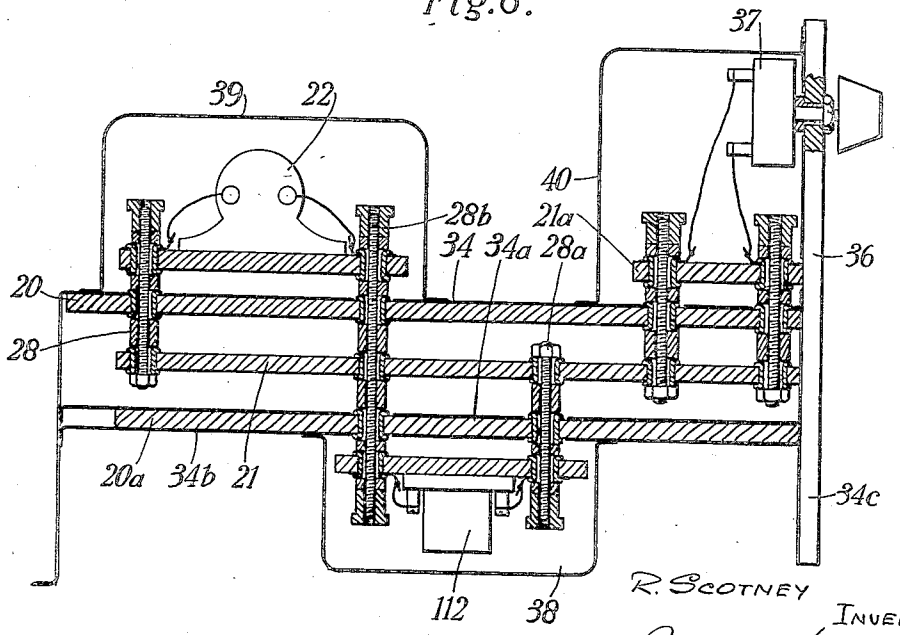


Fig.9A.

Fig.8.



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WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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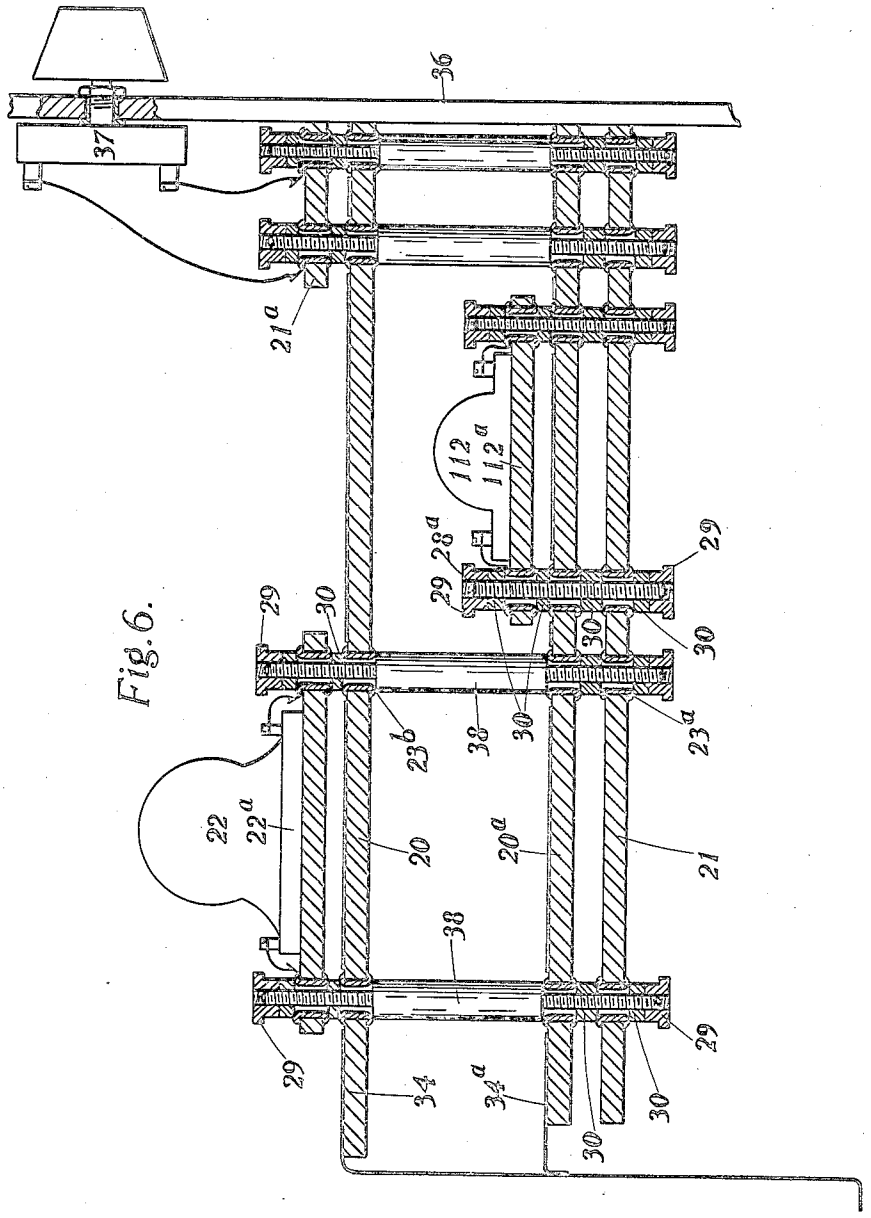


Fig. 6.

R. Scotney.
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WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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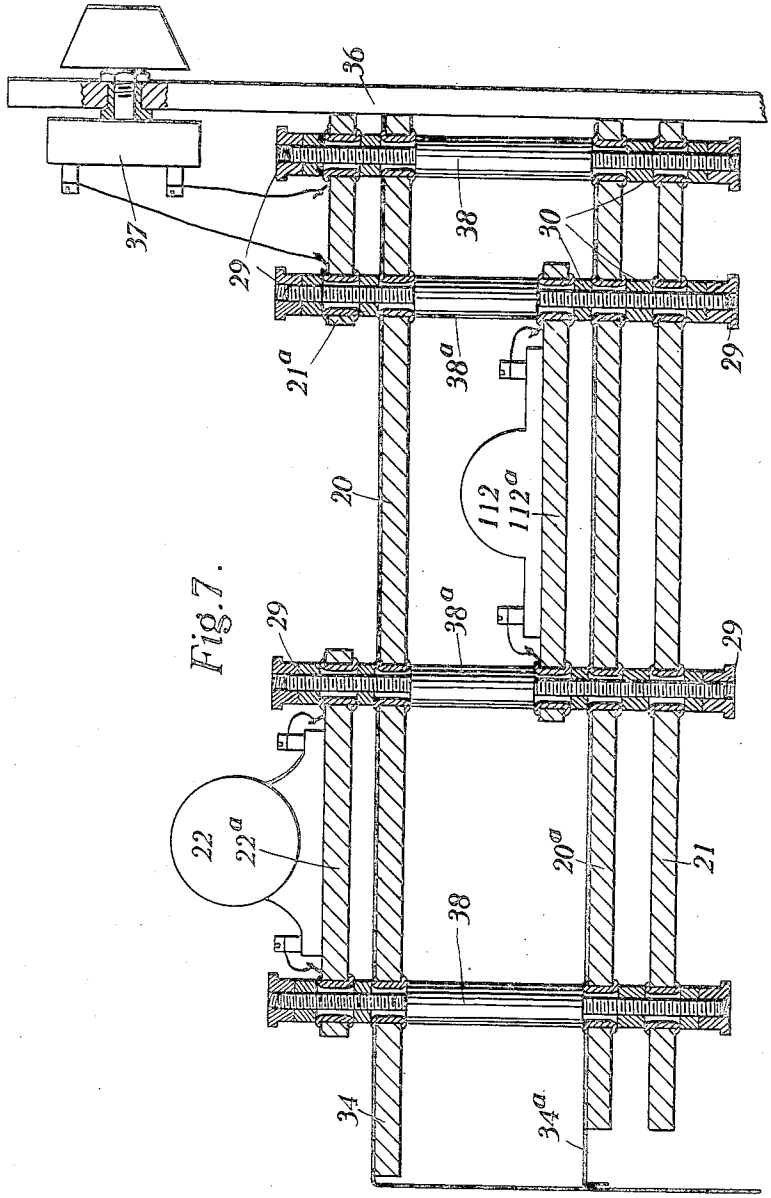


Fig. 7.

R. Scotney.
Inventor.

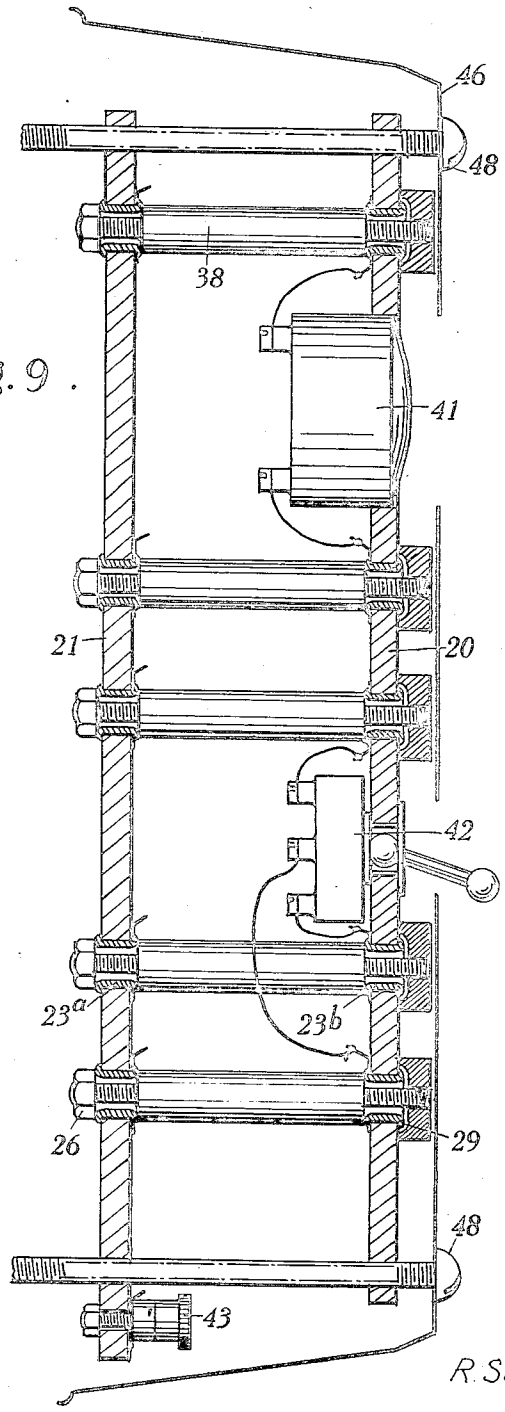
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WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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Fig. 9.



R. Scotney
Inventor

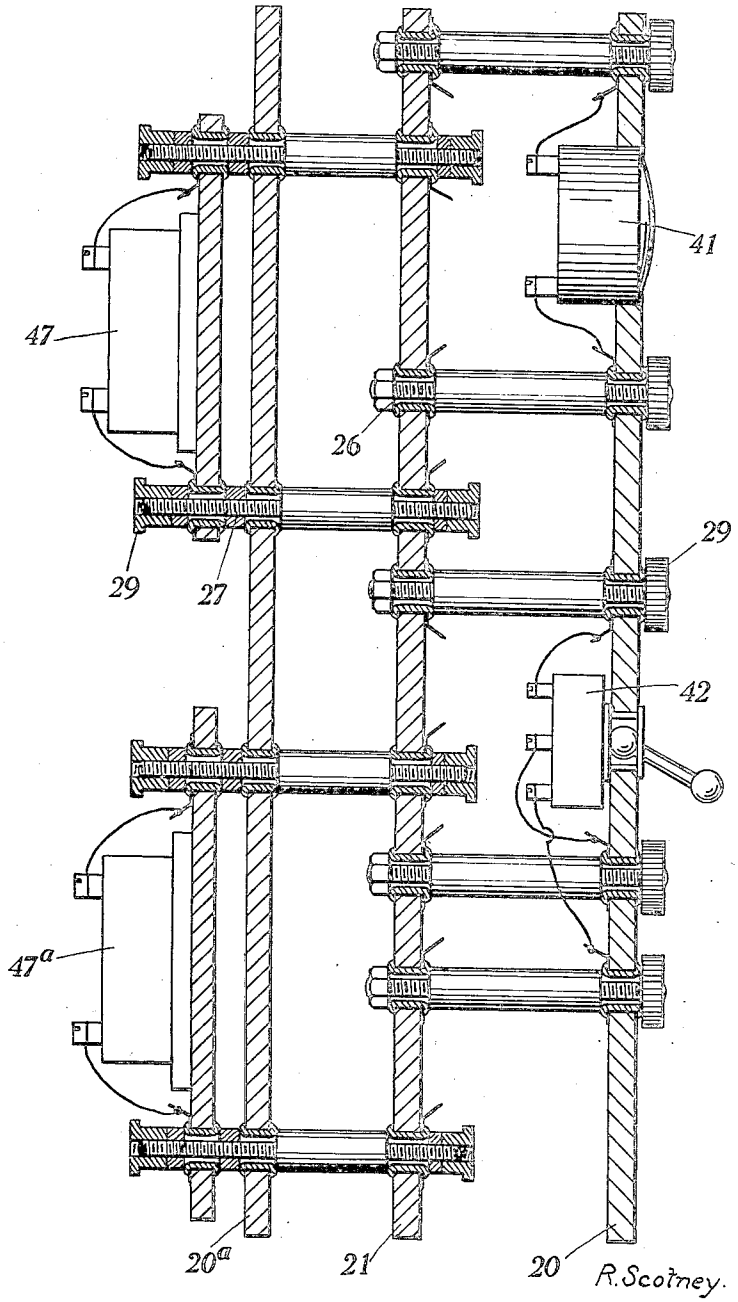
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Dec. 24, 1935. R. SCOTNEY 2,025,619

WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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Fig. 10.



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WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

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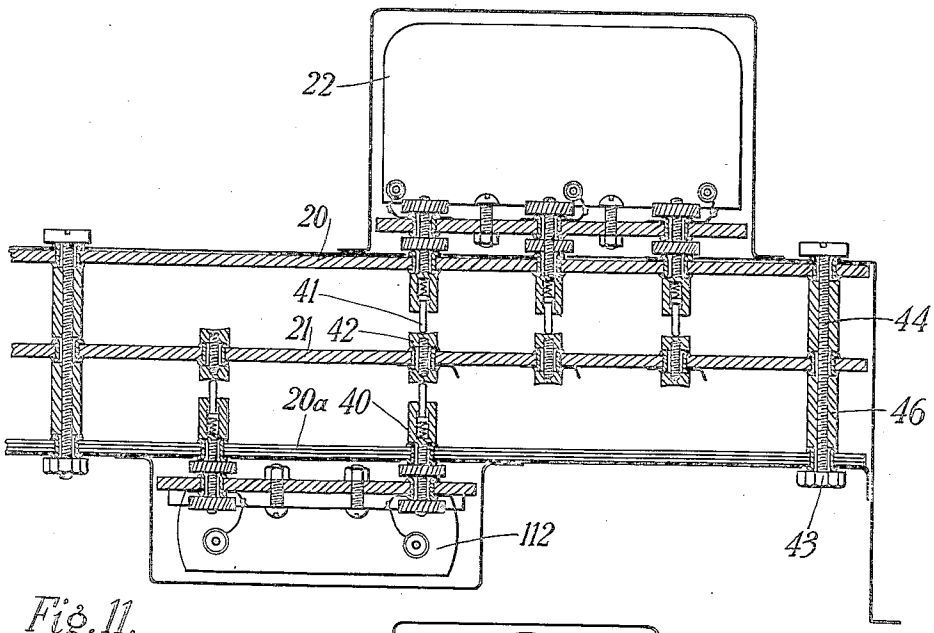


Fig. 11.

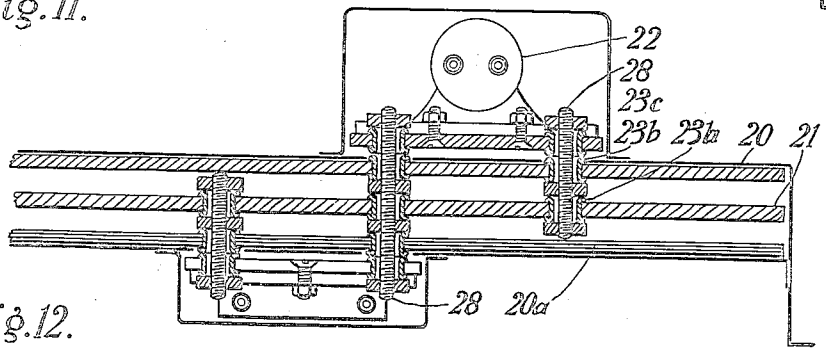


Fig. 12.

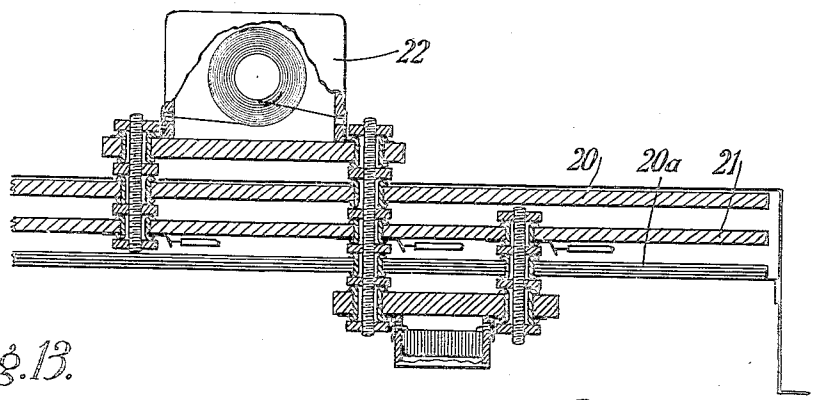


Fig. 13.

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BY. Bacon & Collings

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Patented Dec. 24, 1935 2,025,619

UNITED STATES PATENT OFFICE

2,025,619

WIRING OR CONNECTION OF RADIO OR OTHER ELECTRICAL CIRCUITS

Ronald Scotney, Sherwood, Nottingham, England

Application September 20, 1933, Serial No. 690,249
In Great Britain September 26, 1932

10 Claims. (Cl. 175—298)

This invention is for improvements in or relating to the wiring or connection of radio or other electrical circuits and has reference to apparatus embodying instruments or other parts, generally referred to as components, that are mounted on a support such as a base board and are electrically connected in a predetermined circuit. The invention is particularly applicable to valve amplifying apparatus, such as wireless receivers or transmitters, but eliminators charging apparatus and all kinds of switch boards may be mentioned as examples of apparatus to which the invention is also applicable. It has among its objects to facilitate the assembly of electrical apparatus by providing a construction which permits the sub-division of the assembly process into specialized operations, and to enable tests, alterations, adjustments or the like to be effected more easily and expeditiously than has heretofore been possible.

The invention is also applicable to what are generally known as "home construction sets", i. e. collocations of parts more or less complete which are sold, together with instructions for assembly, so that the purchaser may assemble them into a wireless receiving set in his own home.

Although, generally speaking, in wiring up electrical circuits such as for example wireless circuits it is usual to attach the various components by means of screws to a panel of insulating material and then to connect them in circuit by means of wires which extend directly across the panel between terminals on said components (being either soldered to said terminals or secured by screw means), yet this procedure has its disadvantages. When the components have been assembled in position their close grouping makes the terminals on them somewhat inaccessible so that wiring takes a long time and does not readily lend itself to that sub-division of the various operations which is desirable in a factory; some limitations are placed on possible alterations or modifications of the circuit such as the manufacturer may wish to introduce from time to time to improve the set or such as the owner may wish to make by way of experiment; and a certain amount of electrical knowledge is desirable for correct assembly.

The present invention provides in electrical apparatus, the combination of a components-board, terminals or other contacts affixed thereon at predetermined spaced points convenient for the connection of components to them, a circuit-board, spaced contacts affixed thereon registering with those on the components-board, circuit connections extending over the circuit-board between the contacts thereon, means for detachably mounting the components upon the components-board in electrical connection with the contacts thereon and means for detachably securing the circuit-board to the components-board with the registering contacts in electrical engagement, all in such manner as to permit of the bodily removal of the circuit-board with its circuit connections without disturbing the components upon the components-board and the removal of the components from the components-board without disturbing the circuit connections and the means securing the two boards together.

Various constructions according to this invention will now be described by way of example with reference to the accompanying drawings (which are to a certain extent diagrammatic) and in which

Figure 1 shows in sectional elevation a part of a wireless receiving set or other electrical apparatus incorporating a components-board and a circuit-board.

Figures 2, 3, 4 and 5 show alternative devices for mounting the components and for making the electrical connections between them and the contacts points on the support, which devices are applicable to any of the constructions shown or described herein.

Figures 6 and 7 show further constructions incorporating two components-boards.

Figure 8 shows an alternative to Figure 7.

Figures 9 and 9*a* show respectively a sectional elevation and a wiring diagram of an instrument board according to this invention, and

Figure 10 is a sectional elevation of an alternative arrangement of instrument board.

Figs. 11, 12 and 13 are sectional views illustrative of still other embodiments of the invention.

Throughout this description like reference numerals indicate like parts.

In the construction shown in Figure 1 there is a support which comprises an upper base board 20 which may be termed the components-board and a lower base board 21 which may be termed the circuit-board. The components-board 20 is provided with means for mounting thereon at pre-arranged or predetermined locations and in a detachable manner a number of components, of which the component indicated at 22 may be taken as being representative, and with contacts suitably disposed in an arrangement which corresponds to or depends upon the location of the components so as to permit of the ready electrical connection of said components to the con-

tacts. The boards 20 and 21 are preferably of insulating material and are provided at suitable points as aforesaid with metal eyelets or bushes which constitute contacts and also serve as means for attaching the two boards together and for attaching the components 22, the eyelets 23a in the circuit-board being arranged to match the eyelets 23b in the components-board, which eyelets 23b are so arranged and spaced as to correspond or register with eyelets 23c of the components when the latter are assembled in position. The eyelets 23a in the circuit-board 21 are connected by wires or other electrical connections which extend on one or other face of the board in such manner as to connect the components 22 in the desired circuit. In the construction illustrated the circuit connections extend at the inner face of the board 21 and are attached to metal tabs 24 secured under the turned-over lips of the eyelets although it will be understood that the circuit connections may extend on the underface of the circuit-board and may be connected to the contact points in any other suitable manner, and in order to facilitate assembly in the case of a home construction set it is convenient to provide a wiring diagram which is or may be attached to the circuit-board. It is also convenient that the mechanical devices 25a and 25b by which the components are mounted, preferably detachably, upon the support shall at the same time serve to connect the said components to the contact points of the circuit-board, and in the construction shown in Figure 1 the connecting device at each contact point comprises a set screw 25b which extends from beneath the components-board 20 through eyelets 23b and 23c, and at its upper end is provided with a nut 26, a nut 27 being preferably interposed between the eyelets of the component and those of the component-board (although the eyelets may be arranged to make direct contact shown in Fig. 12). Hence by slacking off each of the nuts 26 the component may be removed without disturbing the set screws 25b. The head of each set screw 25b is provided with a tapped hole and at each contact point there is a shorter set screw 25a which extends through the eyelet 23a and screws into this hole, thereby serving to fix the two boards 20 and 21 together and at the same time to complete the electrical connections between the component 22 and the contact points on the circuit-board 21, and it will be seen that the arrangement is such that the circuit-board may be removed from the components-board without disturbing the components or the components may be removed from the components-board 20 without disturbing the circuit connections on the circuit-board 21. The same result is achieved by the same construction shown in Figure 2 in which, instead of there being two set screws 25a, 25b, there is a single threaded rod 28 which extends through both parts and through the base of the component, which connecting rod is provided top and bottom with knurled nuts 29, and with other nuts 30 between the base of the component and the top of the components-board and between the components-board and circuit-board.

Figure 3 shows a further construction in which the set screw 31 which extends between the two boards 20 and 21 to fasten them together is provided at its upper end with a socket 32 in which a split plug 33 on the base of the component 22 is arranged to be received.

Figures 4 and 5 show modifications of this plug-and-socket mounting for the components. In Figure 4 sockets 32a and 32b are provided on the base 22a of the component 22 and on the circuit-board 21 respectively, while the components-board 20 is provided with a plug 33a at its top face and with a similar plug 33b at its under face; while in Figure 5 the sockets 32a and 32b are provided at the top and bottom faces of the components-board 20, while the plugs 33a and 33b are provided on the component and on the circuit-board respectively. While it is convenient, it is not essential that the connections serving to unite the two boards shall serve the dual purpose of electrical connections for establishing connection between the components and the contact points on the circuit-board and of mechanical connections for attaching the components to the support and for fastening together the two boards comprised in the support. For example in an alternative construction, illustrated in Fig. 11, there are spring-loaded contacts on one of the boards arranged to engage with fixed contact studs in the other board, the components being attached to the components-boards and the two boards being fixed together by means independent of these electrical connections. More particularly, in this arrangement the spring-loaded contacts may each comprise a housing or thimble 40 screwed or otherwise fastened into a board, and a plunger 41 extending through the end of said housing and pressed by a coil spring against a co-operating stud 42, said stud being dished or hollowed at its end to receive said plunger.

The various boards are connected together by screws 44, nuts 45, and distance sleeves 46.

It may be mentioned that the connections described in the two preceding paragraphs are applicable to any of the constructions described and illustrated herein.

Reverting to Figure 1, each component 22 is individually mounted upon a small base plate 22a by which it is attached to the components-board 20 and in which plate the contacts or eyelets 23c are formed, those contacts being connected to the usual terminals or binding posts provided at the top or elsewhere upon the component itself. This is a convenient construction because it permits of a certain latitude in the choice of the components without necessitating any variation in the position or spacing of the eyelets 23a and 23b, but if desired the case or cover of the component itself could be utilized instead of the small base plate 22a as shown in Fig. 13.

Particularly in valve-amplifying apparatus it is desirable that there shall be a screening plate interposed between the components and the circuit wiring on the board 21, and such a screening plate, numbered 34, is shown in Figs. 1 and 2 on the top face of the components-board 20 but it will be understood that it may be placed on the under face thereof or upon the upper or under face of the circuit-board 21 especially when the circuit connections themselves extend across the under face of said circuit-board. The said screening plate may be bent down at the rear to form a support or foot for the base-boards as shown in Figures 4 and 5, and in other figures, instead of employing a transverse frame member 35 as is shown in Figure 1. Incidentally a screening plate may be dispensed with in any of the constructions referred to herein if one or both of the boards is of metal, in which case it is necessary either to insert eyelets of insulating

material or metal eyelets received within bushes of insulating material let into the plate.

Figure 6 shows a construction in which three boards are used:— a main components-board 20, a subsidiary components-board 20a, a circuit-board 21, as well as a subsidiary circuit-board 21a for the components, as 37, mounted on the panel 36. Certain components 22 are mounted on the main components-board 20 by means of long studs 38 which extend through the eyelets in the three boards and serve to fasten these boards together and to establish electrical connection between the said components and the contact points on the circuit-board but other components 112 are mounted on the upper surface of the subsidiary components-board 20a in the space between the two components-boards. These components 112 are attached and connected electrically by studs 28a which, because they need only extend through the base plate 112a and the two boards 20a and 21, are shorter than the studs 38 by which the other components 22 are attached. There may with advantage be certain circuit connections extending upon the subsidiary base-board 20a between certain of the contact points or eyelets thereon and in this connection it is advantageous to employ two screening plates, one screening plate 34 which extends over the upper surface of the component-board 20 and is bent down at the back to form a support, and another screening plate 34a which extends over the upper surface of the subsidiary components-board 20a. The subsidiary circuit-board 21a may be attached to the panel 36 because in the illustrated construction the screening plate 34 does not extend up the back of the panel. This kind of construction makes for great compactness, and certain of the circuit connections may be made on the components-board 20a, in order to simplify the connections on the circuit-board 21.

Figure 7 shows a slight modification of the construction shown in Figure 6, again simplifying the connections on the circuit-board, in which modification the components 112 which are mounted in the space between the two parts 20 and 20a are attached and connected not by separate short studs as is shown in Figure 6, but by the long studs 38a which extend through the three boards 20, 20a and 21 with the result that some of these studs serve to form electrical connections between the compounds 22 and 112 and the circuit connections, and others of them serve to form an electrical connection between the contacts on the subsidiary circuit-board 21a and the components 112 and the circuit-board 21. In this manner by suitably arranging the components and choosing which of them shall be mounted above the board 20a, it is possible to reduce to an absolute minimum the number of wires or the like extending on the circuit-board 21 between the various contact points. It may be mentioned that in this construction the subsidiary circuit-board 21a is attached to and removable with the panel 36.

Figure 8 again shows a construction incorporating one circuit-board 21 and two components-boards 20 and 20a, the circuit-board 21 in this case being mounted between the two components-boards. Furthermore the component 112, which is provided with a screen box 138, is mounted in an inverted position beneath the bottom components-board 20a and one 28b of the connections by which the component 112 is attached and electrically connected extends right through the three base boards 20, 21 and 20a and also serves to attach and connect the component 22, which component is also provided with a screening box 39. The other connection 28a for the component 112 only extends as far as the circuit-board 21 although, if desired, it may be arranged to extend through the three base boards to the subsidiary circuit-board 21a. The said subsidiary circuit-board 21a, and the component 37 mounted on the panel 36, is provided with a screening box 40. As shown, the screening plates may be provided, one 34 above the components-board 20, one 34a above the circuit-board 20a, and another 34b below said circuit-board, while if desired a further screening plate 34c may be provided behind the panel 36. It will be understood that the connecting arrangements illustrated in Figures 6 and 7 may be adopted for the inverted components 112 shown in Figure 8.

In order to illustrate the wide field of application of this invention Figure 9 shows a sectional elevation of the dash-board of a car or of a similar switch panel, and Figure 9a shows the circuit connections. In this construction there is a components- or instrument-board 20 on which instruments such as the ammeter 41 and the three-way switch 42 are mounted, and a circuit- or supporting board 21, each of which boards is provided as hereinbefore described with contact points in the form of metal eyelets and which boards are fixed together by connecting studs 38 (fastened at each end by nuts) which serve to establish electrical connections between the corresponding contact points 23a, 23b, on the two boards. One terminal of the ammeter 41 is connected by a stud 38 and circuit connections on the board 21 to a binding post 43 and thence to the accumulator, the other terminal of the ammeter being connected in a similar way to a terminal of the switch 42. A second terminal of said switch is connected by a stud 38 and circuit connections to two binding posts 44 providing connections for the side lamps, and the third terminal of the switch is similarly connected to binding posts 45 providing connections for the head lamps. As shown in Figure 9, the whole apparatus may be covered with a casing 46 of insulating material or metal perforated at suitable points to expose the instruments and may be held in position by fixing screws 48.

The connections extend between the various tabs 24, and for convenience, in Fig. 9a, the tabs on the instrument board 20 and the connections that extend between them are shown in dotted lines while the tabs and connections on the circuit-board 21 are shown in full lines.

Figure 10 shows a similar arrangement in which at the back of the circuit-board 21 there is a further components-board 20a on which components such as the resistances 47 and 47a are mounted in such manner that they may be removed therefrom without disturbing the circuit connections upon the circuit-board 21 or the instruments 41, 42 upon the front instrument-board 20. In a similar manner the front instrument-board 20 and the instruments mounted on it may be removed without disturbing the circuit connections or the components 47, 47a.

It will be appreciated that the constructions described hereinbefore with reference to the accompanying drawings have this in common, that they comprise in combination, a base-board 20, 21 or other support or chassis, electrical components 22 mounted thereon (and preferably detachably mounted), contacts 23c on the com-

ponents, co-operating contacts 23*a*, 23*b*, on the support so arranged and spaced at predetermined points thereon as to correspond to and make contact with the contacts 23*c* of the components 22 when said components are assembled on the support, and electrical connections extending upon the support between the contacts 23*a* thereon to connect the various components in circuit.

I claim:—

1. In electrical apparatus provided with a circuit-board having fixed contacts thereon between which circuit connections extend, and with components detachably connected to said contacts, by devices which serve both as mechanical fixings and electrical connections, in such manner as to permit of their removal without disturbance of the circuit connections, the combination of a components-board on which the components are mounted and which is attached to the circuit-board, and electro-mechanical connections which extend from the components through the components-board to the various contacts on the circuit-board and fasten said components to the components-board but permit of the bodily removal of the circuit-board and the connections thereon without disturbance to the components.

2. In electrical apparatus the combination of a circuit board of insulating material, metal eyelets therein at spaced points, circuit connections extending between said eyelets, a components-board perforated with holes registering with eyelets in the circuit-board, components detachably mounted on the components-board and connected electrically through the holes therein with appropriate eyelets in the circuit-board, and securing means for this purpose which means also secure the two boards in a manner permitting of the removal of the circuit board without disturbing the fixing of the components to the components-board.

3. In electrical apparatus the combination of a components-board and a circuit-board each of insulating material, registering metal eyelets at spaced points in the two boards, circuit connections extending between the eyelets on the circuit-board, components having similar eyelets serving as terminals, and means extending through the eyelet holes in the components and the two boards and fixing the components detachably to the two boards and fixing the circuit-board detachably to the components-board and components.

4. In electrical apparatus, the combination of a components-board, contacts affixed thereon at spaced predetermined points convenient for the connection of components to them, a circuit-board parallel to the components-board, spaced contacts thereon registering with those on the components-board, circuit connections extending over the circuit-board between various contacts thereon, components, a metal screening plate lying between the circuit connections and the components, and means for detachably mounting the components upon the components-board in electrical connection with the contacts thereon, and means for securing the circuit-board to the components-board with the registering contacts in electrical engagement, said mounting and securing means permitting of the bodily removal of the circuit-board and connections intact without disturbing the components upon the components-board and of the removal of the components from the components-board without disturbing the circuit connections and the connection between the two boards.

5. In electrical apparatus, the combination of a components-board, contacts affixed thereon at spaced points, a circuit-board, spaced contacts thereon registering with those on the components-board, circuit connections extending over the circuit-board between the contacts thereon, components, contacts thereon registering with groups of contacts on the components-board, a panel, panel components thereon, a subsidary circuit board, contacts on said subsidiary board registering with certain of the contacts on the first two said boards, connections between the said panel components and the contacts of the subsidiary circuit-board, and releasable means for fastening all the boards together and the components to them with the various contacts in electrical connection.

6. In the combination claimed in claim 5, at lease one connection which serves to attach a component to the components-board and to connect said component to a contact point on the subsidiary circuit board.

7. In the combination claimed in claim 5, at least one connection which serves to connect a component and a contact point on the subsidiary circuit-board to the main circuit connections.

8. In electrical apparatus, the combination of a components-board, contacts affixed thereon at spaced points, a circuit-board, spaced contacts thereon registering with those on the components-board, circuit connections extending over the circuit-board between the contacts thereon, components releasably attached at either face of the components-board, contacts thereon registering with groups of contacts on the components-board, and releasable means for fastening the two boards together and the components to them with the various contacts in electrical connection.

9. In electrical apparatus the combination of two parallel components-boards, contacts affixed thereon at spaced registering points, a circuit-board parallel to them, spaced contacts thereon registering with those on the components-boards, circuit connections extending over the circuit-board between the contacts thereon, components releasably connected some to each components-board, contacts on said components registering with groups of contacts on the board to which they are attached, and releasable means for connecting all boards together and the components to them with the contacts in electrical connection.

10. In electrical apparatus, the combination of a components-board, components detachably affixed thereon at spaced points, spaced contacts on the components, contacts on the components-board arranged in spaced groups to register with the contacts of the components, a group for each component, a circuit-board, contacts thereon in spaced groups registering with the contacts on the components-board, circuit connections extending over the circuit-board between contacts of the various groups for connecting the components in a predetermined electrical circuit which is substantially complete and permits the circulation of current therethrough and through the various components from positive to negative, and releasable means for fastening the two boards together and the components to them with the various contacts in electrical connection.

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