No. 717,194. Patented Dec. 30, 1902.

E. M. HEWLETT.

ARC LIGHT SWITCHBOARD.

(Application filed May 16, 1901.)

(No Model.) 2 Sheets—Sheet 1.

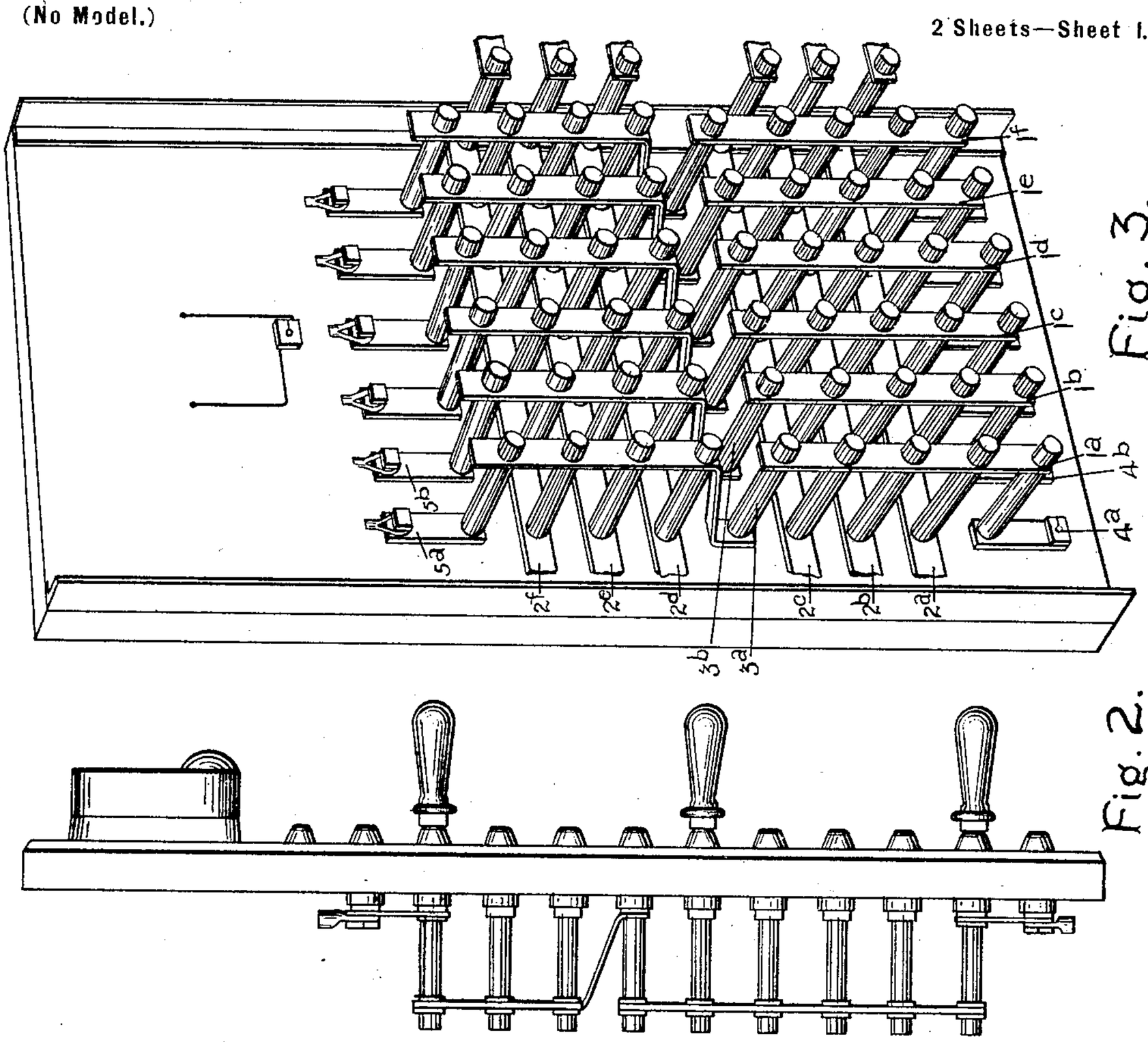

Fig. 3.

Fig. 2.

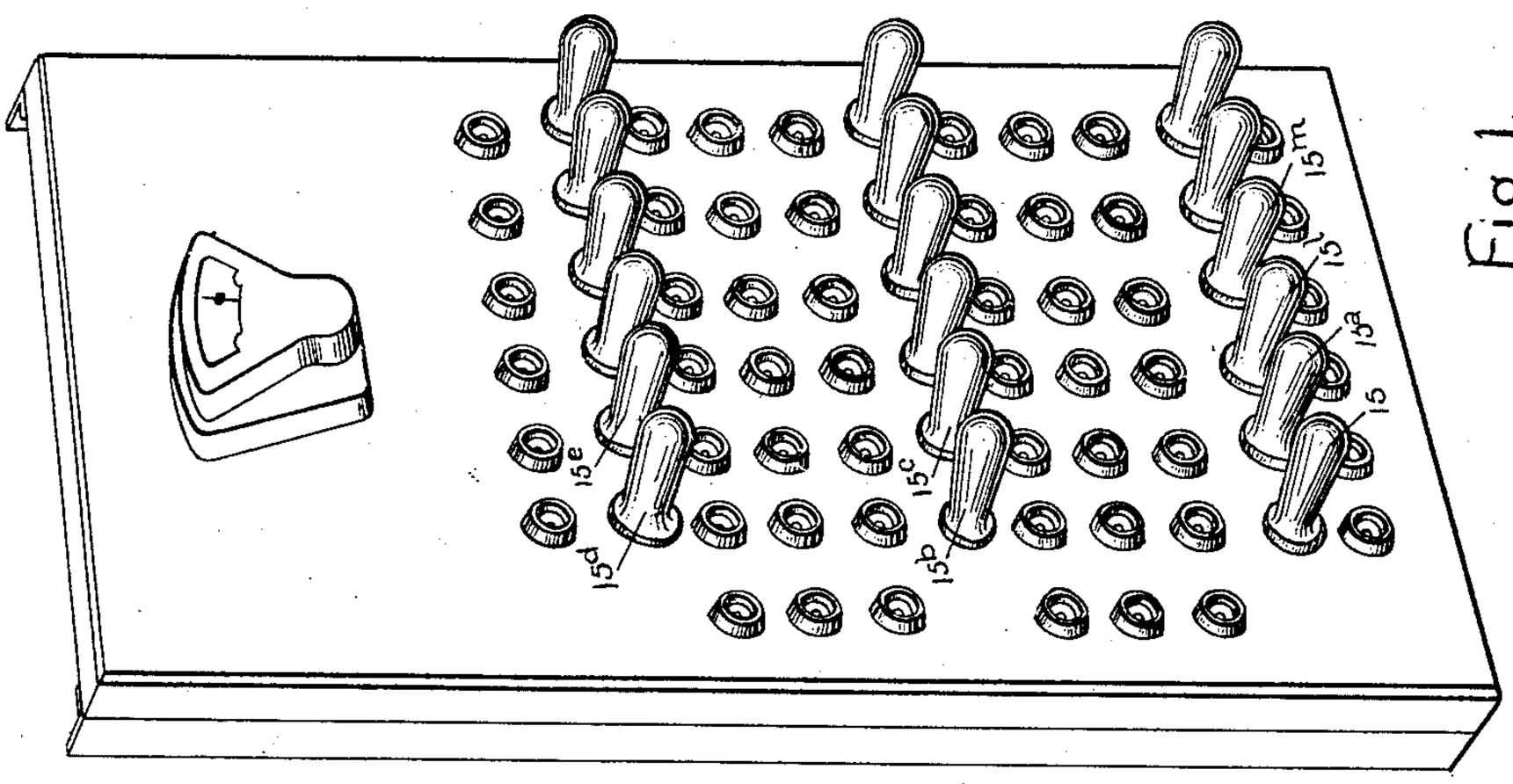

Fig. 1.

Witnesses.

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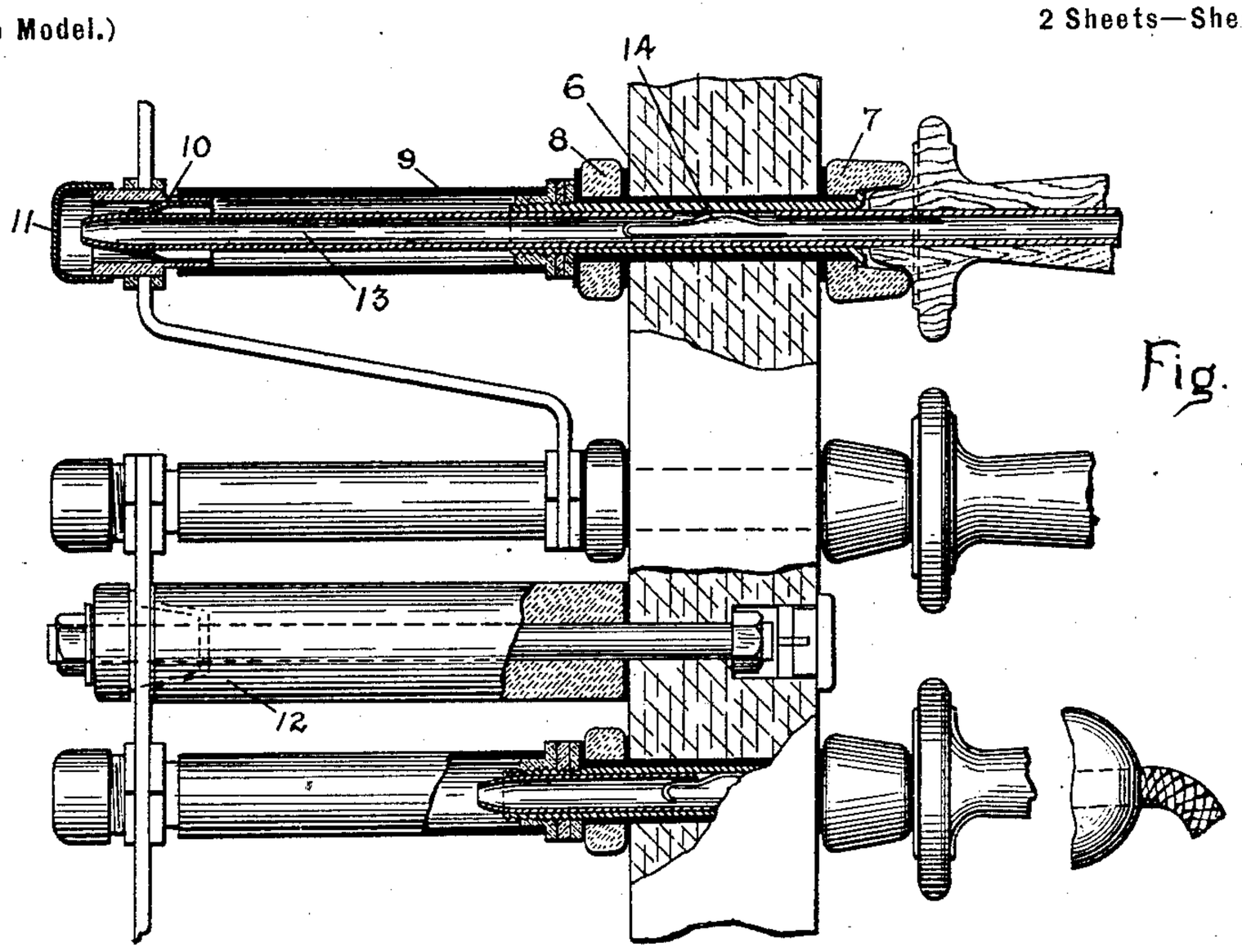

Fig. 4.

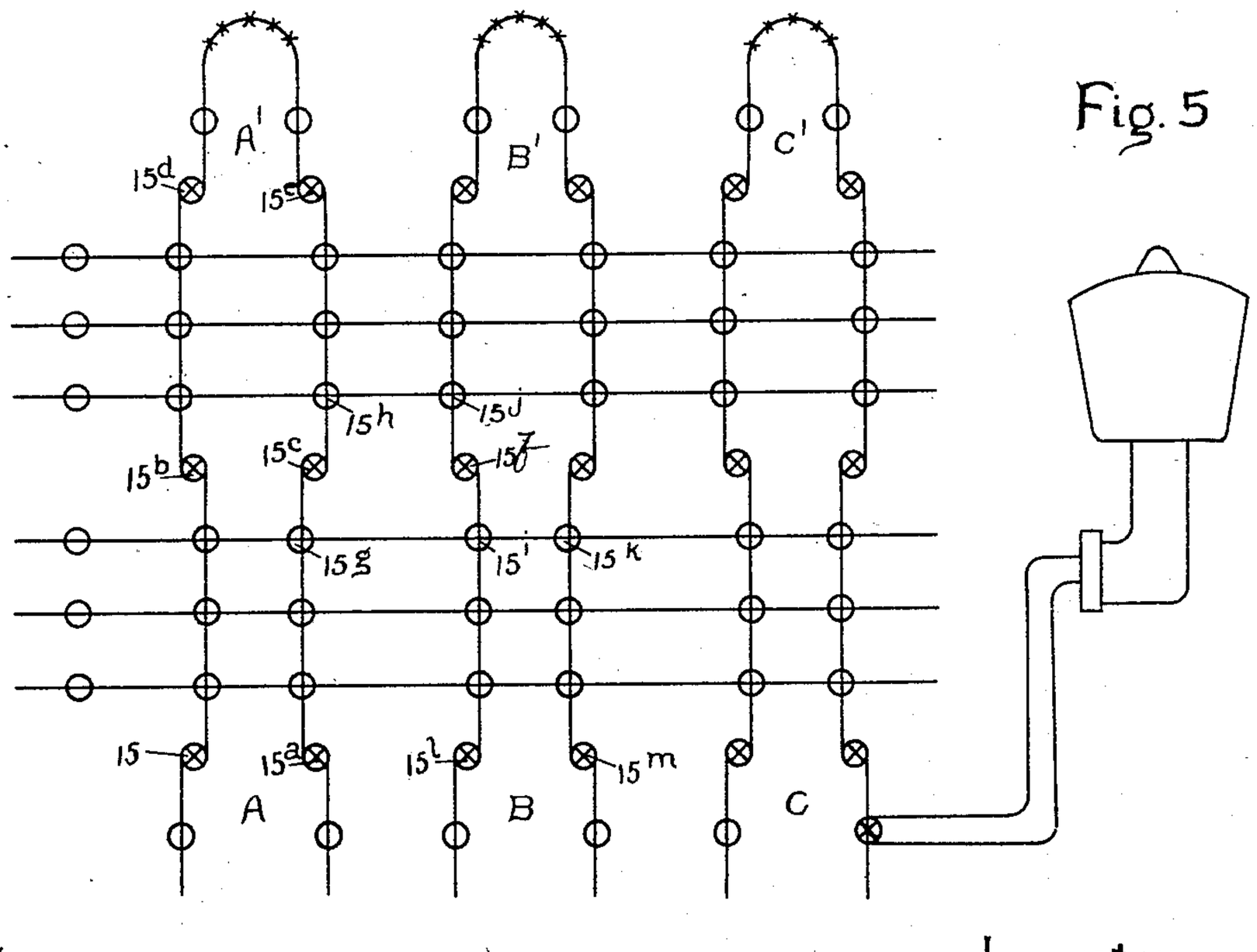

Fig. 5

Witnesses.
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UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LIGHT SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 717,194, dated December 30, 1902.

Application filed May 16, 1901. Serial No. 60,462. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Arc-Light Switchboards, (Case No. 1,696,) of which the following is a specification.

The invention relates to electric switchboards and is especially applicable to boards for arc-light circuits.

In switchboards as commonly designed a transfer of the several machines to different distribution-circuits is effected by means of plugs and cables, the flexible connections often crossing one another and interfering with a rapid operation.

It is the object of my invention to provide a board on which the several machines may be transferred to any circuit on the same panel or another panel or any number of circuits may be connected with any machine without the use of cable connections.

In carrying out the invention I provide each panel of the board with a pair of bus-bars for each machine and a plurality of transfer bus-bars separately insulated and arranged at right angles to one another, the intersecting points of the several sets of bus-bars being connected by insulating-sockets, in which may be inserted plugs for cross-connecting them. Thus by means of the plug any pole of any machine may be connected with any desired transfer-bar, and any machine may therefore be connected by means of plugs with any circuit on the same panel. The transfer-bars of adjoining panels are connected by short bars and removable plugs, so that the connections from a machine of one panel may be extended to any circuit of another panel in the station. In order to facilitate the interconnection of machines and circuits and to add to the flexibility of the switchboard service, I cut the connections between each machine and its circuit at three points—one adjacent to the terminals of the circuit, another adjacent to the poles of the machine, and the third between the two outside transfer-bars, each break being provided with connections for plug-contacts, so that they may be closed when desired. Thus connection may be made with any pole of any machine or any circuit represented on the panel with any of the transfer-bars, so that in changing a machine or circuit any particular transfer-bar which happens to be idle may be used.

In boards of this type as heretofore constructed two sets of bus-bars for machines and circuits, respectively, have been employed, crossing one another at right angles. My invention differs from this in that I employ one set of bus-bars for the machines and circuits, which may be separated electrically, and another set placed at right angles to the first for transferring either a machine or circuit to another part of the panel or board.

The invention embodies various improvements, the novelty of which will be hereinafter more fully described and will be definitely indicated in the claims.

In the accompanying drawings, which illustrate the invention, Figure 1 is a perspective view of the front of a switchboard-panel embodying my improvements. Fig. 2 is a side elevation. Fig. 3 is a rear view showing the arrangement of the bus-bars. Fig. 4 is a part-sectional view showing the relations of the connecting-sockets, and Fig. 5 is a diagram showing the relations of machines and circuits.

Two sets of bus-bars 1^a 1^b 1^c 1^d 1^e 1^f and 2^a 2^b 2^c 2^d 2^e 2^f cross one another, preferably at right angles, on the rear of the board, being separately insulated, the two sets being separated by fiber tubes, in which are contacts for cross-connecting them. The vertical bars are cut, the ends being separably connected at a point between the two outermost transfer-bars 2^a 2^f by insulating-tubes, as 3^a 3^b. The ends of the vertical bars connect at the bottom with the machine-terminals 4^a 4^b, &c., through plug-contacts inserted in connecting insulating-tubes, a similar arrangement being provided at the top between the vertical bus-bars and the circuits, as at 5^a 5^b. The two sets of bus-bars are carried on the insulating-tubes and at opposite ends of the same, as seen in Figs. 2, 3, and 4. The tube itself is supported at the end next to the board by a metal tube 6, bushed with insulation, a porcelain socket 7 clamping the tube at the front

side of the board and a nut and porcelain washer 8 at the rear side. The transfer-bars are held on a brass tube by the nut. Each insulating-tube 9 carries at its outer end a metal contact 10 and is closed by a cap 11. In conductive relation to the metal socket 10 is the machine bus-bar. A number of porcelain posts 12, clamped to the slate frame by bolts and nuts, stiffens the framework and holds the parts in place. The contacts at the ends of the tubes may be cross-connected by tubular plugs carrying an insulating-handle. These plugs may be made of brass tubing 13, tapered at the end and long enough to reach across the two sets of bus-bars. A spring 14, having a knee or bend projecting through a slot in the brass tube, holds the latter in good contact with the tubular terminals 6. Thus it will be seen that by inserting a plug in any socket one of the sections of the vertical bus-bar in which it is inserted is connected with the transfer-bar directly beneath. It will be seen that also by means of the breaks between the machines and the circuits and the break between the two sections of each vertical bus-bar any circuit or any machine may be isolated, leaving both sets of bus-bars clear for a transfer of connections. By this means I am able to dispense almost entirely with cable connections on the face of the board. I provide, however, a few such for establishing connections in case of emergency when all the transfer-bars may be in use. I provide also a twin cable and plug for connecting an ammeter. This instrument is commonly mounted at the top of the panel and may be cut into any circuit by inserting the jack into one of a series of sockets at the bottom of the board—as, for example, as indicated diagrammatically in Fig. 5. A socket of the bottom row corresponding to the machine-terminals 4^a 4^b, &c., (one for each machine,) provided with a spring-contact, may be employed for this purpose. As the use of such sockets is common in the construction of arc-light switchboards, I have deemed it unnecessary to illustrate it in detail. One such socket for each machine or circuit may be provided, so that the ammeter may be put in series relation to any circuit. With a construction as thus organized it will be evident that by inserting plugs, as indicated in Fig. 1, each machine will be feeding its own circuit. The panel shown in the drawings is designed to accommodate three machines and three circuits. Machine A will be connected by the bottom pair of plugs 15 15^a with the lower section of the vertical bus-bars. The two sections of the bus-bars will be bridged by the plugs 15^b 15^c, and the break adjacent to the circuit will be connected by the plugs 15^d 15^e. Similarly the breaks between the other two machines and their circuits are bridged. Suppose now for some reason it should be desired to shut down the middle machine and to run circuits A′ and B′ on machine A. Looking at Fig. 5 the inserted plugs are marked X, and it will be apparent that there is a separate circuit for each machine. Plugs may be inserted at the sockets marked 15^g 15^h 15^i 15^j and plugs 15^c and 15^f removed, thus leaving the two machines and two circuits in series. The middle machine may now be short-circuited by inserting a plug at 15^k and then cut out by removing the plugs 15^l 15^m. By a similar process the third or any circuit on the panel may be included in circuit with any machine, and any desired connections may be made by use of the plugs and bus-bars.

A distinctive advantage which is afforded by the type of board herein described is that extra machines may be added to the board without increasing the area of the board to the same extent as heretofore. It will be apparent that the machines being connected at one end with the divided set of bus-bars and the feeders or distributing-circuits at the opposite ends to add to the capacity of the board simply necessitates the addition of more bus-bars for the machines, the same transfer-buses being maintained without addition. In boards where this arrangement is not maintained the space occupied by the board increases as the square of the number of machines added. This improved type of machine results in a great advantage when the capacity of a plant must be increased, since it necessitates much less alteration and much less room for such increase.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A switchboard provided with two sets of insulated conductors crossing one another at an angle, one set connecting with the machines and circuits at their ends, and means for cross-connecting the two sets of bars at the points of intersection.

2. A switchboard provided with two sets of insulated conductors crossing one another at an angle, the several conductors of one set connecting with the machines and circuits at their ends, means for cross-connecting them with those of the other set at the points of intersection and means for cutting them at a point between the outer conductors of the other set.

3. A switchboard provided with two parallel sets of insulated conductors crossing one another at an angle, means for cross-connecting them at the several points of intersection, and means for cutting the conductors of one set, the machines and feeders being connected at opposite sides of the cut.

4. A switchboard provided with two parallel sets of insulated conductors crossing one another at an angle, means for cross-connecting them at the several points of intersection, and means for cutting the conductors of one set at a plurality of points, the machines and feeders being connected at opposite ends of the broken set.

5. A switchboard having two rows of insulated bus-bars at right angles to one another,

one row connecting with the sources of current and distributing-circuits at their ends, means for electrically cutting these conductors at two or more points, and means for connecting each severed part with one of the other row.

6. A switchboard having main bus-bars connecting the several sources with the distributing-circuits, transfer bus-bars crossing the others at right angles, means for cross-connecting the several points of intersection, and means for cutting the bus-bars between the first and last transfer-bus.

7. A switchboard having main bus-bars connecting the several sources with the distributing-circuits, transfer bus-bars crossing the others at right angles, means for cross-connecting the several points of intersection, and means for cutting the main bus-bars at a plurality of points.

8. A switchboard having main bus-bars connecting the several sources with the distributing-circuits, transfer bus-bars crossing the others at right angles, means for cross-connecting the several points of intersection, and means for cutting the main bus-bars at and between the outer transfer-buses.

9. A switchboard having two rows of superposed bus-bars insulated from one another and placed at right angles, plug-contacts for cross-connecting them, one set connecting the sources and the distributing-circuits, and the other set acting to transfer any source to any circuit.

10. A switchboard having two rows of superposed bus-bars insulated from one another and placed at right angles, plug-contacts for cross-connecting them, one set connecting the sources and the distributing-circuits, and the other set acting to transfer any source to any circuit, and connections from the transfer-buses of one panel to those of the next.

In witness whereof I have hereunto set my hand this 14th day of May, 1901.

EDWARD M. HEWLETT.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.