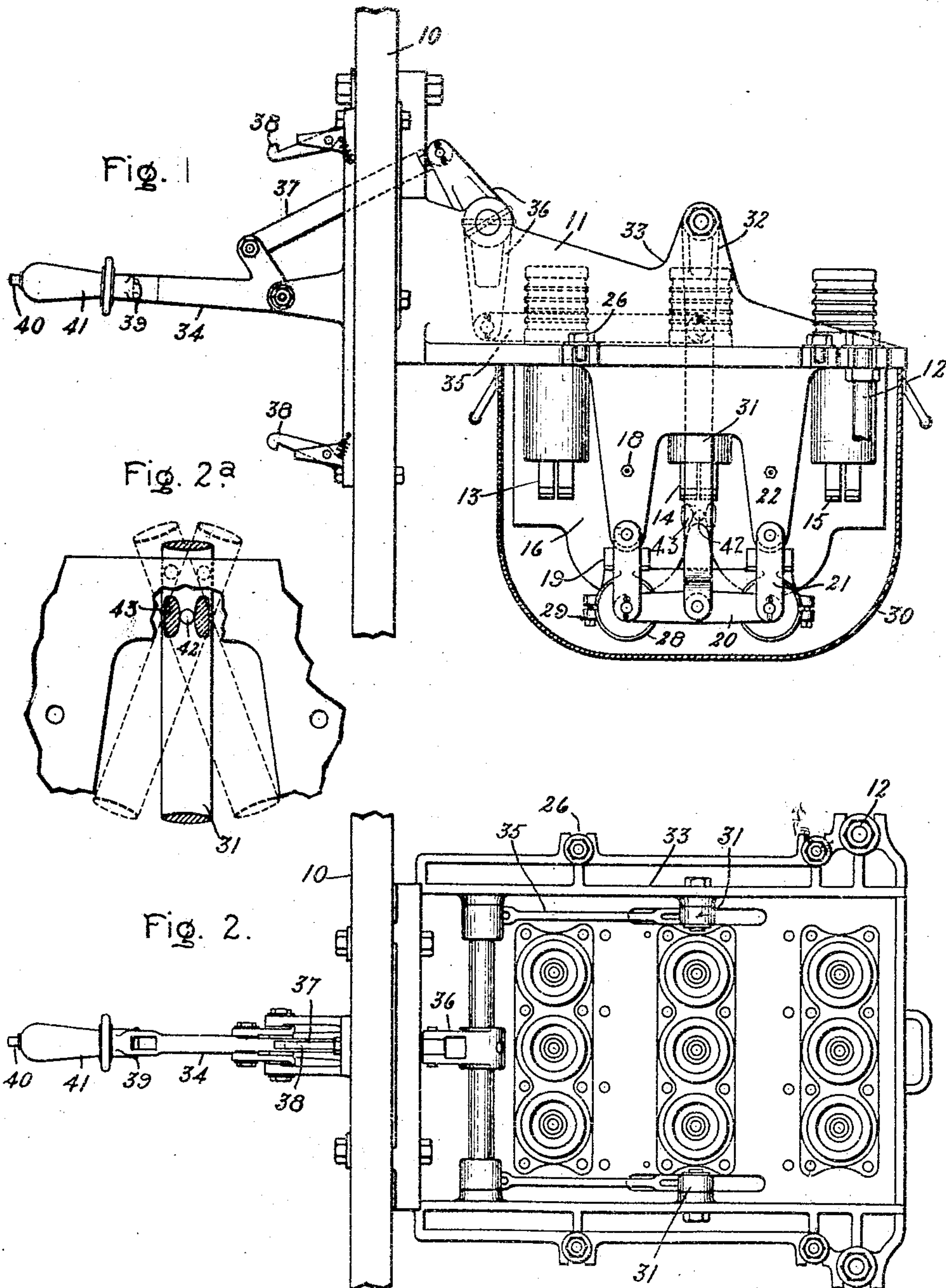


E. M. HEWLETT.
ELECTRIC SWITCH.

APPLICATION FILED JULY 27, 1904.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

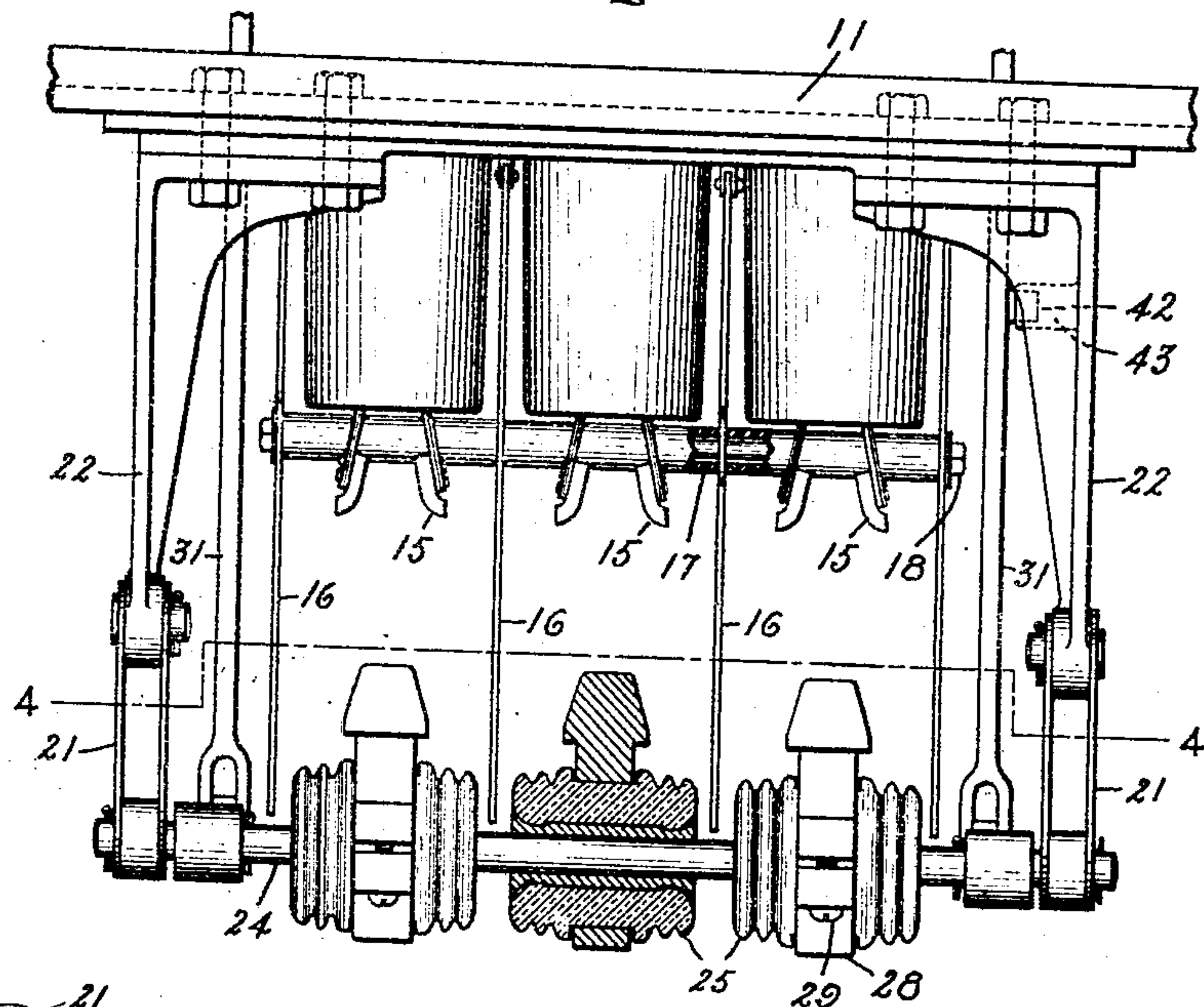


Fig. 4.

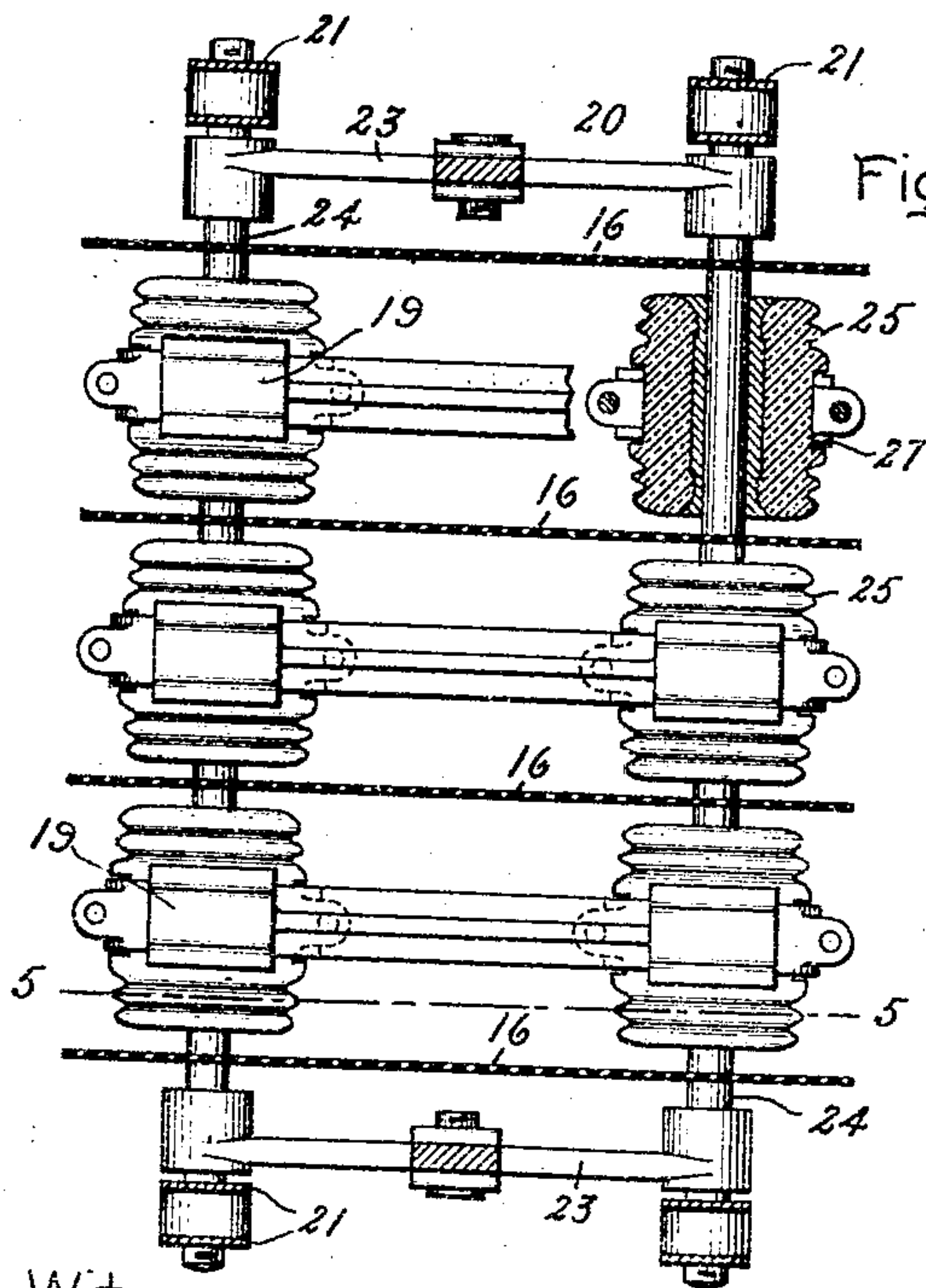
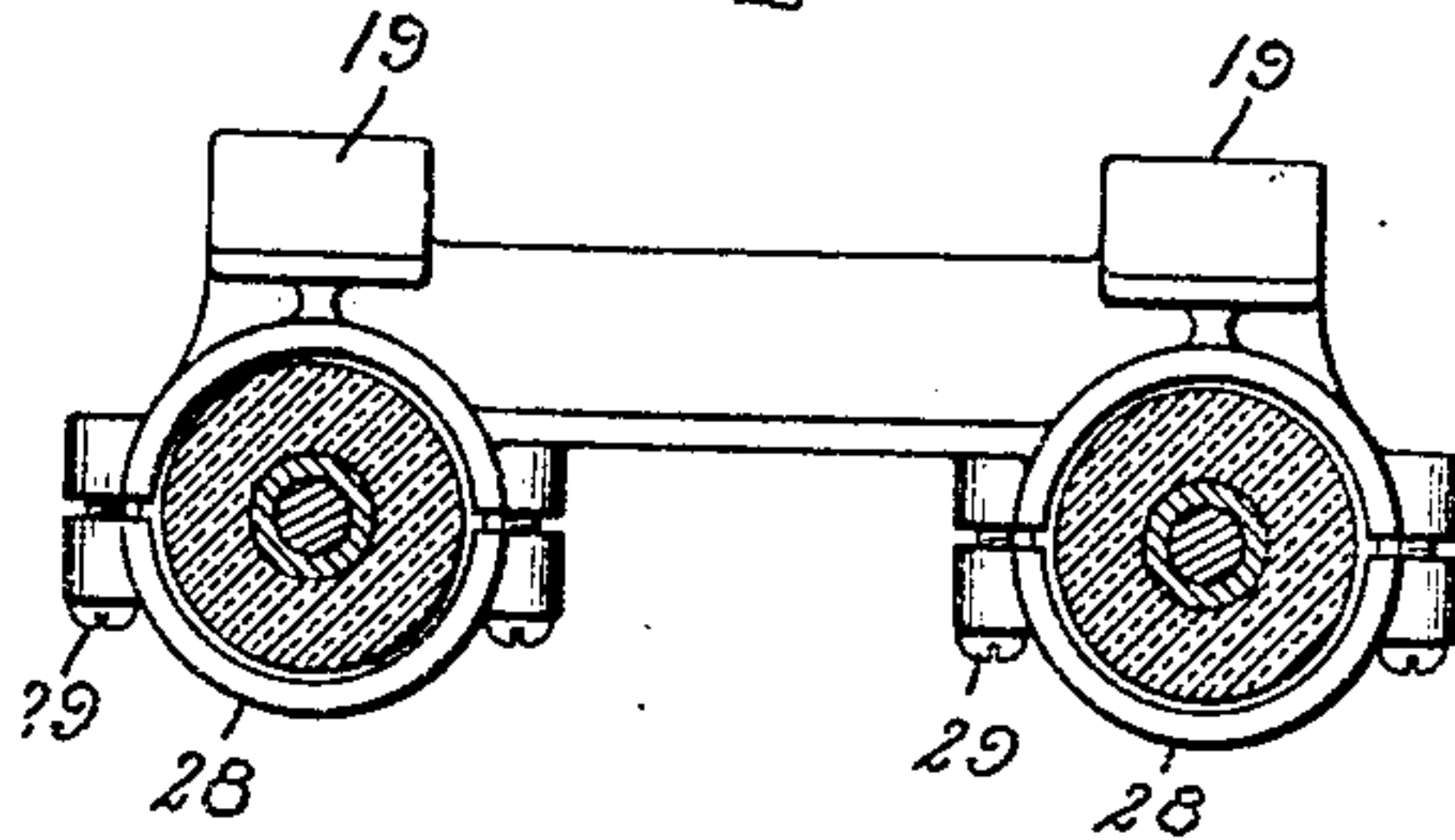


Fig. 5.



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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.

ELECTRIC SWITCH.

No. 815,825.

Specification of Letters Patent.

Patented March 20, 1906.

Application filed July 27, 1904. Serial No. 218,344.

To all whom it may concern:

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches, and has particular reference to double-throw switches adapted to make and break circuit under oil and especially designed for handling currents of high potential and large amperage.

The general object of the invention is to provide a switch for this purpose which shall be simple and compact in structure and effective in operation and so arranged that its various parts are readily accessible for inspection or repair.

In the present application I have disclosed one embodiment of my invention in which I arrange the switch-contacts so that they project downward from a suitable horizontal support into an oil-bath which is contained in an oil-receptacle removably connected with said support. The fixed contacts are arranged in sets of three per phase, and co-operating therewith are three movable bridging contacts, which hang from the horizontal support so as to lie below the fixed contacts and so as to swing into engagement therewith to complete the circuit between the center contacts and either trio of outside contacts, according to the direction of movement of the operating mechanism. Motion is transmitted to the movable contacts by means of connecting-links which are connected at their lower ends to said contacts and at their upper ends to cranks mounted upon the horizontal support and operatively connected with a manually-actuated lever. When the hand-lever is actuated, the cranks are rocked and the connecting-links pull upward on the movable switch element and rock it into either one or the other of its closed positions. In order to obtain correspondence between the movement of the switch and the operating-lever—that is, in order to give certainty to the switch movements—I provide means for giving the movable switch element an initial lateral movement in a direction corresponding to the direction of movement of the operating-lever. In the present instance this consists of a temporary fulcrum for each

of the connecting-links. By this organization the lateral movement of the cranks is transmitted to the upper end of the connecting-links, which are thereby rocked about their fulcrum to give the movable element of the switch a positive lateral movement. In this way there is exact correspondence between the movements of the cranks and the movable switch element, so that like movements of the operating-lever will always establish like circuit connections.

The invention consists of a novel organization, together with certain novel features and combinations, which will be more fully understood upon reference to the following detailed description of the invention, taken in connection with the accompanying drawings.

In the said drawings, Figure 1 is a side elevation of a double-throw multipolar switch constructed in accordance with my invention. Fig. 2 is a plan view of the same. Fig. 2^a is a detailed view illustrating the temporary fulcrum by which direction is given to the movement of the movable element of the switch. Fig. 3 is a rear view of the switch-contacts, parts being shown broken away and in section. Fig. 4 is a plan view of the movable switch element, illustrating certain of the connecting parts and the barriers in section on a plane indicated by the line 4 4 of Fig. 3; and Fig. 5 is a sectional elevation of one of the contacts shown in Fig. 3, the plane of section being indicated by the line 5 5 of Fig. 4.

Referring in detail to the drawings, Fig. 1 designates a switchboard or other suitable support upon which the switch is adapted to be mounted. To the rear of the switchboard 10 is firmly bolted or otherwise secured a horizontally-disposed supporting-frame 11, which is carried in part by standards 12, located at its rear and adapted to rest at their lower ends upon the floor or other suitable support. The horizontal frame 11 carries a plurality of circuit-terminals 13 14 15, which are arranged in sets of three per phase, as clearly illustrated, with the different phases separated by suitable barriers 16, which are hung from the under side of the frame 11 and suitably spaced by means of tubular washers 17, held together by bolts 18, passing through their centers in the manner illustrated in Fig. 3. Coöperating with the fixed contacts 13 14 15 are a plurality of bridging contacts 19, which are hung so as to swing into posi-

tion to bridge either the contacts 13 and 14 or the contacts 14 and 15. The bridging contacts 19 are mounted upon and insulated from a horizontally - disposed supporting-frame 20, which is hung, by means of a plurality of links 21, to the lower ends of the depending side walls 22, which are secured at their upper ends to the under side of the supporting-frame 11. Referring particularly to the movable element of the switch, the frame 20, which carries the bridging contacts 19, comprises side members 23, through whose ends extend the transverse bolts 24, which also pass through the lower ends of the supporting-links 21, as clearly shown in Fig. 3. Insulators are equally spaced upon the rods 24, and each is provided with an exterior annular groove 27, which is designed to receive one end of a bridging contact. These contacts are provided with concave bearing-surfaces at their opposite ends, which rest in the grooves 27, and they are held in place by co-operating clamping members or straps 28, which are connected thereto by screws 29. By reason of the location of the depending portions of the side walls 22 midway between the center contact 14 and the outside contacts 13 and 15, respectively, the bridging contacts 19 may be readily swung into either of their circuit-closing positions. All of the contacts, together with the side walls 22 and the depending barriers 16 and other connecting parts, are surrounded by an oil-can 30, which is removably secured to the under side of the supporting-frame 11 in any preferred manner, as by the bolts 26. When this switch is set up for operation, the receptacle 30 is filled with oil until all of the contacts are submerged. The lower ends of the barriers 16 extend into close proximity to the transverse rods 24 of the movable contact-carrying frame 20 and into the space between the insulators 25 upon which the contacts 19 are located. The lower ends of the barriers are also curved concentrically with the path of movement of the rods 24, so that they maintain a close relation with said rods throughout the entire movement of the switch in either direction. By reason of the short radius upon which the movable contacts 19 are swung, due to the short links 21, and by reason of the connection between said links and the depending walls 22 being below the fixed contacts 13, 14, and 15 a substantially vertical break is obtained between the contacts of the switch and a maximum effect is obtained with a minimum size of oil-can 30.

In order to rock the movable switch element into its closed positions, operating-links 31 are provided. These links are pivoted at their lower ends to the side members 23 of the contact-supporting frame 20 and at their upper ends to the cranks 32, which are suitably journaled in the vertically-extending webs 33 of the supporting-frame 11. Motion

is transmitted to the cranks 32 from the operating-lever 34 through the agency of connecting-links 35, cranks 36, and a link 37. Suitable spring-pressed latches 38 are located on the front of the board 10 and are adapted to engage pins 39 on the operating-lever to hold the switch closed whenever said lever has been properly thrown. A spring-returned pin 40 extends down through the handle 41 on the operating-lever 34 into proximity to the pins 39 and is adapted to be pressed against the outer end of the latches 38 to release them from the pins 39 whenever it is desired to move the operating-lever from either closed position.

From the above it will be seen that with the switch open whenever the operating-lever 34 is moved the cranks 32 will be rocked to pull upon the contact-carrying frame 20 through the connecting-links 31. Assuming that the switch parts are in the position shown in Fig. 1, if the operating-lever 34 is pushed upward the cranks 32 will be rocked forward and will pull upward upon the links 31 and the contacts 19 will be drawn upward into engagement with the contacts 13 and 14 or the contacts 14 and 15, according to the direction in which said contacts are moved at the time the cranks 32 begin to pull upward. It will be apparent that until some means is provided for positively producing this movement a given movement of the operating-lever 34 would result in closing the circuit sometimes between the contacts 13 and 14 and at other times between the contacts 14 and 15. For the purpose of obtaining the necessary certainty of action between the switch parts a temporary fulcrum is provided for each of the links 31. The desired lever movement is obtained by the action of a pin or projection on the link 31 engaging co-operating projections 43 on the inner face of the depending walls 22. The projections 42 are located intermediate of the lengths of the links 31, so that an initial movement of the cranks 32 in the forward direction will always force the contacts 19 rearward, while a rearward movement of the cranks 32 will always produce a forward movement of the contacts. It will be apparent that the projections 42 and 43 remain in engagement only for a very short time, but long enough to determine the direction of movement of the movable element of the switch. After this direction is determined the links 31 cease to operate as levers and simply continue their function of drawing upward upon the frame 20.

From the above it will be apparent that I have devised a double-throw switch which is very compact and simple in construction. It will also be apparent that many alterations and modifications can be made in the structure and mechanism disclosed without departing from the spirit and scope of my invention. I therefore do not wish to be limited

ited to the specific matter disclosed, but aim to cover by the terms of the appended claims all such alterations and modifications.

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

1. A double-throw electric switch having its movable element swung from a suitable support, operating means acting to draw said element toward said support to rock it into its closed positions, and directive means associated therewith for positively starting said element in a direction corresponding to the direction of movement of the operating means.

2. A double-throw electric switch having its movable element swung from a horizontal support, operating means acting to draw said element upward, and means associated therewith for giving a lateral direction to said movement corresponding to the direction of movement of the operating means.

3. A double-throw electric switch having its movable element swung from a suitable support, an operating-crank mounted adjacent thereto, a link connecting said crank and movable element and operative to draw said element toward said support into either of its closed positions, and means for giving a transverse movement to said element corresponding to the initial movement of the crank.

4. A double-throw electric switch having its movable element swung from a suitable support, an operating-crank mounted adjacent thereto, a link connecting said crank and movable element and operating to draw said element toward said support into either of its closed positions, and means comprising a temporary fulcrum for giving a transverse movement to said element corresponding to the initial movement of the crank.

5. A double-throw electric switch having its movable element swung from a suitable support, a link connected with said element and arranged to draw it toward said support to close the switch, a temporary fulcrum for the link, and means for slightly rocking said link about its fulcrum so as to give direction to the movement of the movable switch element.

6. A double-throw electric switch having its movable element supported by links, an operating-lever, an operating-link connected to said element and actuated by said lever to draw said element in the direction of said links, and means for rocking said element off "dead-center" to insure a switch movement in correspondence with the movement of the operating-lever.

7. A double-throw electric switch having its movable element supported by links, an operating-lever, an operating-link connected to said element and actuated by said lever to draw said element against the thrust of said links, a temporary fulcrum for said operating-link, and means actuated by the operat-

ing-lever to rock said operating-link about its fulcrum to carry the movable element off "dead-center" to one side or the other according to the direction of movement of the operating-lever.

8. A double-throw electric switch, comprising a horizontally-disposed support, fixed contacts projecting from the under side thereof, movable contacts hung from said support and free to swing in opposite directions into circuit-closing positions, one or more operating-cranks located above said movable contacts, an operating-lever for rocking said cranks, one or more links connecting said cranks and said movable contacts, lugs on said links, and fixed lugs located so as to be engaged by the lugs on said links at the beginning of the closing movement and thereby rock the movable contacts in a direction corresponding with the movement of the operating-lever.

9. A double-throw electric switch, comprising a suitable support, fixed contacts thereon, a swinging frame hung by links from said support, cooperating contacts carried thereby, and means for swinging said frame into either switch-closing position.

10. A double-throw electric switch, comprising a horizontally-disposed supporting-plate, fixed contacts thereon, a swinging frame hung by links from said plate, cooperating contacts carried thereby, and means for swinging said frame so as to bring said contacts into either circuit-closing position.

11. A double-throw electric switch, comprising a horizontal support, the fixed contacts projecting therefrom, and cooperating contacts hung by links from said support so as to swing into engagement with the center and either of the extreme fixed contacts.

12. An electric switch, comprising a horizontally-disposed support, fixed contacts depending from the under side thereof, a horizontal frame carrying cooperating contacts, link connections between said frame and said support, and means for swinging said frame so as to close the switch.

13. An electric switch comprising a horizontal support, fixed contacts depending from the under side thereof, a horizontal frame hung from said support, cooperating contacts carried thereby, means for swinging said frame and contacts into circuit-closing position, and an oil-receptacle secured to said support and completely surrounding the switch-contacts.

14. An electric switch, comprising a suitable supporting-plate, a plurality of sets of fixed contacts thereon, a swinging frame carried by said plate, a plurality of parallel bridging contacts mounted thereon and suitably insulated from each other and said frame, and means for swinging said frame and contacts into circuit-closing position.

15. An electric switch, comprising a suit-