No. 840,327.

PATENTED JAN. 1, 1907.

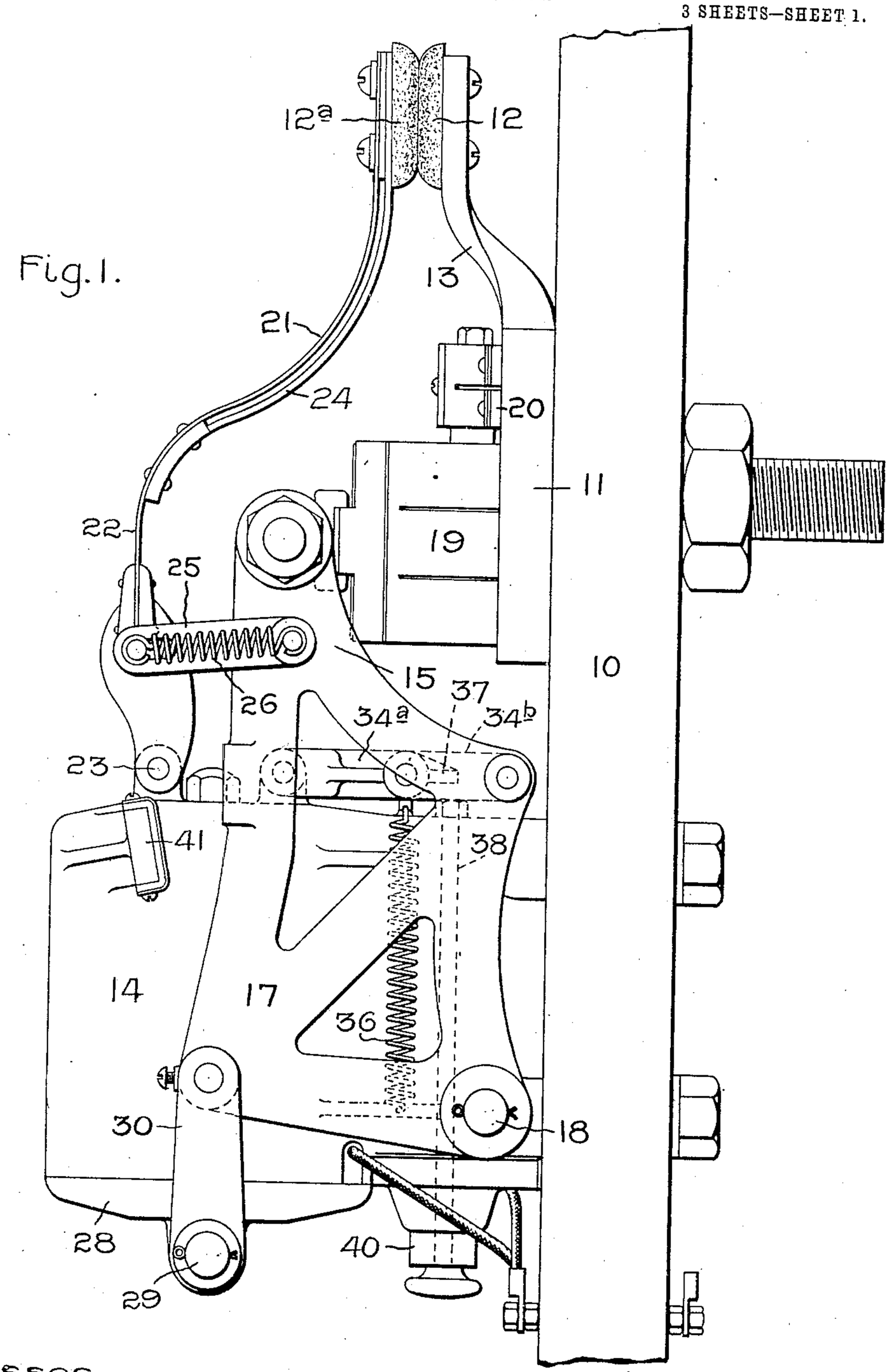
E. M. HEWLETT & T. E. BUTTON.

ELECTRIC SWITCH.

APPLICATION FILED MAY 28, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

Erving R. Gurney

Helen A. Ford

Inventors:

Edward M. Hewlett,

Theodore E. Button,

by Albert G. Davis

Atty.

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3 SHEETS—SHEET 2.

Fig. 2.

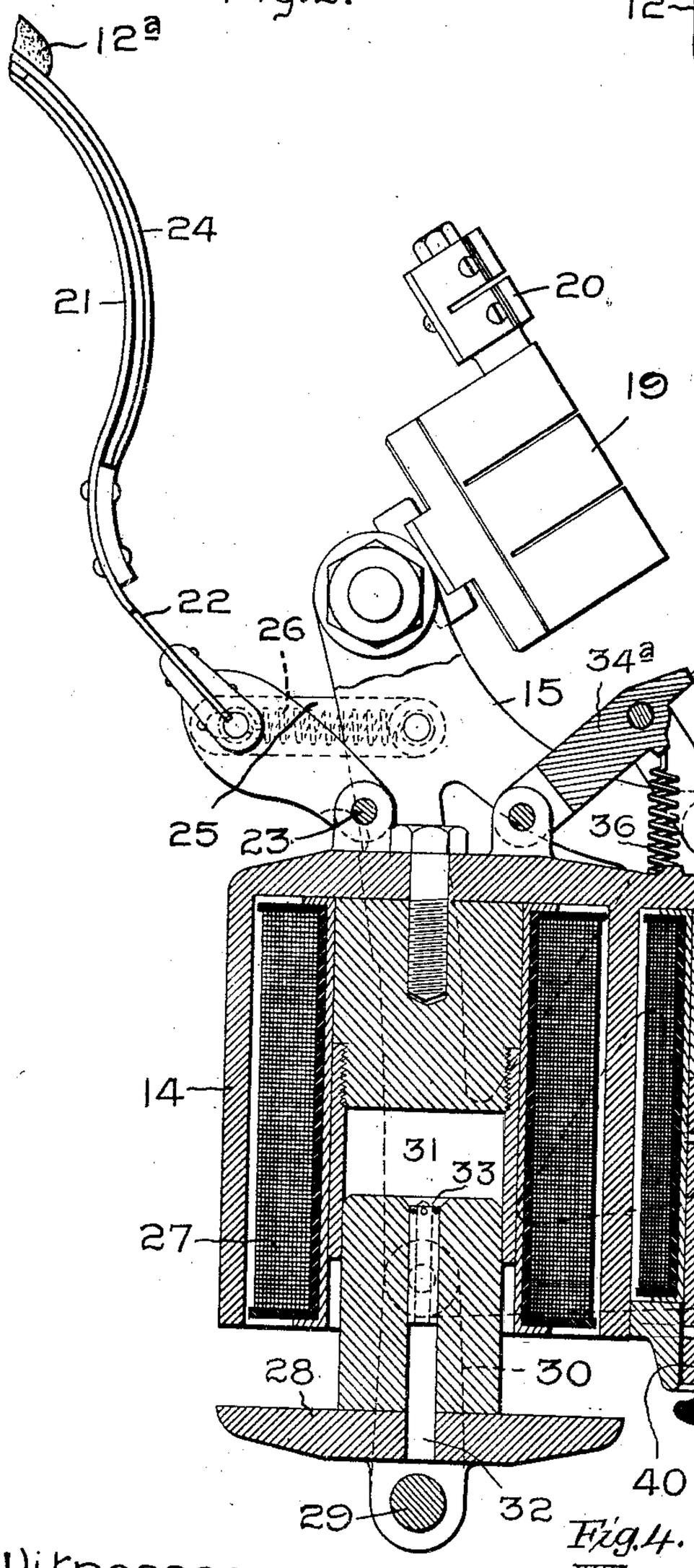
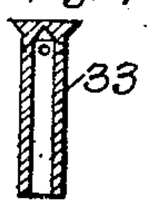
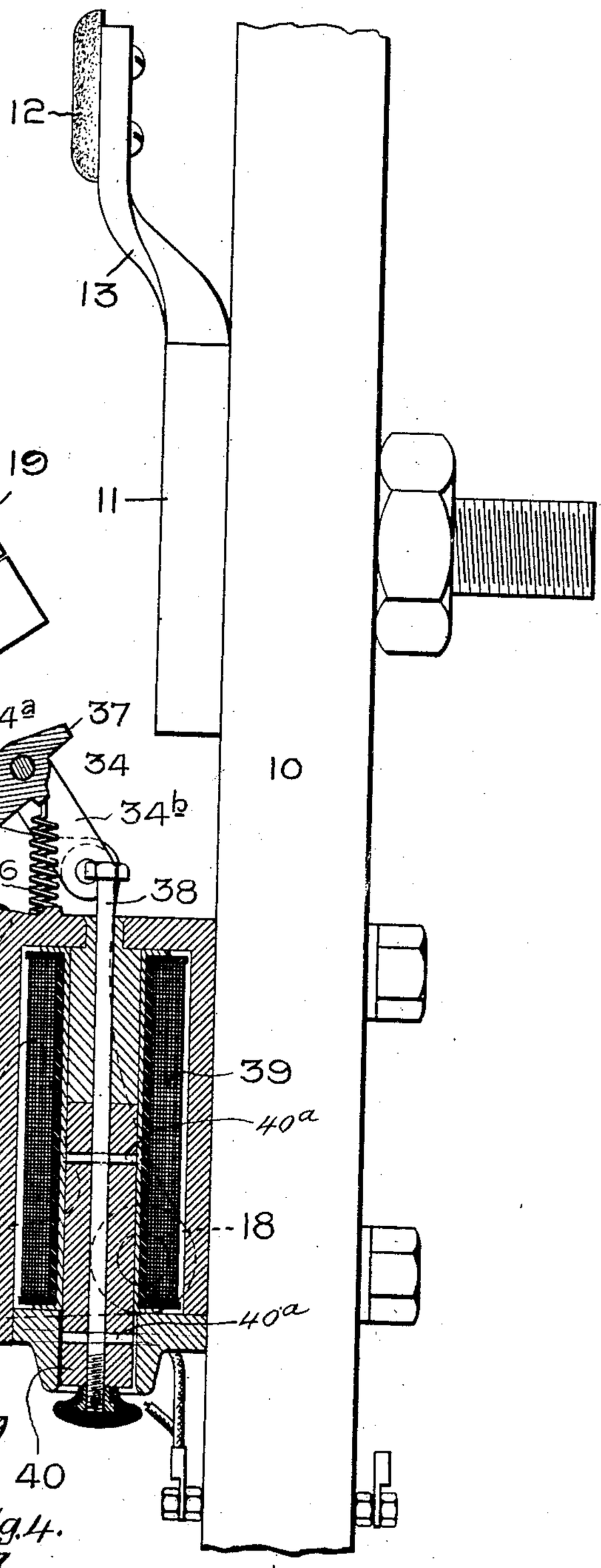


Fig. 4.





Witnesses.

Emily R. Burney

Helen Alford

Inventors:
Edward M. Hewlett,
Theodore E. Button,
by Albert G. Davis
Atty.

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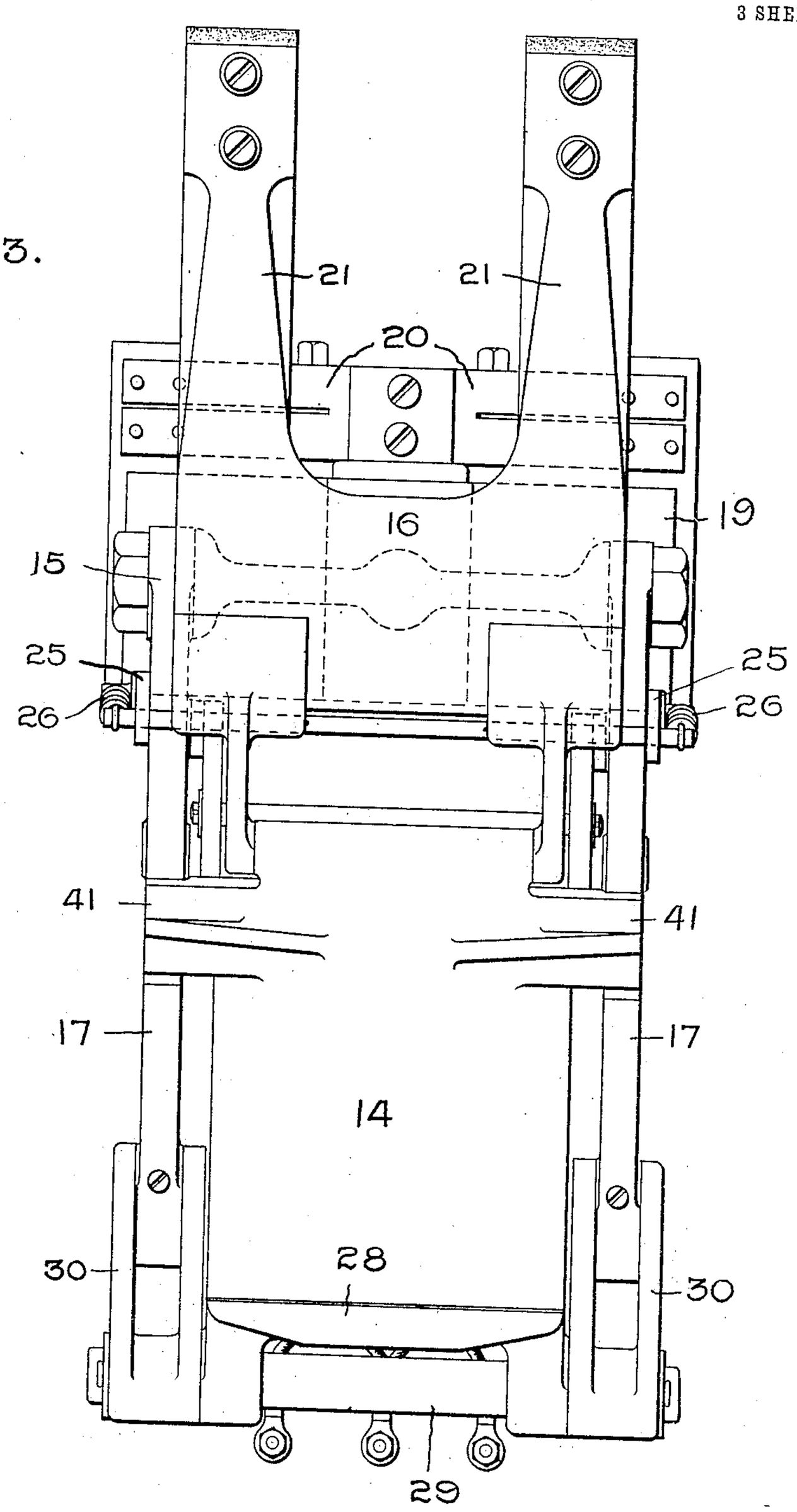
ELECTRIC SWITCH.

APPLICATION FILED MAY 28, 1904.

3 SHEETS—SHEET 3.

Fig. 3.



Witnesses.

Erving Bruce.

Helen Alford

Inventors:
Edward M. Hewlett,
Theodore E. Button,
by Albert G. Davis
Atty.

UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT AND THEODORE E. BUTTON, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

No. 840,327. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed May 28, 1904. Serial No. 210,165.

To all whom it may concern:

Be it known that we, EDWARD M. HEWLETT and THEODORE E. BUTTON, citizens 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.

The present invention relates to improvements in electric switches, and particularly to electrically-controlled switches which may be closed or opened from a distant point.

The object of the invention is to provide a switch of this type which is compact in structure and effective in operation.

To this end the invention comprises a novel organization, as well as certain novel structural features, all of which will be understood upon reference to the following description, taken in connection with the accompanying drawings, and the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Figure 1 is a side elevation of an electric switch constructed in accordance with the invention, the switch being shown in closed position. Fig. 2 is a similar view showing the switch open and the operating-magnet in section. Fig. 3 is a front elevation of the switch, and Fig. 4 is a vertical section of the dash-pot valve.

The switch illustrated is of the carbon break type and comprises horizontally-disposed main contacts and coöperating copper and carbon shunt-contacts. The movable switch-contacts are mounted on pivotally-supported frames which are yieldingly connected and arranged so that in operation the final break in the circuit takes place between the carbon contacts. The main-contact-supporting frame is an arched or inverted-U-shaped frame which straddles the switch-operating mechanism and carries the contact at its upper central portion. The operating mechanism comprises a plurality of magnets included in a common magnet-casing, and the lower ends of the arched frame are pivoted to the opposite sides of said casing at a point adjacent to the switch-base. This whole arrangement presents a very compact and efficient structure.

Referring in detail to the drawings, 10 designates a slab of slate, marble, or other insulating and fireproof material upon which the switch parts are mounted. This of course may be a portion of a switchboard or an independent switch-base. On the front of this slab are located the contact-studs 11, which extend through the slab and terminate in threaded shanks provided with nuts for engagement with suitable terminals. The fixed carbon contacts 12 are electrically and mechanically connected to the studs by upwardly and outwardly extending arms 13. The magnet casing or frame above referred to and designated 14 is suitably bolted or otherwise secured to the face of the support 10 below the contact-studs 11 and serves as the base or support of the frame 15. This frame consists, substantially, of a horizontal connecting member 16 and two downwardly-extending parallel members 17, which are connected at their lower ends to the magnet-casing 14 by the pivots 18. The bridging contact 19, which is connected to the center of the horizontal member 16, is composed of a bundle of laminations of spring-copper or other conducting material and is adapted to close the circuit between the studs 11.

Rigidly secured to the upper side of the contact 19 are oppositely-extending horizontal contact-fingers 20, arranged in shunt to the primary contact 19. These fingers are provided with removable contacting ends and are composed in part of spring material which is given a set sufficient to bring the face of their outer contacting ends slightly beyond the contacting face of the ends of the laminations comprising the contact 19 when the switch is opened, thus causing the circuit to be broken between the studs 11 and the fingers 20 after it is broken between the studs 11 and the contact 19. The final break, however, normally occurs between the carbon contacts 12 and 12^a; but if they for any reason are out of service the main brush is protected from injury from pitting and fusing by the contacts 20. The movable carbon contacts 12^a are carried at the upper ends of vertically-extending arms 21, which form part of the spring-plate 22, which is pivoted at its lower edge at the point 23 to the upper side of the magnet-frame 14.

Electrical connection is established between the movable carbon contacts 12^a by way of a strip 24 of copper or other good con-

ducting material, which is secured on the inner side of the plate 22. This plate 22, which, in fact, is a supporting-frame for the moving carbon contacts 12ª, is mechanically connected to the frame 15 by means of links 25 and springs 26. The links have a pin-and slot connection between the frames while the springs 26 are under tension and tend to draw the frames 15 and 22 together, but permit them to separate when the pressure between the contacts 12 and 12ª becomes excessive or the movement of the frame 15 is extremely rapid. By means of this spring connection between the frames 15 and 22 any suddenness of motion transmitted to the former is not communicated to the latter in the same degree. This has the effect of increasing the life of this portion of the switch by preserving the resiliency of the spring-plate 22. When, however, the carbon contacts 12 and 12ª are brought into engagement, the links 25 come into play, and through the agency of the ends of the slots bearing against their pins the said contacts are pressed into firm engagement. The spring action of the plate 22 also causes a wiping contact between the carbon blocks 12 and 12ª.

Motion is transmitted to the main-contact-supporting frame 15 and thence to the carbon-contact-supporting frame 22 by means of the operating-magnet 27. This magnet is located in the outer portion of the magnet-casing 14 and is provided at its lower end with an armature 28, comprising a horizontal portion and a movable core, which armature is connected, by means of a cross-bar 29 and end links 30, to the lower ends of the vertical portions 17 of the frame 15. The coil of the magnet 27 may be included in any suitable circuit and when energized draws the armature 28 upward, and thereby rocks the frame 15 about its pivots 18, so as to close the switch. By reason of the strong pull of the magnet 27 upon its armature some means must be employed for preventing the contact 19 from striking the studs 11 with too great a force. In order to take up this blow, we provide a dash-pot 31, which is located in the interior of the coil of the magnet 27. Into this pot the core of the armature 28 is loosely fitted. As a result of this construction when the magnet 27 is energized the air entrapped in the dash-pot 31 is compressed and the blow between the contacts is thereby cushioned. In order to permit a rapid return of the parts to open position, the armature 28 is provided with a passage 32, which leads from the chamber of the dash-pot to atmosphere. This passage is controlled by a valve 33, which closes the passage during the closing movement of the switch and by reason of the difference in air-pressure on its opposite sides opens said passage during the opening movement of the switch.

In order to maintain the switch in closed position, we provide a locking-toggle 34, which comprises a T-shaped or equivalent link 34ª and a pair of coöperating links 34ᵇ. The link 34ª is pivoted at the outer end of its central branch between projections extending from the upper side of the magnet-frame 14 and at the ends of its lateral branches to the links 34ᵇ, which in turn are pivoted at their opposite ends to the vertical members 17 of the contact-supporting frame 15, thus providing a toggle connection between the fixed magnet-frame and the movable frame of the main contacts. This toggle is normally drawn into locking position by means of coiled springs 36, located on opposite sides of the magnet-frame and connected therewith at their lower ends and to the lateral arms of the toggle-link 34ª at their upper ends, as clearly shown in Fig. 1.

In order to trip the toggle, the link 34ª is provided with a central projection 37, which is adapted to lie in the path of movement of a tripping-pin 38, which is normally held by gravity in non-engaging position. This pin is actuated to trip the toggle 34 by means of the trip-magnet 39, having a movable core 40, to which the pin 38 is secured by suitable pins 40ª. This magnet is housed within the casing 14 between the closing-magnet 27 and the support 10. The coil of the trip-magnet may be included in circuit with a relay or other device responsive to variations of conditions in the main circuit, or it may be included in circuit with a manual or other independent switch. When the switch is closed and locked, the parts will occupy the position illustrated in Fig. 1. If when in this position the trip-magnet 39 is energized, the movable core 40 will be drawn upward and the pin 38 will be driven with considerable force against the projection 37 of the toggle, thus breaking it and allowing the movable parts of the switch to fall to open position under the force of gravity. It is apparent that the springs 36 in returning the toggle to locking position are not absolutely necessary, since gravity might perform the same function, and where these springs are employed they should not be so strong as to interfere to any appreciable extent with the action of gravity in opening the switch. The opening movement of the switch is limited by stops 41, projecting from the opposite sides of the magnet-frame 14 into the path of the members 17 of the frame 15. The stops are preferably covered with leather or other soft material to cushion the blow.

It is apparent that many changes and alterations may be made in the specific construction illustrated without departing from the spirit and scope of our invention. We therefore do not wish to be limited to the specific matter disclosed, but aim to cover by the terms of the appended claims all equivalent alterations and modifications.

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

1. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, locking devices for said switch-contacts, a release-magnet therefor, and a switch-closing magnet, said magnets located in a common magnet-frame, said locking device and releasing and closing magnets being housed between the vertical portions of said frame.

2. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, a switch-magnet and a releasing-magnet located in a common magnet-frame mounted between the vertical portions of said contact-supporting frame.

3. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, a switch-operating magnet and a releasing-magnet located in a common magnet-frame mounted between the vertical portions of said contact-supporting frame, and locking devices located on the upper side of said magnet-frame.

4. An electric switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, electrically-actuated mechanism for closing the switch-contacts housed between the vertical portions of said frame, auxiliary fixed and movable shunt-contacts, an auxiliary frame carrying said movable shunt-contact, and elastic connecting means between said auxiliary frame and said supporting-frame whereby the supporting-frame actuates the auxiliary frame and said shunt-contacts are maintained in engagement after the circuit is broken at the main contacts.

5. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, a releasing-magnet and a switch-operating magnet mounted between the vertical portions of said frame, a toggle above the releasing-magnet for locking said contacts in closed position, and connecting means below the switch-operating magnet and operable thereby to rock said frame to close the switch.

6. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable bridging contact, a releasing-magnet and a switch-operating magnet mounted between the vertical portions of said frame, a locking-toggle connected to said frame above said releasing-magnet, a pin operated by said releasing-magnet to break said toggle, an armature for the switch-operating magnet located at the lower end of said magnet, and a link connection between said armature and said supporting-frame for closing said switch when said armature is drawn upward.

7. A magnetically-controlled switch comprising fixed and movable contacts, an arched supporting-frame for the movable contact, switch-operating means housed between the vertical portions of said frame, said means comprising an operating-magnet having its armature connected to said supporting-frame so as to close said switch when said magnet is energized, and means for cushioning the blow of the contacts.

8. A magnetically-controlled switch comprising fixed and movable contacts, a supporting-frame for the movable contact, and switch-operating means comprising an operating-magnet having its armature connected to said supporting-frame so as to close said switch when said magnet is energized, and a dash-pot located within said magnet-coil and arranged to retard the movement of said armature in closing the switch and to permit a quick movement in opening it.

9. A magnetically-controlled switch comprising fixed and movable contacts, a supporting-frame for the movable contact, and switch-operating means comprising an operating-magnet having its armature connected to said supporting-frame so as to close said switch when said magnet is energized, and an armature for said magnet fitted loosely in an air-pot within the magnet-coil, and a valve controlling an outlet-passage from said pot arranged to close during the closing movement of said switch to cushion the blow of the switch-contacts, and to open during the opening movement of the switch to permit a quick switch movement.

10. An electric switch comprising a support, fixed main and shunt contacts, a main frame pivoted to said support and carrying a movable main contact, a supplementary frame carrying a movable shunt-contact pivoted to said support and actuated by said main frame, and an elastic connection between said frames.

11. An electric switch comprising a support, fixed main and shunt contacts, a main supporting-frame carrying a movable main contact, a supplementary frame carrying a movable shunt-contact and connected from said main supporting-frame, a lost-motion connection between said frames, and a spring connecting said frames.

12. An electric switch comprising fixed and movable main and shunt contacts, supporting-frames for the movable contacts, a lost-motion connection between said supporting-frames, and springs tending to force said shunt-contacts into engaging position whereby the shunt-contacts remain closed during the initial opening movement of the main contact.

13. An electric switch comprising fixed and movable main and shunt contacts, supporting-frames for the movable contacts, a pin-and-slot connection between said sup-

porting-frames, and springs tending to draw said frames toward each other, whereby the shunt-contacts are held closed during the initial opening movement of the main contact.

14. An electric switch comprising a supporting-base, contact-studs mounted thereon, a movable bridging contact, an arched supporting-frame for said bridging contact pivoted to said base, a magnet for closing said contacts secured to said base between the vertical portions of said frame, a fixed shunt-contact, a movable shunt-contact pivoted to said magnet, and elastic connections between said supporting-frame and said movable shunt-contact whereby the circuit is broken between said main and shunt contacts in succession.

15. A magnetically-controlled switch comprising fixed and movable contacts, an operating-magnet for the movable switch element located below said contacts, a locking-toggle for holding the switch in closed position located between said magnet and contacts, and a releasing-magnet for said toggle mounted in a common magnet-frame with said operating-magnet.

16. A magnetically-controlled switch comprising fixed and movable contacts, an iron-clad actuating-magnet for the movable switch element located below said contacts, an arched contact-supporting frame pivoted at its lower ends to the opposite sides of said magnet-frame, and locking means connected to the upper side of said magnet-frame.

17. A magnetically-controlled switch comprising a base, a switch-operating magnet and a releasing-magnet located in a common magnet-frame, fixed and movable contacts, a supporting-frame for the movable contact carrying said contact at its upper end and pivoted to the magnet-frame at its lower end, and means for locking the switch in closed position located on the upper side of said magnet-frame.

18. A magnetically-controlled switch comprising a base, a switch-operating magnet and a releasing-magnet in a common magnet-frame secured to said base, fixed and movable contacts, a supporting-frame for the movable contact carrying said contact at its upper end and pivoted at its lower end to the magnet-frame, and an armature for the switch-operating magnet located at the lower side of the magnet and connected to said supporting-frame so as to close the switch when said magnet is energized.

19. A magnetically-controlled switch comprising a base, a switch-operating magnet and a releasing-magnet in a common magnet-frame secured to said base, fixed and movable contacts, a supporting-frame for the movable contact carrying said contact at its upper end and pivoted at its lower end to the magnet-frame, an armature for the switch-operating magnet located at the lower side of the magnet and connected to said supporting-frame so as to close the switch when said magnet is energized, and a locking-toggle for holding the switch in closed position connected between the upper side of said magnet-frame and the contact-supporting frame.

20. A magnetically-controlled switch comprising a base, an iron-clad operating-magnet secured thereto, fixed and movable main and shunt contacts, and supporting-frames for the movable contacts carrying said contacts at their upper ends and pivoted to the magnet-frame at their lower ends.

21. A magnetically-controlled switch comprising a base, an iron-clad operating-magnet secured thereto, fixed and movable main and shunt contacts, supporting-frames for the movable contacts carrying said contacts at their upper ends and pivoted to the magnet-frame at their lower ends, and an elastic connection between said supporting-frames whereby the circuit is broken at the main and shunt contacts in succession.

In witness whereof we have hereunto set our hands this 27th day of May, 1904.

EDWARD M. HEWLETT.
THEODORE E. BUTTON.

Witnesses:
G. C. HOLLISTER,
HELEN ORFORD.