No. 819,360. PATENTED MAY 1, 1906.

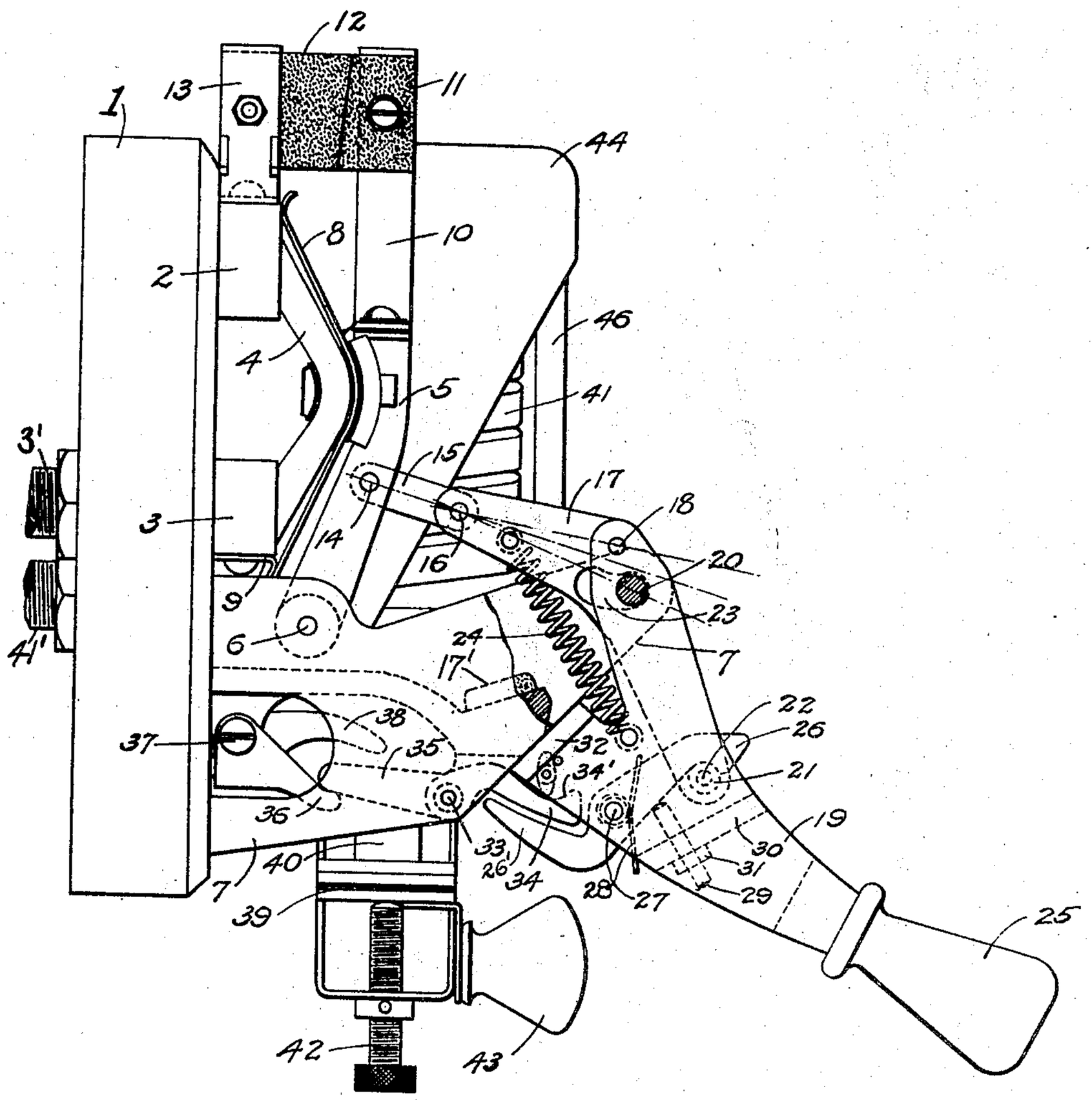
W. S. MAYER.

ELECTRICAL SWITCH.

APPLICATION FILED MAR. 22, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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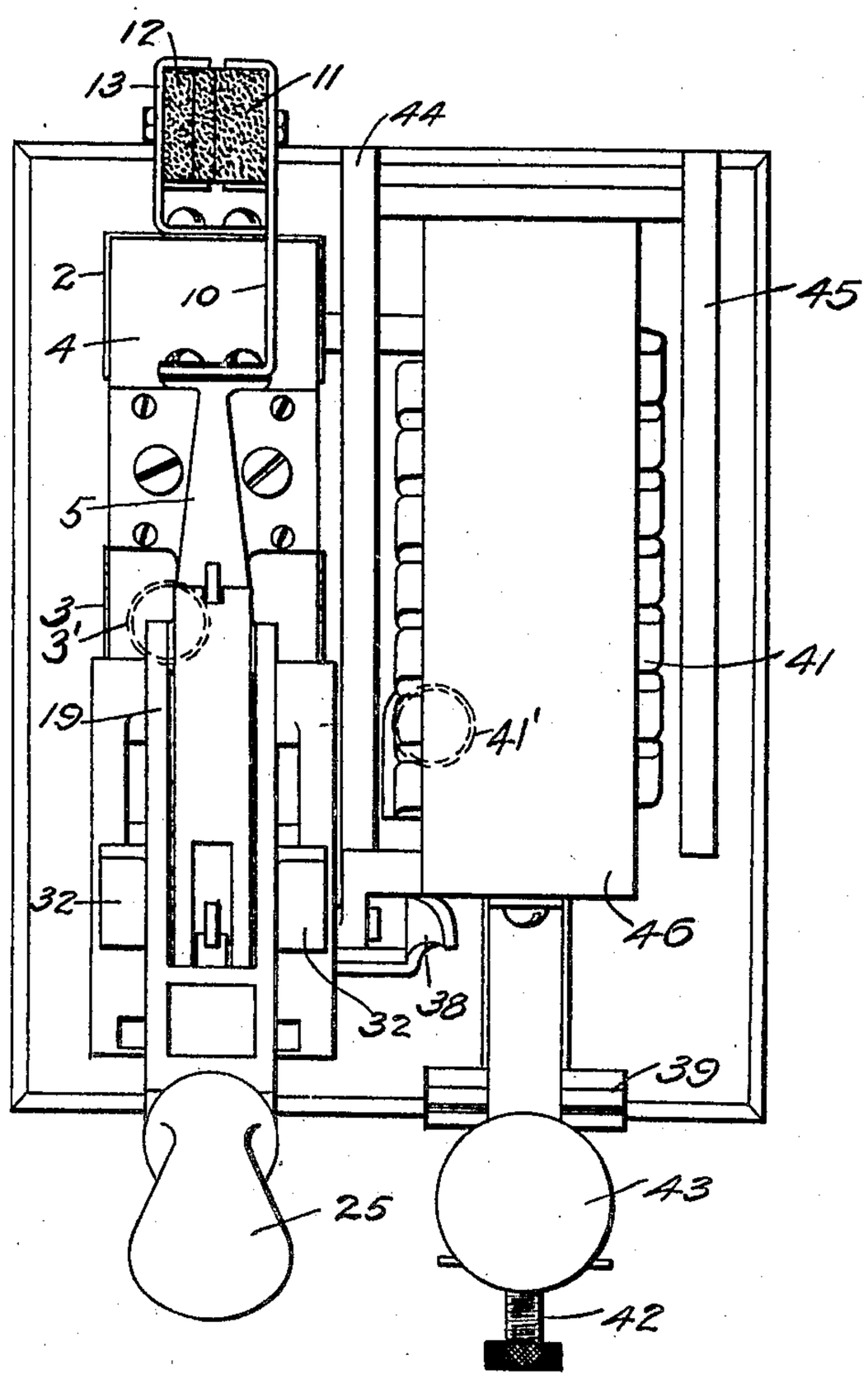
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3

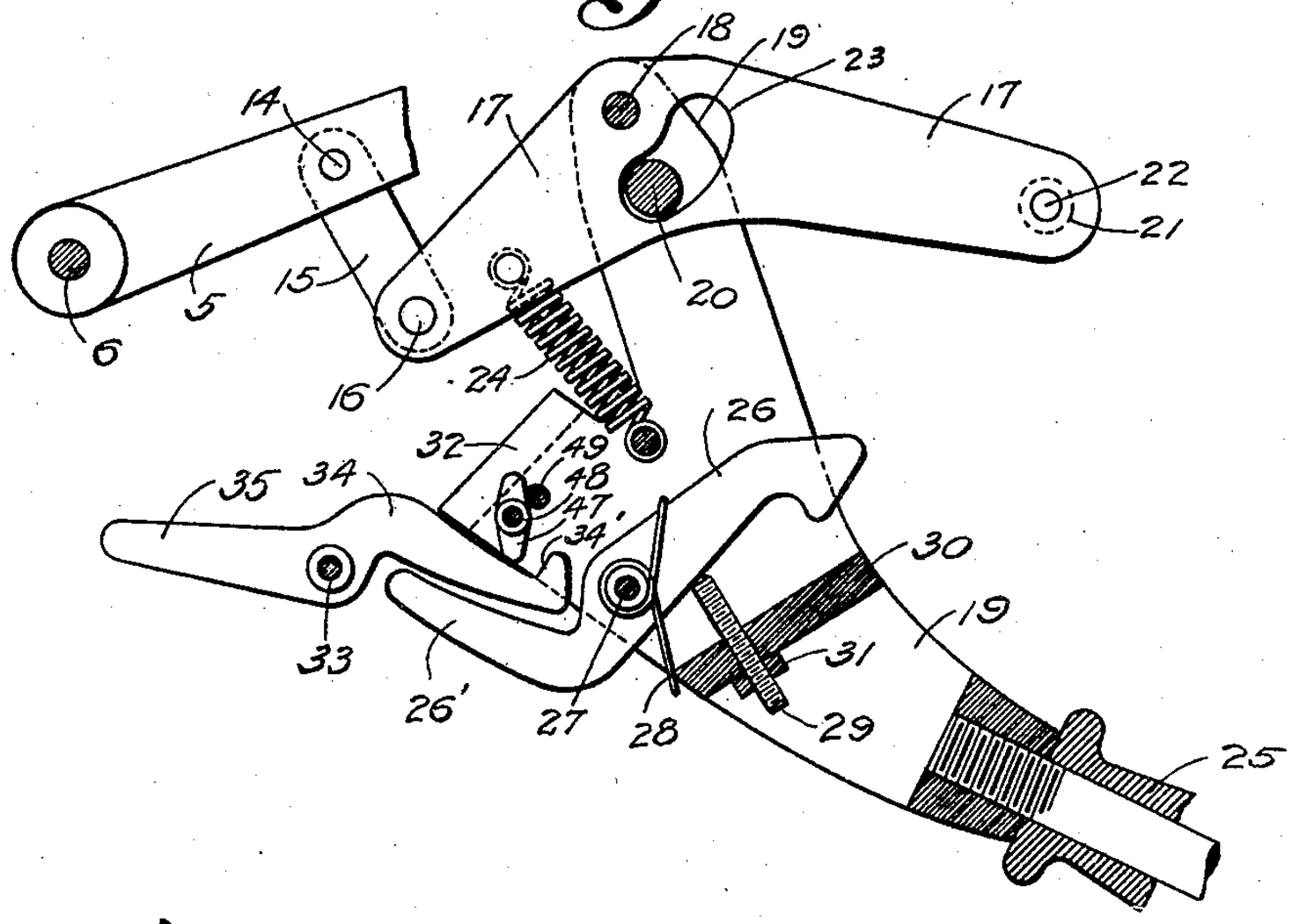
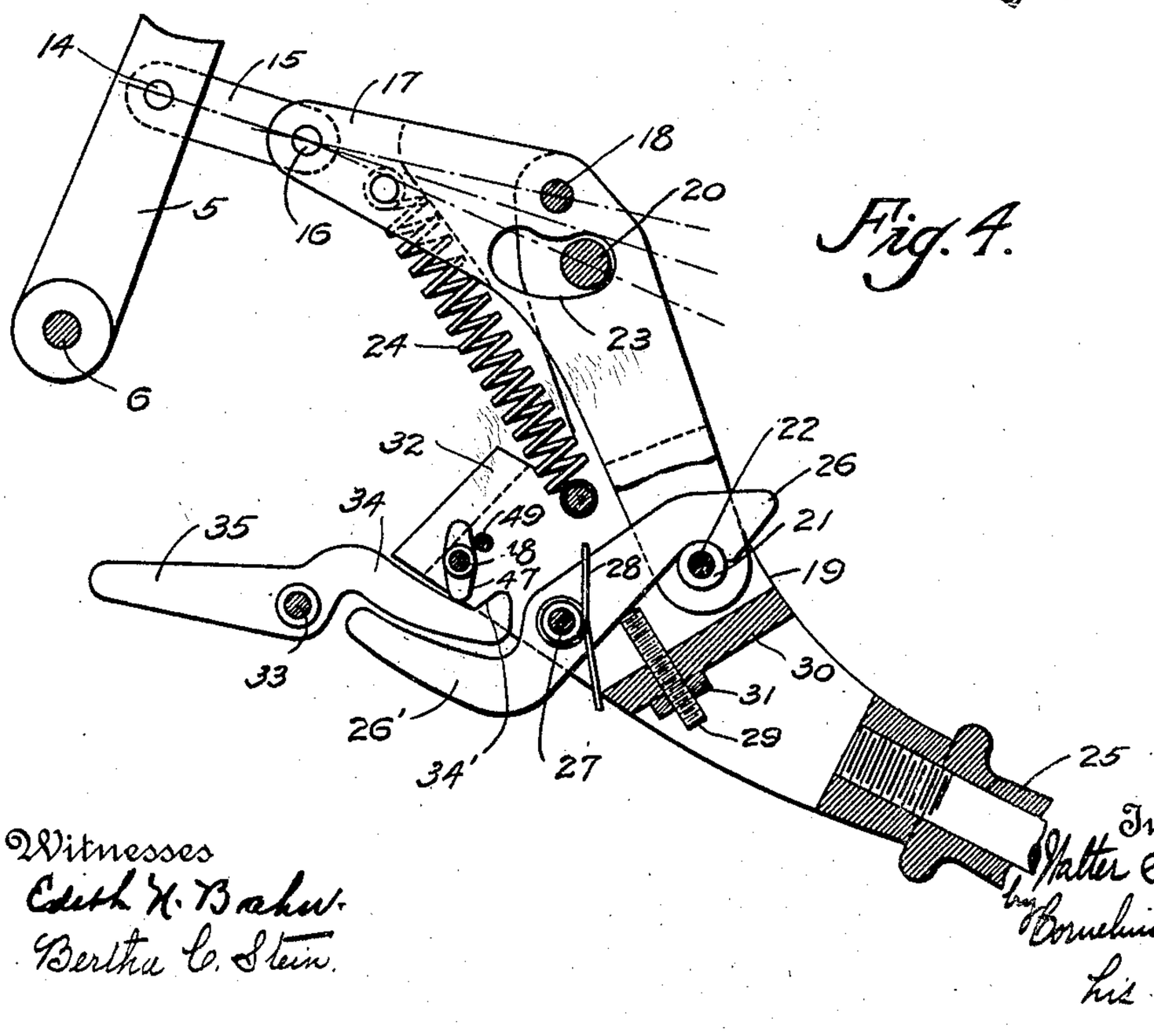


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRICAL SWITCH.

No. 819,360. Specification of Letters Patent. Patented May 1, 1906.

Application filed March 22, 1905. Serial No. 251,416.

To all whom it may concern:

Be it known that I, WALTER S. MAYER, a citizen of the United States, residing in the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Electrical Switch, of which the following is a specification.

My invention relates to electrical switches, more especially to those of the automatic type, for use in connection with either direct or alternating current circuits of either low or high potential.

It is the object of my invention to provide an electrical switch which shall be simple in construction, of great current-carrying capacity, and capable of preventing an operator from fully closing the switch or holding it closed during the existence or continuance of predetermined electrical conditions in a circuit.

By the employment of a circuit-breaker which cannot be closed by the operator during the existence or continuance of predetermined electrical conditions the usual simple mechanical switch heretofore used in connection with each automatic circuit-breaker upon a switchboard may be dispensed with.

For an illustration of one form which my invention may take reference is to be had to the accompanying drawings, in which—

Figure 1 is a side elevation of an automatic circuit-breaker embodying my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a fragmentary view showing the operating portions corresponding with open position of the switch or circuit-breaker. Fig. 4 is a view of the same parts shown in Fig. 3, but corresponding with the closed position of the switch or circuit-breaker.

Referring to the drawings, 1 is a suitable base of insulating material, such as a switchboard, upon which are secured the main terminal blocks 2 and 3, having their contact-faces parallel with the base and in a vertical plane. A laminated bridging member 4 is adapted to engage and bridge the main contact-terminals 2 and 3. The bridging member 4 is secured to and insulated from the arm 5, adapted to swing in a vertical plane toward and from the base about the pivot 6 in the frame 7, secured upon the base 1.

8 is a metallic shunt-contact, consisting of a conducting-spring adapted to engage the upper main contact-terminal 2 and to separate from such contact-terminal shortly after the laminated bridging member 4 separates from it. The member 8 extends downwardly and engages the contact-piece 9, secured upon the under side of the terminal block 3. Secured upon and insulated from the arm 5 is the vertically-extending resilient conducting member 10 in electrical communication with member 8 and carrying at its upper end the movable shunt-carbon 11, rigidly secured. The stationary shunt-carbon is shown at 12 secured to the conducting member 13, which is in turn secured upon the top of the main contact-terminal 2. In the circuit-closing position the carbons 11 and 12 overlap each other considerably, and when the circuit-breaker opens the carbon 11 slides upon and separates from the carbon 12, the final separation being at an instant of time later than the separation of the metallic shunt-contact 8 from the terminal block 2. During the opening movement of the switch the laminated bridging member 4 breaks contact. Then the metallic shunt-contact 8 and finally the carbon 11 separate from the carbon 12. In closing the switch the carbon 11 strikes the carbon 12 and rides up and slides upon it, due to the member 10 yielding in a lateral direction, as viewed in Fig. 2.

Pivoted to the arm 5 at 14 is a toggle-link 15, pivoted at its outer end at 16 to the toggle-link 17, which is pivoted at 18 to the actuator or operating-lever 19. The actuator 19 is pivoted at 20 in the frame 7. The toggle-link 17 extends beyond its pivot 18 and carries at its lower end the roller 21, rotatable upon the pivot 22, mounted in said piece 17.

23 is a slot in the member 17, embracing the pivot 20, enabling the member 17 to move through a considerable angle with respect to the actuator 19. A spring 24 is connected at its one end to the member 17 and at its other end to the actuator 19 and with the parts in the circuit-closing position, as shown in Figs. 1 and 4, is under tension. A suitable handle 25 is secured to the actuator 19. A latch 26 is pivoted at 27 upon the actuator 19. A spring 28 urges the latch 26

against the adjustable screw 29, threaded through the web 30 of the actuator 19 and locked by the nut 31.

32 is an ear on the actuator 19, by which the actuator engages the under side of the frame 7, as shown in Fig. 1. This ear 32 limits the downward motion of the actuator 19. Pivoted at 33 in the frame 7 is the latch-actuating lever 34, having the tail 35 extending into the path of travel of the lever 36, pivoted to the base at 37.

38 is a lever secured to and rotatable with the lever 36 about the axis 37. The lever 38 extends into the path of travel of the head 39 of the core 40 of the solenoid-coil 41. The core 40 and the solenoid-coil 41 constitute an overload tripping-magnet, as well understood in this art. One terminal of winding 41 is electrically connected with stud 41′, and the other terminal is electrically connected with terminal block 2. Terminal block 3 is electrically connected with stud 3′. Studs 3′ and 41′ constitute the terminals of the circuit-breaker. The adjusting-screw 42 determines the vertical position of the core 40, and therefore the current value at which the circuit-breaker will be opened.

43 is a button or knob secured to the head 39, so that the core 40 may be lifted manually to trip the circuit-breaker.

44 and 45 are plates of insulating material for housing the solenoid-coil 41.

46 is a bar of iron or other magnetizable material forming part of the magnetic circuit of the solenoid-coil 41.

A buffer 17′, of rubber of other suitable material, limits the opening movement of link 17.

The operation is as follows: When the circuit-breaker or switch is in open-circuit position, the operating parts are in the position shown in Fig. 3. To close the switch or circuit-breaker, the operator grasps the handle 25 and raises the actuator 19, thus rotating it in a counter-clockwise direction (as viewed in Fig. 3) about its pivot 20 in the frame 7. During this motion the toggle-link 17 will, in effect, rotate on its pivot 18 on the actuator 19 in a clockwise direction and the latch 26 will ride over and engage the roller 21 in the outer end of the link 17. The link 17 is then positively connected with the actuator 19 and upon depressing such actuator the toggle 15 17 is straightened out, thus rotating the arm 5 upon its pivot 6 and bringing the bridging member 4 into engagement with the terminal blocks 2 and 3. As the parts approach full circuit-closing position the pivots 14, 16, and 18 come more and more closely into the same imaginary straight line. The pivot 16 falls slightly short of the line joining the pivots 14 and 18 when full circuit-closing position is reached. To reach full circuit-closing position, the pivot 16 has passed beyond the imaginary straight line joining the centers of pivots 14 and 20. Thus considering the link 15 with the actuator 19, having the link 17 secured thereto by latch 26, as a toggle, it has slightly overtraveled to reach circuit-closing position, and thus locks the laminated member 4 in engagement with the contact-terminals 2 and 3. When this full circuit-closing position has been reached, the ear 32 rests against the under side of the frame 7 and prevents the toggle 15 17 from collapsing upwardly. When the current flowing through the solenoid 41 attains a predetermined value, the core 40 is drawn forcibly upward and the head 39 strikes the under side of the lever 38, thus raising the lever 36 and striking upon the under side of the tail 35 of the lever 34. Lever 34 accordingly rotates in a clockwise direction about its pivot 33 and strikes upon the upper side of the tail 26′ of the latch 26, thus releasing the lever 17 from the actuator 19. Since the lever 17 is now free from the actuator 19 and since the pivot-pin 16 falls slightly short of the straight line joining the centers of pivots 14 and 18, the toggle 15 17 collapses, due to the tension of spring 24, the resiliency of the laminated bridging member 4, and gravity, and the parts fly to open-circuit position, as shown in Fig. 3. If during the closing movement above described an abnormal or predetermined circuit condition obtains, upon the initial closure of the circuit, either at the carbons 11 and 12 or at the metallic contact parts, the solenoid-core 40 will be drawn up and the latch 26 operated to release the lever 17 from the actuator 19. Thereby the toggle 15 17, which has been extended, will collapse and the circuit-breaker open, while the operator still holds the handle 25. If the parts are in circuit-closing position and it is desired to trip or open the circuit-breaker, it is simply necessary to slightly raise the actuator 19, whereupon the member 47, pivoted to it at 48, rides upon the surface 34′ of the lever 34, depressing the lever and causing it to operate the latch 26, as heretofore described. The pin 49, secured to the actuator 19, prevents the rotation of the member 47 as it rides upon the surface 34′. During the closing movement the member 47 is permitted to rotate about its pivot 48 and rides freely over the lever 34 without actuating it.

From the foregoing description it is seen that the toggle for operating the movable contact member 4 is underset or undertraveled when the link 17 is free to rotate about the pivot 18, but is overset or overtraveled when the link 17 is locked by latch 26 to the actuator 19. In effect, therefore, one link of the movable contact-operating toggle is rotatable about either of two pivots, depending whether such link is locked to the actuator or free from the actuator, the disposition of the pivots being such that when free to rotate upon one pivot the toggle is always underset or undertraveled and when rotating upon

the other pivot is overset or overtraveled when the parts are in the full circuit-closing position.

What I claim is—

1. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, and locking connections between said toggle and said actuator whereby said toggle may overtravel when operated by said actuator and is underset when unlocked from said actuator.

2. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a link of said toggle pivoted upon said actuator, and a latch for connecting said toggle-link with said actuator.

3. In an electrical switch, a movable contact member, a toggle for operating said member, an actuator, a link of said toggle pivoted to said actuator, a latch for connecting said link with said actuator, said toggle being adapted to overtravel to lock said contact member in normal position when said link is latched to said actuator, and electroresponsive means for actuating said latch to release said link from said actuator and permit said toggle to collapse.

4. In an electrical switch, a movable contact member, a toggle for operating said contact member, a pivoted actuator, a link of said toggle pivoted to said actuator at a distance from the pivot of said actuator, and a latch for connecting said toggle-link with said actuator.

5. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator rotatable upon a pivot, a link of said toggle pivoted to said actuator at a distance from said pivot, and a latch for connecting said toggle-link with said actuator, whereby said toggle slightly overtravels to move said contact member to normal position, and is slightly undertraveled when said link is free from said actuator.

6. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator rotatable upon a pivot, a link of said toggle pivoted to said actuator at a distance from said pivot, and a latch for connecting said actuator with said toggle-link, whereby said toggle may overtravel when said link is locked to said actuator, and is undertraveled when said link is unlocked from said actuator.

7. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a locking connection between said toggle and said actuator whereby said toggle may overtravel when operated by said actuator and is underset when unlocked from said actuator, and electroresponsive means for breaking said connection upon attempted operation of the switch during the continuance or existence of predetermined electrical conditions.

8. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a link of said toggle pivoted upon said actuator, a latch for connecting said toggle-link with said actuator, and electroresponsive means for controlling said latch upon attempted operation of said actuator during the existence or continuance of predetermined electrical conditions.

9. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a locking connection between said toggle and said actuator whereby said toggle may overtravel when operated by said actuator and is underset when unlocked from said actuator, and means for limiting the overtravel of said toggle.

10. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a link of said toggle pivoted upon said actuator, a latch for connecting said toggle-link with said actuator, and means for actuating said latch upon reversed movement of said actuator.

11. In an electrical switch, a movable contact member, a toggle for operating said contact member, an actuator, a link of said toggle pivoted upon said actuator, and means for connecting said toggle-link with said actuator to cause them to operate as a unit, said toggle being overtraveled when said link and actuator are connected together and when said contact member is in normal position, and underset when said link is disconnected from said actuator.

12. In an electrical switch, a movable contact member, a toggle-link pivoted to said member, a second link pivoted to said first-mentioned link, said second link having a plurality of pivotal supports about which it may rotate, and means for shifting said link from one of said pivotal supports to another.

13. In an electrical switch, a movable contact member, a toggle-link pivoted thereto, a second toggle-link pivoted to said first-mentioned link, a plurality of pivotal supports about which said second link may rotate, and electroresponsive means for shifting said link from one pivot to another.

14. In an electrical switch, a movable contact member, a toggle-link pivoted thereto, a second toggle-link pivoted to said first-mentioned link, a plurality of pivotal supports about which said link may rotate, and electroresponsive means for shifting said second link from one pivotal support to another upon attempting to move said contact member to normal position during the existence or continuance of predetermined electrical conditions.

15. In an electrical switch, a movable con-

tact member, means for operating said contact member comprising an actuator and a lever pivoted upon said actuator, said lever intervening between said actuator and said contact member, and a latch for connecting said actuator and said lever together, whereby said contact member may be moved to and locked in normal position and is unlocked when said connection is broken.

16. In an electrical switch, a movable contact member, means for operating said contact member comprising an actuator and a member pivoted upon said actuator, said member intervening between said actuator and said movable contact member, and means for connecting said member and actuator together to cause them to operate as a unit, whereby said movable contact member may be moved to and locked in normal position and is unlocked when said connection is broken.

17. In an electrical switch, a movable contact member, means for operating said contact member comprising an actuator and a member pivoted upon said actuator, said member intervening between said actuator and said movable contact member, means for connecting said actuator and said member together to cause them to operate as a unit, and means for breaking said connection upon reversed movement of said actuator.

18. In an electrical switch, a movable resilient contact member, a toggle for cramping said contact member in normal position, an actuator, a link of said toggle pivoted upon said actuator, and a latch for locking said toggle-link and actuator together, whereby said toggle may overtravel to lock the contact member in normal position and is underset when unlocked from said actuator.

19. In an electrical switch, a movable contact member, an actuator, a power-multiplying device intervening between said actuator and said contact member and having a member pivoted to said actuator, a connection for locking said actuator and said pivoted member together, and means for breaking said connection whereby said contact member may move independently of said actuator.

20. In an electrical switch, a movable contact member, a toggle-link mechanically connected with said contact member, a second toggle-link pivoted to said first-mentioned link, a plurality of points of support about which said second link may rotate, an actuator, and a latch for locking said actuator and said second toggle-link together.

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