No. 882,340. PATENTED MAR. 17, 1908.

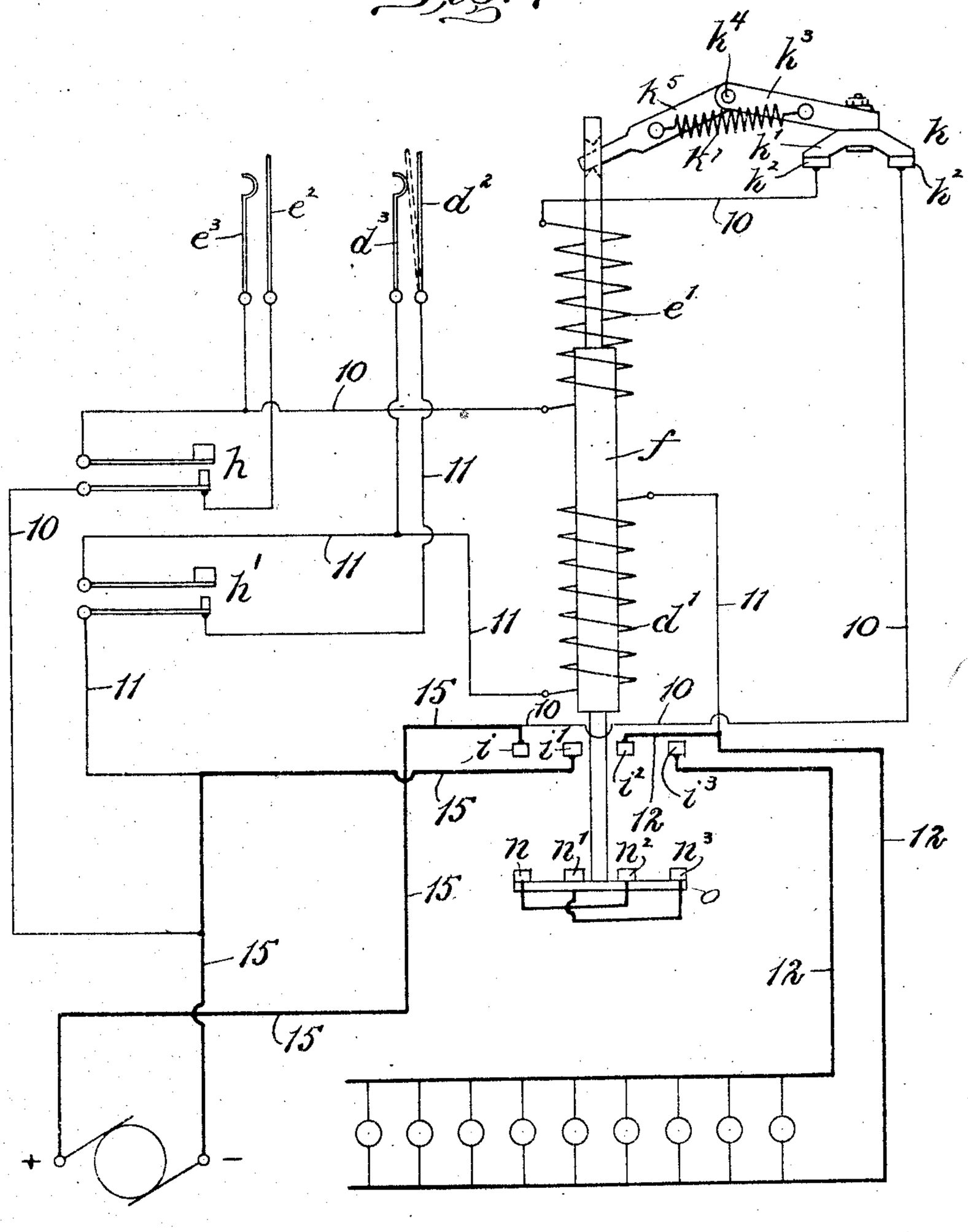
G. E. PALMER.

ELECTRICALLY CONTROLLED SWITCH MECHANISM.

APPLICATION FILED MAY 5, 1906.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses:
A. L. Folsom;
E. Bachelder

Inventor:
G. E. Palmer
by
Wright Brown Quinby & May
Attorneys.

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2 SHEETS—SHEET 2.

Fig. 2

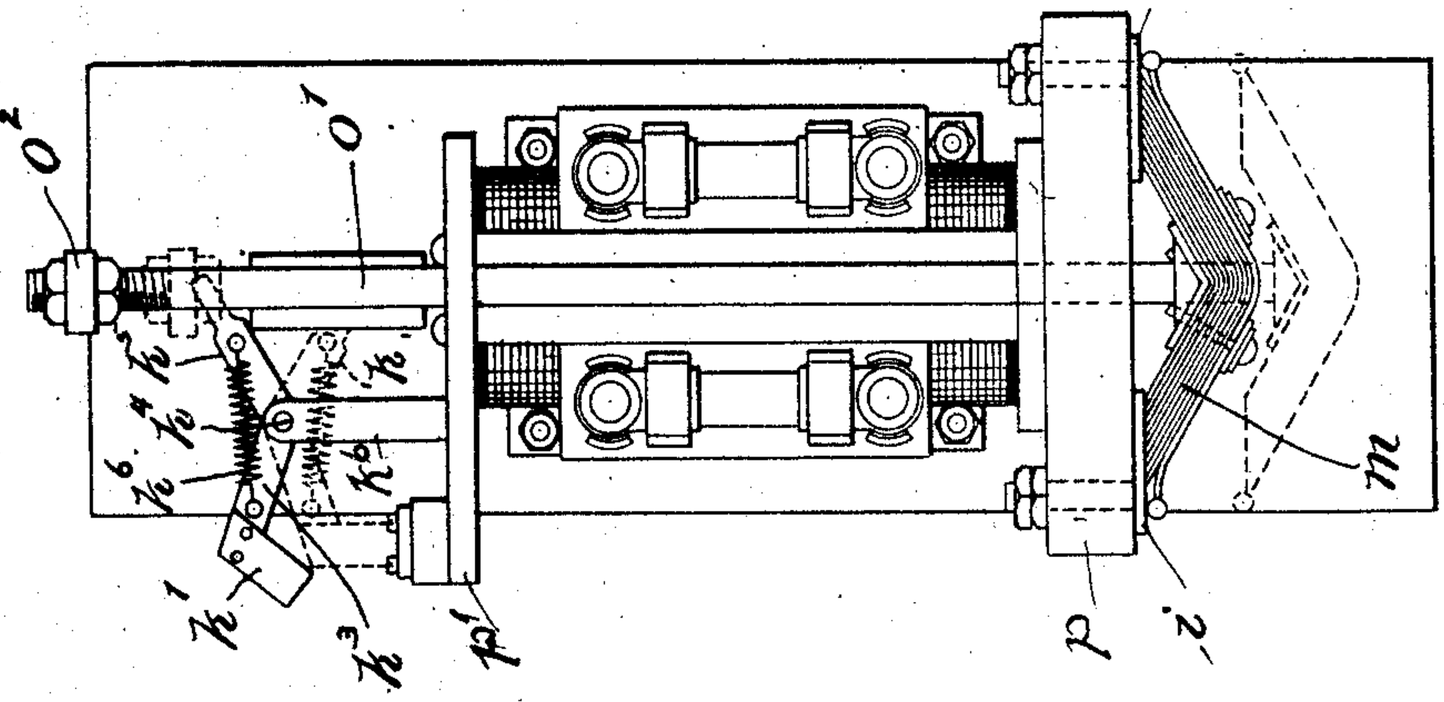
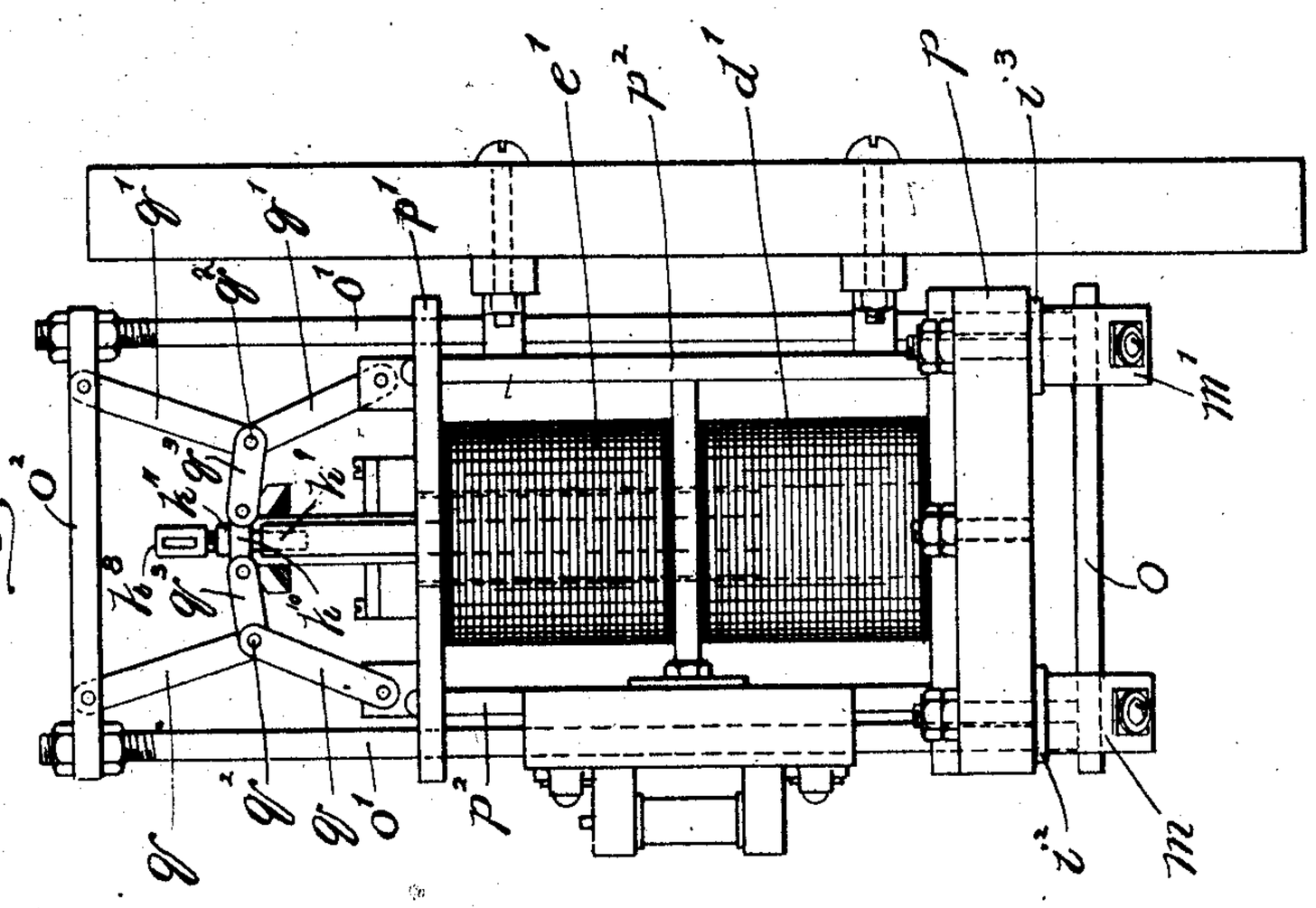


Fig. 3



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Inventor.
G. E. Palmer
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Attorneys.

UNITED STATES PATENT OFFICE.

GRANVILLE E. PALMER, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-FOURTH TO CHARLES B. PRICE AND ONE-FOURTH TO FRANK S. PRICE, OF SALEM, MASSACHUSETTS.

ELECTRICALLY-CONTROLLED SWITCH MECHANISM.

No. 882,340. Specification of Letters Patent. Patented March 17, 1908.

Application filed May 5, 1906. Serial No. 315,442.

To all whom it may concern:

Be it known that I, GRANVILLE E. PALMER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electrically-Controlled Switch Mechanisms, of which the following is a specification.

This invention relates to an electrically controlled switch mechanism for electric light or power circuits, and more particularly such a mechanism controlled from a point remote from the switch.

The characteristic features of my invention are the provision of means whereby the switch closing armature or solenoid, when it has fully completed its closing movement locks the switch firmly closed and automatically breaks the energizing circuit for the switch control, and on the other hand, if the closing impulse is for any reason not sufficiently strong to entirely close the switch, the latter will open full again by gravity, thus avoiding the danger of a continuing arc due to a partially and improperly closed switch. Thus the mechanism is thoroughly reliable in its action. It is equally reliable in its opening action, and as soon as the switch has opened, the control circuit is automatically broken.

In the accompanying drawings Figure 1 is a diagram of the arrangement of circuits for my switch mechanism control; Fig. 2 is a front elevation of the mechanism; Fig. 3 is a side elevation of the same.

Referring to the diagram, Fig. 1, the terminals of the main circuit 15 are connected to the two contacts i i^1 and the two terminals of the lighting or work circuit 12 are connected with the opposing contacts i^2 i^3. The switch-brushes n, n^1, n^2, n^3, when closed, connect the contacts i i^2 and the contacts i^1 i^3 respectively. I will hereinafter describe the construction of the switch-mechanism but it may be here stated that the brushes are mechanically operated by the armature or solenoid core f, which is arranged in an upright or vertical position and is raised by the "on" coil e^1 and drawn downward by the "off" coil d^1.

The switch control branch circuit, which I have termed the "on" circuit, is indicated at 10, and has one terminal connected with the contact i of the main switch and its other terminal connected with the other side of the main circuit 15. This circuit 10 includes a circuit-breaker k which is automatically operated by the solenoid core f. The "off" branch circuit 11, which includes the coil d^1, has one terminal connected with one side of the lighting circuit 12 and its other terminal connected to the main circuit 15. Connected in these two auxiliary or control circuits are the manually operated circuit-closers h and h^1, by the manipulation of which the main switch may be opened or closed. There may be also connected up in parallel with these circuit closers h and h^1, any automatic closing device, at d^2, d^3, and e^2, e^3, such as a time switch or thermostat.

I have already stated that in the branch "on" circuit 10 there is a circuit-breaker. This is indicated as k and it is automatically operated by the movement of the armature or solenoid core of the coils d^1 and e^1, so that, immediately upon the closing of the main switch, the circuit-breaker k is operated to break the closing circuit, and, when the main circuit is opened, the circuit-breaker is closed.

The construction of the main switch and of the auxiliary circuit-breaker k in the "on" circuit is illustrated in Figs. 2 and 3. My present invention resides essentially in the construction of this main switch. The four contacts i i^1 i^2 i^3 are supported by an insulating base and have connected to them the terminals of the main and lighting circuits. They are arranged in pairs with the contact i opposite that at i^2, and the contact i^1 opposite that at i^3. There are two switch brushes indicated at m m^1, each formed of a plurality of superimposed, thin, flat, spring-metal plates, or strips as shown in Fig. 2, the ends of these brushes being indicated conventionally in Fig. 1 at n n^1 n^2 n^3. Each brush is bent at an angle and is secured at its central portion to a cross-bar o which may be of insulating material. The cross-bar o forms the lower end of a vertically moving rectangular frame comprising in addition thereto, two side-bars o^1 o^1 and an upper cross-bar o^2. The side-bars are arranged to slide vertically in suitable guides in any convenient framework that may be utilized to support the switch and the electro-

magnets which operate it. This frame-work if desired, may comprise a base p to which the contacts of the main switch are secured, a top p^1 and connecting uprights p^2.

To the top p^1 of the frame and to the upper cross-bar o^2, hereinbefore referred to, are connected two pairs of pivoted liks $q\,q$, $q^1\,q^1$. To the pivots q^2, which connect the links of each pair, are pivoted links q^3, which are in turn pivoted to the upper end of the vertically moving solenoid core f, (Fig. 1). These pairs of links $q\,q$, $q^1\,q^1$, and $q^3\,q^3$ constitute toggle joint mechanism for opening and closing and locking the main switch in its closed position.

When the switch is closed by the movement of the solenoid coil through the medium of the compound toggle levers, the whole frame o, o^1, o^2 rises as the two pairs of links $q\,q$ and $q^1\,q^1$ are straightened until the links $q^3\,q^3$ pass slightly past the dead center position so as to lock the switch closed with the brushes under tension. When the "off" coil however is energized, the core is drawn downward with sufficient force to break the lock and draw the frame and the switch bar downward, and to open the switch.

I preferably make the rectangular switch-carrying frame heavy enough, so that, after the toggle $q^3\,q^3$ is once broken on the downward movement, the frame and the switches will drop by gravity, although of course this will be assisted by the downward pull of the solenoid core, and in fact it is this parallel vertical movement of the switch frame and core which constitutes one of the efficient features of the switch. The apparatus is likewise so formed that the switch-brushes leave their contacts at substantially the instant the toggle is broken. As a result of this construction, the switches will not become locked unless the current through the "on" coil is strong enough and is caused to flow long enough to move the toggle levers into the position shown in Fig. 3 and lock the switch in its closed position. Therefore, if the circuit through the "on" coil is closed momentarily and the toggles are not locked, the switch will drop back again to its full open position and will not remain in a partially open or a partially closed position.

The circuit-breaker k comprises a single pole switch k^1, adapted to engage the two stationary contacts k^2 and k^2 (Fig. 1). This switch is mounted upon the end of a lever k^3 fulcrumed at k^4 on a standard k^6 (Fig. 2) rising from the top of the framework. Pivoted on the same fulcrum pin is a lever k^5, the free end of which enters a socket or aperture in the upper end of the core. The ends of a coiled spring k^7 (Fig. 1) are connected to the levers $k^3\,k^5$, so that, when the core rises and falls, the switch is opened and shut with a snap. This circuit-breaker is so constructed and arranged with relation to the plunger that it is not operated to break the "on" circuit until the main switch has been fully closed and locked. Preferably the end of the arm k^5 is engaged with a female threaded member or nut k^8 (Fig. 3), which is adjustable on a screw k^9 threaded into a socket in the upper end of the plunger.

The two links $q^3\,q^3$ of the compound toggle mechanism are pivoted at their knuckle to a nut k^{10}, which may be adjusted towards and from the end of the plunger by the screw k^9 and secured in place by the lock-nut k^{11}. By adjusting the member k^8, and the nut k^{10}, the parts may be set to operate with the greatest accuracy. In accordance with this embodiment of the invention, the "on" coil is deënergized immediately after the closure of the main switch, and this is done by the movement of the snap switch k arranged in the "on" circuit; and when the main circuit is opened, by closing the "off" circuit, the "off" circuit is broken again as soon as the brushes of the main switch leave their respective contacts, thus the energization of the "on" or "off" coil of the control circuit is but momentary.

I claim as my invention:—

1. An electrically controlled switch mechanism, comprising a base and fixed contacts, a vertically moving rectangular frame carrying two pairs of switch contacts, two electro-magnets adapted for multiple connection with the main circuit, a vertically moving solenoid core common to both electro-magnets, and toggle lever means connecting the moving switch frame with the solenoid core.

2. An electrically controlled switch mechanism, comprising a base and fixed contacts, a vertically moving frame carrying switch contacts, two electro-magnets, a vertically moving solenoid core common to both, and toggle lever mechanism connecting said core with the switch frame whereby the latter and the core rise and fall together.

3. A switch-operating mechanism, comprising one or more vertically movable contacts, a pair of electromagnets, a vertically moving solenoid core for said electromagnets, two oppositely arranged pairs of toggle levers, each pair having one link stationarily pivoted and the other connected to said movable contacts, and a toggle lever connected at its knuckle to the solenoid core and at the outer ends of its links to the links of the first mentioned toggle levers.

4. An electrically controlled switch mechanism, comprising a stationary frame supporting two electromagnets and a common vertically moving core therein, contacts on the base of said frame, a vertically moving frame carrying contacts to engage those on the stationary frame and toggle levers connecting the moving frame with the core and with the stationary frame.

5. An electrically controlled switch mechanism, comprising a stationary frame supporting two electromagnets and a common vertically moving core therein, contacts on the base of said frame, a vertically moving frame carrying contacts to engage those on the stationary frame and toggle levers connecting the upper part of the moving frame with the core and with the upper part of the stationary frame.

In testimony whereof I have affixed my signature, in presence of two witnesses.

GRANVILLE E. PALMER.

Witnesses:

MARCUS B. MAY,

A. L. FOLSOM