No. 771,344. PATENTED OCT. 4, 1904.

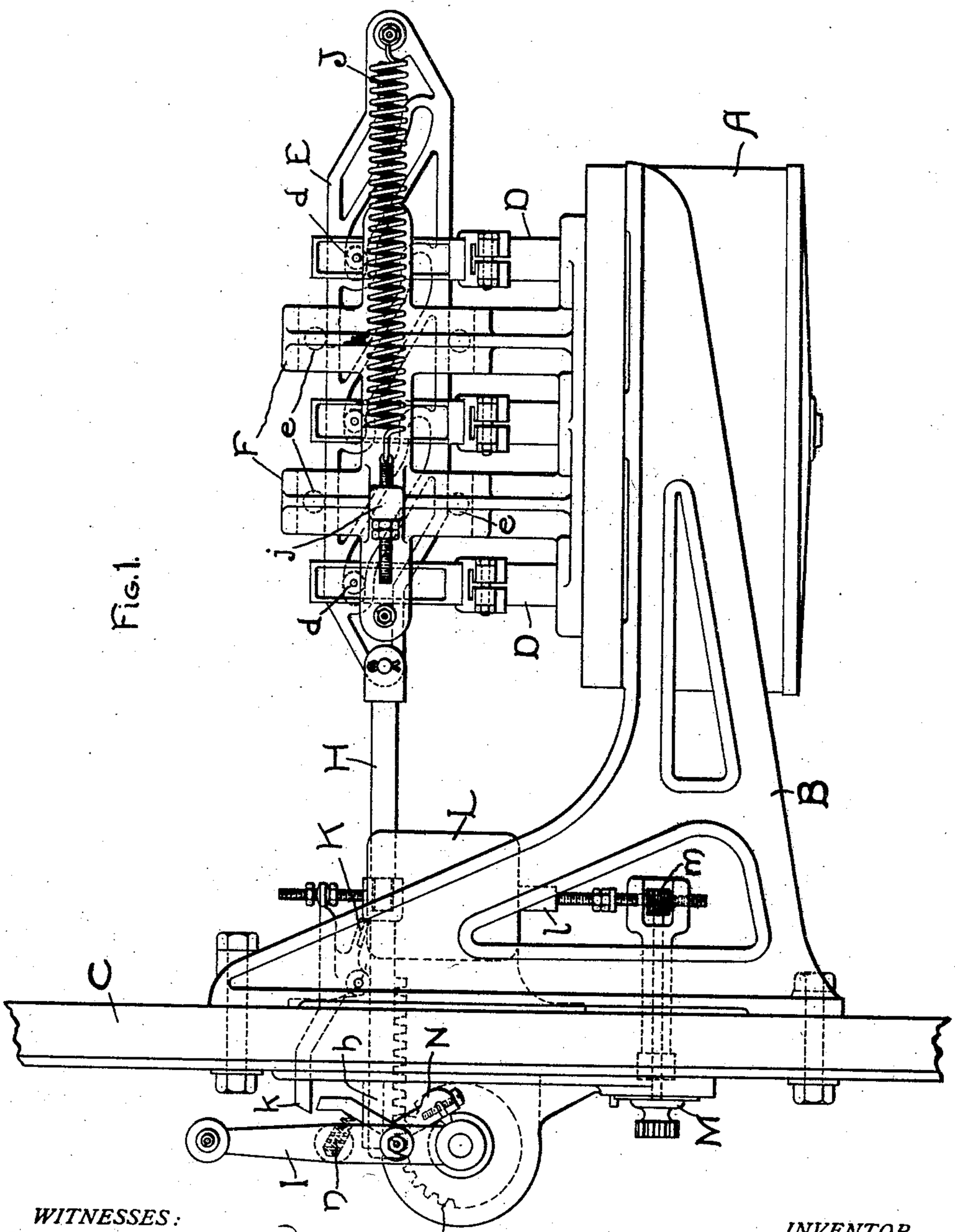
H. C. WHITE.

SWITCH FOR ELECTRIC CIRCUITS.

APPLICATION FILED NOV. 23, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

R. E. Hamond

W. H. Jones.

INVENTOR.

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NO MODEL. 2 SHEETS—SHEET 2.

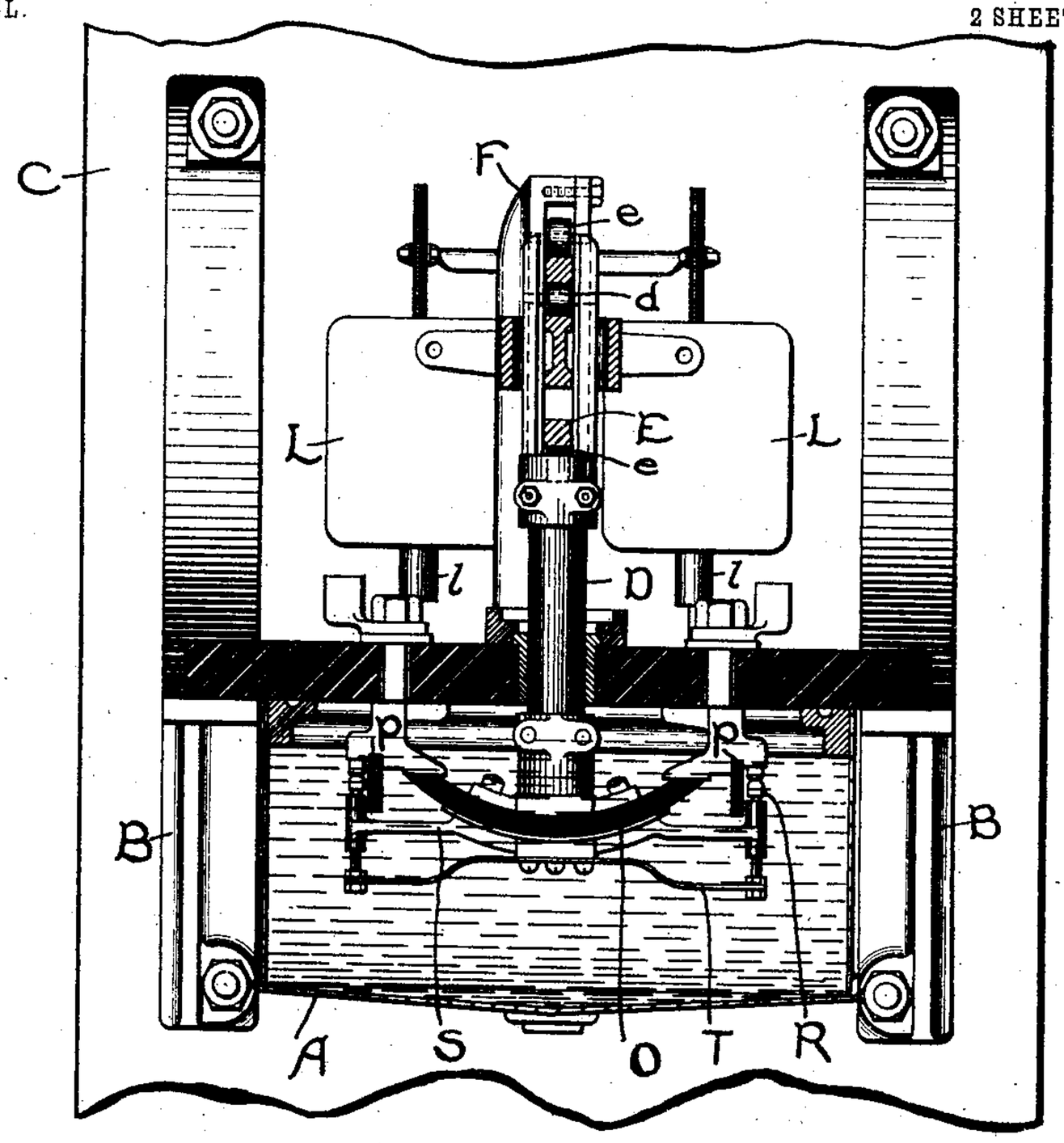

Fig. 2.

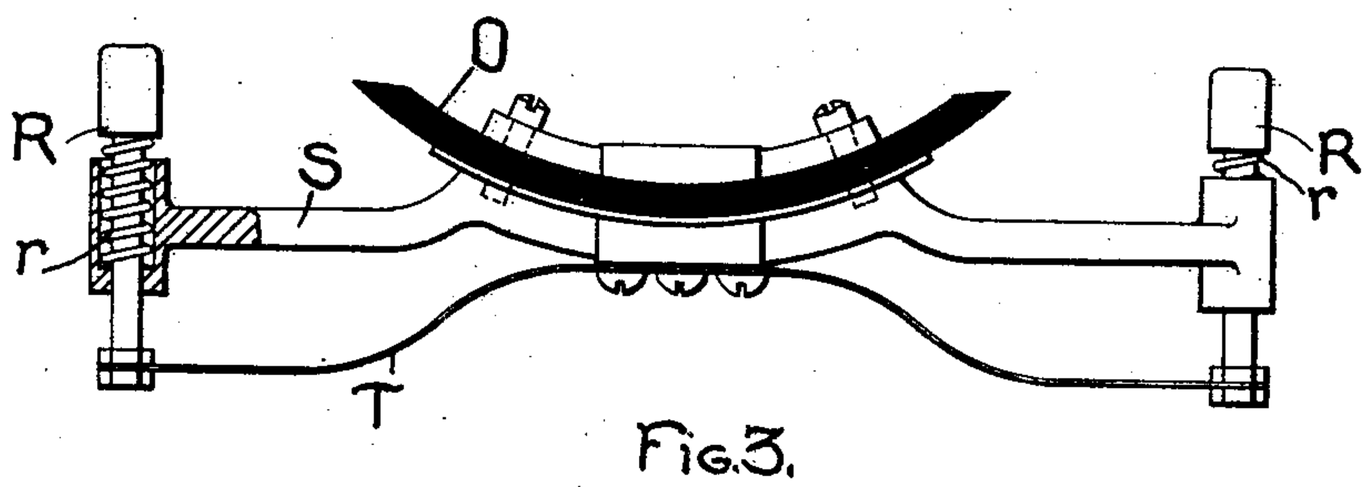

Fig. 3.

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UNITED STATES PATENT OFFICE.

HAROLD C. WHITE, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO STANLEY ELECTRIC MANUFACTURING COMPANY, OF PITTSFIELD, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

SWITCH FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 771,344, dated October 4, 1904.

Application filed November 23, 1903. Serial No. 182,271. (No model.)

To all whom it may concern:

Be it known that I, HAROLD C. WHITE, a citizen of the United States, and a resident of Pittsfield, Massachusetts, have invented certain new and useful Improvements in Switches for Electric Circuits, of which the following is a specification.

My invention relates to switches and circuit-breakers for interrupting circuits of high-current capacity. Such switches must be of considerable size in order to carry the large current, and in many switches which have been built for such uses much power is required for operation and the parts of the switch are not sufficiently durable to stand continuous use.

The object of my invention is to provide an operating mechanism for such switches and circuit-breakers which shall be simple, durable, and economical, which shall be positive in action, and which shall require a minimum amount of power for operation.

In the accompanying drawings, Figure 1 shows a side elevation of a structure embodying my invention. Fig. 2 shows an end elevation in cross-section of the same. Fig. 3 shows a detail view of the movable contacts.

In Fig. 1, A represents a tank or reservoir which is adapted to contain an insulating liquid, such as oil, and which is supported by the frame B, attached to the marble slab C. D D are vertically-movable plungers, their lower ends extending into the oil-tank A and their upper ends supported by the rollers *d d d*, attached thereto. These rollers are supported by cam-shaped slots in the cam-plate E. Cam-plate E is movable longitudinally between the rollers *e* and the guide-posts F. Cam-plate E is reciprocated longitudinally by means of the longitudinally-movable rod H, which is cut at one end to form a rack *h*, which is engaged by the gear-wheel G. I is an operating-handle for rotating gear G.

It will be evident from the description thus far that as gear G is rotated cam-plate E is longitudinally reciprocated, and plungers D D will be raised and lowered by means of the rollers *d* traveling in the cam-slots.

J is a tension-spring attached at one end to cam-plate E and at the other end adjustably to an abutment *j*, carried by one of the guide-posts F. When cam-plate E is moved to its extreme right-hand position, as shown in Fig. 1, and the plungers D D are raised to their highest position, spring J is placed under tension. Cam-plate E is maintained in this position with spring J under tension by means of the pivoted latch K, which engages a shoulder on rod H.

L is a solenoid adapted when energized to rock latch K on its pivot and release rod H, permitting spring J to draw cam-plate E quickly to its left-hand position. Two solenoids L L are shown in Fig. 2, this arrangement being customary for three-phase systems, the tripping-coils being included in two of the three phases. The switch illustrated in the drawings is intended for three-phase work, three plungers D D being shown. The cores *l* of solenoids L are adjustable by means of the setting device M, which carries the small gear-wheel *m*, engaging a rack carried by core *l*. By this means the tripping-point of the solenoids is adjusted. The engagement of the handle I with gear G is by means of the dog N, which is pivoted on handle I and normally pressed forward by spring *n*, which abuts at one end on handle I and which forces a tooth on the other end of dog N into engagement with a slot on the hub of gear G, as shown. The purpose of this connection between handle I and gear G is to prevent the switch being held closed on overload. In case an attempt is made to close the switch while an overload continues solenoid L will draw up its core and rock latch K on its pivot, depressing the arm *k* of the lever by which the latch K is carried. Lever-arm *k* when depressed engages the upper end of dog N, compressing springs *n* as handle I is moved to the closed position, thus rocking dog N on its pivot out of engagement with the slot on the hub of gear G. Gear G is thus released from handle I, and the operating mechanism is free to move to the open position under the influence of spring J.

It will be seen that by properly shaping the slots in the cam-plate E on a compound curve, as shown in Fig. 1, the power required at the beginning and end of the motion of the plungers may be made very small. The greatest amount of force at the contacts is required at the time when the movable contacts are brought into or released from engagement with the stationary contacts. By giving the cam-slots in plate E a small slope at the place corresponding to the opening and closing position of the contacts the power required for operating the switch may be reduced to an amount no greater than that required for the movement of the contacts through the rest of their range.

In Figs. 2 and 3 I have shown a preferred form of contact. Plunger D carries the main movable contact O, which is a laminated bridging member, such as is commonly used in switches of high capacity. Plunger D also carries at the ends of cross-bar S the two shunt-contacts R R. These two shunt-contacts are pressed upward into engagement with the stationary contacts by spiral springs *r*. T is a flexible connection joining the two shunt-contacts. Interposed between the main and auxiliary contacts when they are closed are the barriers P. This form of switch-contact is well suited to the purpose; but it will be understood that my invention is not limited to this particular form of contact.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes therein which do not depart from the spirit of my invention and which are within the scope of the appended claims will be obvious to those skilled in the art.

Having thus fully described my invention, I claim as new and desire to protect by Letters Patent—

1. In a switch for electric circuits, a reciprocating slotted cam-plate, a rectilinearly-moving plunger engaging a slot in said cam-plate and operated thereby, a switch member carried by said plunger, a spring tending to return said cam-plate to a given position, means for moving said cam-plate to strain said spring, a catch for restraining said cam-plate, and means for releasing said catch.

2. In a switch for electric circuits, a reciprocating slotted cam-plate, the slot being formed on a compound curve, a roller adapted to travel in the slot, a plunger supported by said roller, and a switch member carried by said plunger.

3. In a switch for electric circuits, a longitudinally-movable rod, a slotted cam-plate carried thereby, the slot being formed on a compound curve, a roller adapted to travel in the slot, a plunger supported by said roller, and a switch member carried by said plunger.

4. In a switch for electric circuits, a reciprocating slotted cam-plate, a roller adapted to travel in the slot, a plunger supported by said roller, a switch member carried by said plunger, a spring arranged to be placed under tension by the movement of said cam-plate, a latch for said cam-plate, and means for releasing said latch.

5. In a switch for electric circuits, a longitudinally-reciprocating slotted cam-plate, a spring arranged to be strained thereby, a latch therefor, means for releasing said latch, a rectilinearly-moving plunger engaging a slot in said cam-plate and operated thereby, and a switch member adapted to be raised and lowered by said plunger.

6. In a switch for electric circuits, a reciprocating slotted cam-plate, a roller adapted to travel in the slot, a plunger supported by said roller, and a switch member carried by said plunger, the slot in said cam-plate being curved to reduce the power required at the beginning and end of the travel of said cam-plate.

7. In a switch for electric circuits, a reciprocating slotted cam-plate, a roller adapted to travel in the slot, a plunger supported by said roller, and a switch member carried by said plunger, said slot being curved to produce a greater movement of said plunger for a given movement of said cam-plate at the middle of the travel of said cam-plate than at the ends of said travel.

Signed at Pittsfield, Massachusetts, this 20th day of November, 1903.

HAROLD C. WHITE.

Witnesses:

L. A. HAWKINS,

R. E. HAYNES.