

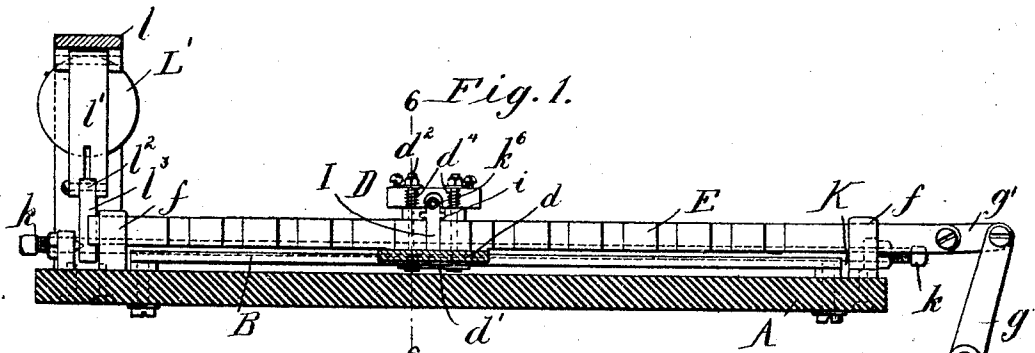
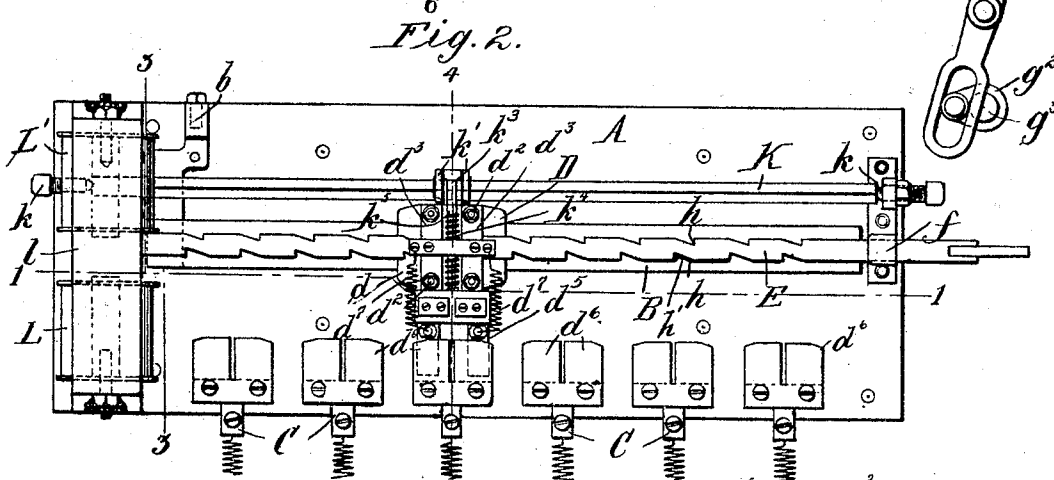
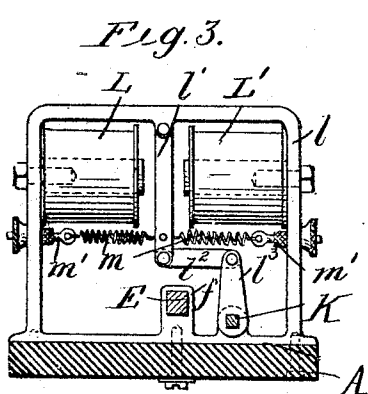
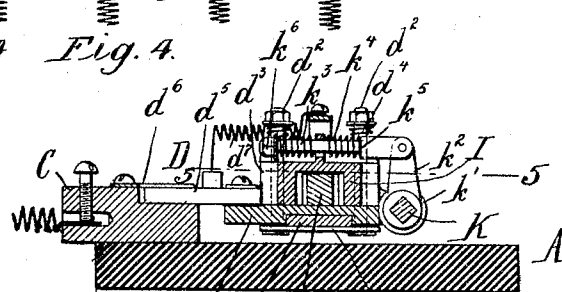
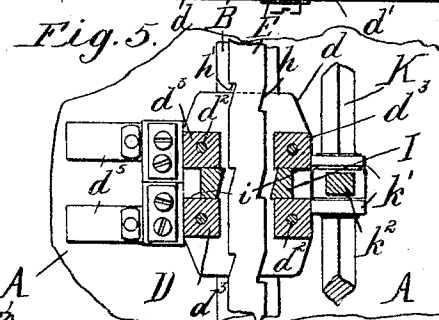
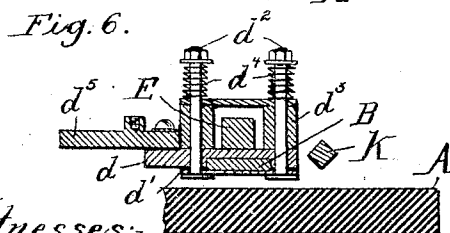
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W. F. RICHARDS & W. A. TURBAYNE.

ELECTRICAL SWITCH AND OPERATING MECHANISM THEREFOR.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL SWITCH AND OPERATING MECHANISM THEREFOR.

SPECIFICATION forming part of Letters Patent No. 795,235, dated July 18, 1905.

Application filed April 9, 1904. Serial No. 202,374.

To all whom it may concern:

Be it known that we, WILLARD F. RICHARDS, residing at Buffalo, and WILLIAM A. TURBAYNE, residing at Lancaster, in the county of Erie and State of New York, citizens of the United States, have invented new and useful Improvements in Electrical Switches and Operating Mechanism Therefor, of which the following is a specification.

This invention relates to electrical switches and operating mechanism therefor, and primarily to switches such as disclosed in the application for United States Letters Patent of William A. Turbayne, filed October 30, 1903, Serial No. 179,145, for system of electrical distribution; but the invention is well adapted for other purposes—such, for example, as end-cell switches for storage batteries and the operating mechanism therefor. The object of the invention is to provide an efficient desirable switch and operating mechanism therefor of simple construction which will move the movable switch or contact member intermittently or step by step in opposite directions from one to the other of the stationary contact members and which is constructed to allow a great range of movement of the movable contact member for co-operation with a large number of stationary contact members.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a switch and operating mechanism embodying the invention in line 1 1, Fig. 2. Fig. 2 is a plan view thereof. Fig. 3 is a transverse section thereof in line 3 3, Fig. 2. Fig. 4 is a transverse section thereof, on an enlarged scale, in line 4 4, Fig. 2. Fig. 5 is a fragmentary plan view, partly in section, in line 5 5, Fig. 4. Fig. 6 is an enlarged section in line 6 6, Fig. 1.

Like letters of reference refer to like parts in the several figures.

A represents a base, preferably of slate or other suitable insulating material; B, a long continuous stationary conductor strip

or bar which is preferably fixed on the base at its ends, and is spaced therefrom between its ends, and is provided at one end with any convenient sort of connector *b* for attachment to an electrical conductor; C, a series of separate stationary switch or contact members bolted or otherwise secured to the base in parallel relation to the conductor-bar and each provided with means for connection with an electrical conductor, and D a movable switch or contact member having a part in electrical contact with the continuous conductor-bar and a part or parts which make and break contact with the separated stationary contact members.

The movable switch or contact member is preferably constructed as follows: *d* represents a slide having a groove in its under side by which it is seated and guided in its sliding movements on the stationary conductor-bar. A contact-plate *d'* is arranged beneath the slide and is supported by bolts *d²*, passing up through the slide, and guide-blocks *d³* thereon, and is held yieldingly up in scraping contact with the under face of the conductor-bar by coil-springs *d⁴*, surrounding the upper ends of its supporting-bolts between adjusting-nuts thereon and the guide-blocks. *d⁵* indicates contact-blades which are secured to and insulated from the slide in any suitable manner and project toward the stationary separated contact members and are adapted to enter between the bases of the same and contact-plates *d⁶*, secured thereto. (See Fig. 4.) The contact-blades *d⁵* of the movable switch or contact member are separately connected to the slide and contact-plate *d'* thereof by conductors *d⁷*. In the system disclosed in the said application of William A. Turbayne the stationary conductor-bar is connected to one side of an electric work-circuit, and the stationary separated contact members to the terminals of counter-electromotive-force cells to be successively cut into and out of the system for regulating the voltage of said work-circuit; but the device shown in the

present application is applicable generally for making and breaking electrical connection between contact devices, and the movable switch or contact member may be of any other usual or preferred construction or may be maintained in electrical connection with a conductor in other ways.

The movable switch or contact member is moved intermittently or step by step in both directions to make and break contact with the several separated stationary contact members by the following mechanism: E represents an operating-bar which is arranged parallel with and preferably above the stationary conductor and passes through and is guided in holes in suitable bearing-brackets *f*, secured to and rising from the ends of the base. The operating-bar is reciprocated lengthwise by any preferred means—as, for example, a lever *g*, connected by a link *g'* thereto and rocked by a crank *g''*, secured to a power-driven shaft *g'''*. The operating-bar passes through holes in the guide-blocks of the movable switch member and is provided at opposite sides with teeth or notches preferably having inclined and abrupt faces *h* *h'*, respectively, Fig. 5, which are oppositely disposed on the opposite sides of the bar.

I, Figs. 4 and 5, represents a device for connecting the movable switch or contact member with the operating-bar. It preferably consists of a double pawl which is of substantially inverted-U shape, having two noses or legs which straddle the toothed operating-bar and are suitably fashioned for cooperation with the teeth or notches of the bar. The pawl is mounted to slide transversely relative to the operating-bar in suitable guideways or grooves *i* in the guide-blocks on the slide of the movable switch member, and its legs are spaced far enough apart for the toothed bar to reciprocate between and not engage them in the central or normal position of the pawl. (Shown in Figs. 4 and 5.) If the pawl or operating-bar is shifted laterally in one direction, one leg of the pawl will be placed in operative relation to the teeth or notches at one side of the operating-bar and the movable switch or contact member will be moved in one direction, whereas by an opposite movement of the pawl or bar the other leg of the pawl will be rendered operative and the movable switch or contact member moved in the opposite direction. Preferably the pawl is shifted for this purpose and in the construction shown by the following instrumentalities: K represents a rock-shaft arranged parallel with the stationary contact-bar and journaled at its ends on adjustable bearing-cones *k* on the bearing-brackets *f'* at the ends of the base or in any other suitable manner. The rock-shaft passes through and rocks in bearing-lugs *k'*

on the movable switch or contact member and is provided between said lugs with a rock-arm *k''*, to which is connected a stem *k'''*, passing loosely through a perforated lug on the top of the double pawl. Coil-springs *k''''* surround said stem between said lug and a shoulder *k'''''* and an adjusting-nut *k''''''* on the stem at opposite sides of the lug. The rock-arm turns with the rock-shaft, but is slid longitudinally thereon by the lugs *k'* on the movable switch member in the movements of the latter, for which purpose the rock-shaft is preferably angular or polygonal in cross-section and passes through a correspondingly-shaped hole in the rock-arm. Ordinary bearing-bushings are preferably provided for the rock-shaft in the bearing-lugs of the movable switch member. When the rock-shaft is oscillated in one direction, the rock-arm and pawl-stem are moved in one direction, thereby compressing one of the pawl-springs and pressing one leg of the pawl yieldingly against one side of the toothed operating-bar, in the movements of which in one direction the operative leg of the pawl yields and rides over the inclined faces of the teeth or notches of the operating-bar, while it is engaged by the abrupt faces of the teeth or notches in the opposite movements of the operating-bar, so that the pawl and movable switch or contact member will be moved step by step in one direction. When the rock-shaft is oscillated in the opposite direction, the other leg of the pawl is yieldingly pressed against the other side of the operating-bar and will similarly act to move the movable switch or contact member step by step in the opposite direction. The notches or teeth of the operating-bar and its movements are so proportioned that the movable switch member will be moved a sufficient distance at each step movement to bridge two of the separated contact members or pass completely from one to the other thereof. The movements of the movable switch member are therefore quick and positive, and the harmful burning of the contacts by sparking is largely avoided.

The rock-shaft is oscillated in one direction or the other, according to necessary direction of movement of the movable switch member, by electromagnetic means, preferably comprising two oppositely-disposed electromagnets L L', Fig. 3, mounted on a suitable frame *l*, secured to one end of the base. A common armature *l'* is pivoted on the frame between the two magnets, with its free end connected by a link *l''* to a rock-arm *l'''* secured to the adjacent end of the rock-shaft. The armature is held normally in a central position between the magnets by two coil-springs *m* at opposite sides thereof, connected to the armature and by adjusting-screws *m'*

to the magnet-frame. These springs also hold the rock-shaft and double pawl normally in the central or neutral position. When one magnet is energized by the passage of an electric current through its coil, the armature is attracted thereby and the rock-shaft oscillated in one direction, and when the other magnet is energized the rock-shaft is oppositely rocked. It is not necessary to describe the electrical connections for energizing the magnets, it being understood that suitable electrical controlling mechanism, either hand-operated or automatic, is employed for separately energizing the magnets to cause the movement of the movable switch or contact member in one or the other direction. Other means could be employed for oscillating the rock-shaft without departing from the scope of the invention.

20 We claim as our invention—

1. The combination of a series of contact members, a movable contact member, an operating-bar for the latter which reciprocates independently of said movable contact member, a single double-nosed pawl for engaging different portions of said operating-bar to move said movable contact member in opposite directions, and means for causing a relative movement between said operating-bar and said pawl whereby the latter engages one or the other portion of the operating-bar, substantially as set forth.

2. The combination of a series of contact members, a movable contact member, an operating-bar for the latter which reciprocates independently of said movable contact member, a single double-nosed pawl for engaging different portions of said operating-bar to move said movable contact member in opposite directions, and means for shifting said pawl whereby it engages one or the other portion of the operating-bar, substantially as set forth.

3. The combination of a series of stationary contact members, a movable contact member, a constantly-reciprocating operating-bar for the latter having two sets of teeth, a single double-nosed pawl connected to said movable contact member for engaging either of said sets of teeth on the operating-bar, and means for moving said pawl separately into operative relation to said sets of teeth to move said movable contact member in opposite directions, substantially as set forth.

4. The combination of a series of stationary contact members, a movable contact member, a constantly-reciprocating operating-bar for the latter having oppositely-disposed teeth on opposite sides thereof, a double pawl which is connected to said movable contact member and straddles said operating-bar, and means for moving said pawl separately into operative relation to said teeth

on opposite sides of the operating-bar to move said movable contact member in opposite directions, substantially as set forth.

5. The combination of a series of stationary contact members, a conductor-bar, a movable contact member having sliding contact with said conductor-bar, a constantly-reciprocating operating-bar for the latter, a device for connecting said movable contact member to said operating-bar, and means for shifting said connecting device in different directions to engage said operating-bar to move said movable contact member in opposite directions, substantially as set forth.

6. The combination of a series of contact members, a movable contact member, an operating-bar for the latter which reciprocates independently of said movable contact member, means for engaging different portions of said operating-bar to move said movable contact member in opposite directions, a rock-shaft parallel with said operating-bar, and means movable with said movable contact member and operated by said rock-shaft for shifting said engaging means whereby it engages one or the other portion of the operating-bar, substantially as set forth.

7. The combination of a series of stationary contact members, a conductor-bar, a movable contact member having sliding contact with said conductor-bar, a reciprocating operating-bar for the latter, a pawl connected to said movable contact member and movable transversely of said operating-bar, a rock-shaft, a connection between said rock-shaft and said pawl, and means for rocking said rock-shaft in opposite directions to move said pawl into operative relation to different portions of said operating-bar to move said movable contact member in opposite directions, substantially as set forth.

8. The combination of a slide, a reciprocating operating-bar for said slide, a single double-nosed pawl connected to said slide, and electrically-controlled mechanism for shifting said pawl in one direction to engage one portion of said bar to move said slide in one direction, and for shifting said pawl in the opposite direction to engage another portion of said bar to move said slide in the opposite direction, substantially as set forth.

9. The combination of a series of separated stationary contact members, a conductor arranged parallel to said contact members, a slide movable on and guided by said conductor, and contact parts carried by said slide for engagement with said stationary contact members and conductor-bar, and means for operating said slide, substantially as set forth.

10. The combination of a series of separated stationary contact members, a conductor-bar arranged parallel to said contact members, a slide movable on and guided by

said conductor-bar, a contact-plate carried
by said slide and pressed yieldingly against
said conductor-bar, and one or more contact-
blades carried by said slide for engagement
5 with said stationary contact members, and
means for operating said slide, substantially
as set forth.

Witness our hands this 6th day of April,
1904.

WILLARD F. RICHARDS.
WILLIAM A. TURBAYNE.

Witnesses:

C. M. BENTLEY,
E. C. HARD.