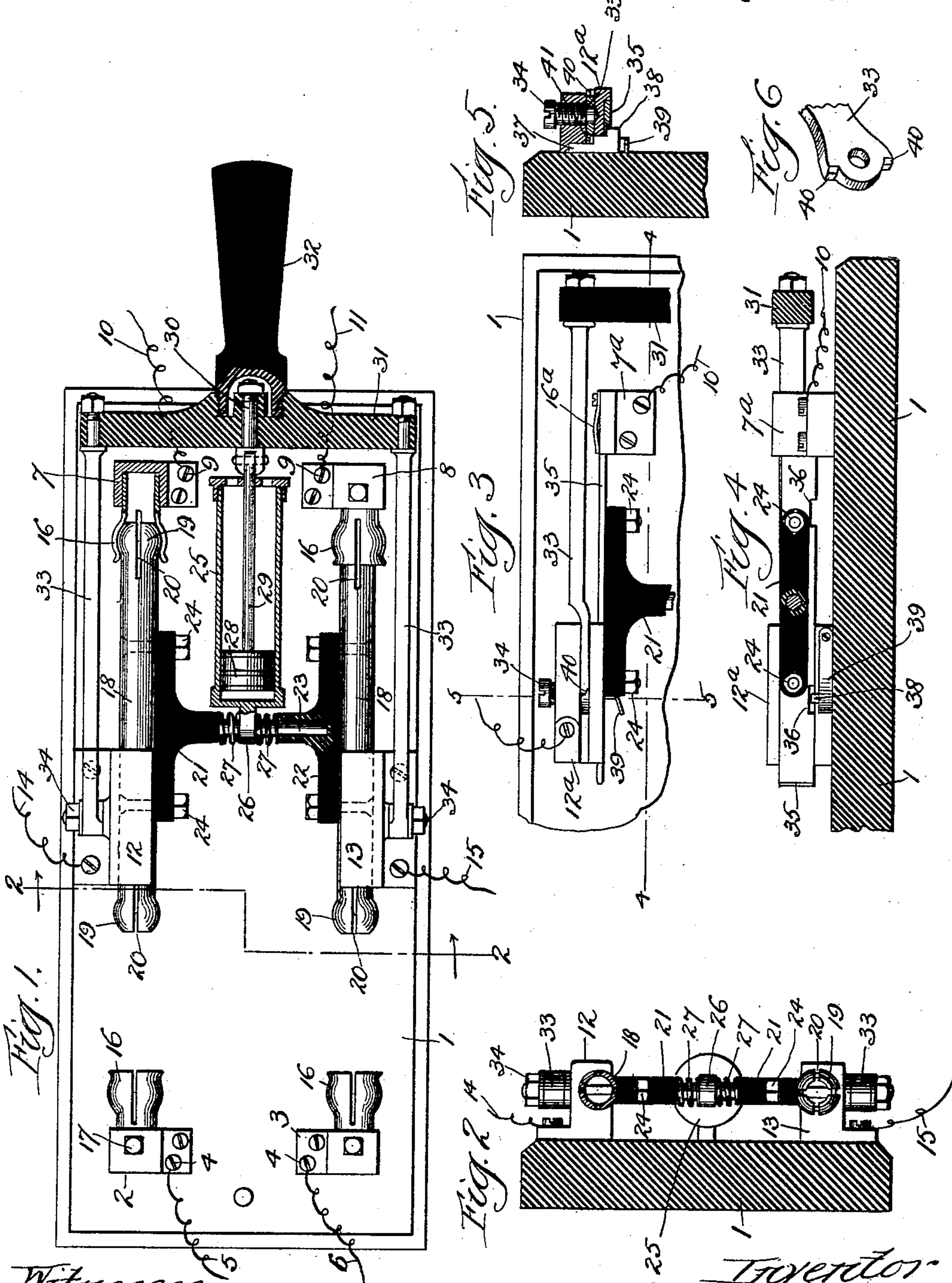


(No Model.)

A. G. McPHERSON.
ELECTRIC SWITCH.

No. 602,767.

Patented Apr. 19, 1898.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 602,767, dated April 19, 1898.

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To all whom it may concern:

Be it known that I, ARTHUR G. MCPHERSON, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful improvements in Electric Switches, of which the following is a full, clear, and exact specification.

My invention relates to that class of switches employed for alternately cutting out one generator or source of supply and throwing in another. Devices of this character are especially useful in electric-light plants when it becomes necessary to throw in a larger generator at times when the amount of current required becomes too great for the smaller generator. In an alternating-current system it is impossible to accomplish this shift without a momentary interruption of the current, because if one generator is thrown into circuit before the other is completely cut out one will short-circuit through the other, and if one is cut out before the other is thrown in the interruption will nevertheless occur. This interruption, even though very brief, is exceedingly objectionable, especially in electric-light systems. The primary object of my invention, therefore, is to provide means whereby the shift from one generator or other source of current may be alternately effected, but with such great rapidity that the make and break are virtually effected simultaneously, and therefore the interruption not objectionably noticeable.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side view of my improved switch, partly in plan section. Fig. 2 is a transverse sectional view thereof, taken on the line 2 2, Fig. 1. Fig. 3 is a detail side view showing a modification hereinafter described. Fig. 4 is a longitudinal sectional view thereof, taken on the line 4 4, Fig. 3. Fig. 5 is a transverse sectional view thereof, taken on the line 5 5, Fig. 3;

and Fig. 6 is a detail perspective view of a part of the shifting lever.

My invention, in its broadest aspect, comprises two isolated contacts, each adapted to be connected with one limb or branch of an electric system, and between which contacts is arranged an oscillatory or vibratory or other shiftable piece connected with a quick-action motor, which causes such shiftable piece to leave one contact and impinge against the other with a very rapid movement at the instant it is desired to change from one generator to the other, this shiftable piece being also in electrical communication with another branch or limb of the system, so that the current may pass from the generator through one of said contacts and the shiftable piece and out onto the line, or vice versa. In electric-light systems, however, it is of course necessary to duplicate the mechanism thus generally described, so as to constitute means for making the shift or change in the return-wire also. In adapting my improvements to an electric-light system of wires or any other system in which an outgoing and return wire are employed I use two pairs of isolated contacts and two of the isolated shiftable pieces adapted to alternately connect, respectively, with the contacts of each of said pairs, each of said shiftable pieces being in electrical communication with one side of the circuit. As a simple and convenient means of accomplishing this I employ any suitable base 1, preferably composed of insulating material, upon one end of which is mounted a pair of blocks 2 3, each having binding-screws 4, whereby the two sides or limbs 5 6 of the circuit may be electrically connected to the blocks 2 3. At the other end of the base 1, and preferably diametrically opposite the blocks 2 3, is another pair of blocks 7 8, having binding-screws 9, by means of which conductors or limbs 10 11 may be electrically connected to the blocks 7 8, respectively. Mounted about midway between the two pairs of blocks 2 3 and 7 8 is another pair of blocks 12 13, to each of which is electrically connected one of the wires or limbs 14 15.

One pair of the conductors 5 6 and 10 11 may constitute the leads from one of the generators or sources of electricity and the other

pair from the other generator or source, while the conductors or limbs 14 15 constitute leads which extend throughout the lighting system; but it is also obvious that, if desired, the conductors 14 15 may constitute the leads from one of the generators, while one of the other pairs of conductors constitutes the leads or limbs which extend throughout the system.

Each of the blocks 2 3 and 7 8 is provided with a contact-piece, preferably constructed of a short section of tubing having a quartered bell-mouth 16, which is so formed as to constitute a socket. This contact 16 may be held in place in each of the said blocks by means of a set-screw 17, the side of the block being bored, as shown on the right in Fig. 1, to receive the neck or smaller end of the tube. Each of the blocks 12 13 is bored longitudinally, as shown more clearly in Fig. 2, and arranged to slide through each of these longitudinal bores is the shiftable contact-piece 18, before referred to. This preferably consists of a tubular portion fitting accurately in the bore of the block 12 or 13, so as to be capable of sliding back and forth, and each end of each of these tubes 18 is given a spherical form or swelled outwardly, so as to constitute a lump or ball 19, each end being quartered by the longitudinal slits 20 like the sockets 16. The extreme ends of the pieces 18 are of smaller diameter than the mouths of the sockets 16, so that when the pieces 18 are shifted longitudinally they will be received by the socket 16 in the manner shown on the right in Fig. 1, and thus establish electrical communication between the blocks 7 8 or 2 3 and the blocks 12 13, and consequently place one of the generators in communication with the conductors 14 15. The purpose of this ball-and-socket connection 16 19 is to enable the socket 16 to hold onto the shiftable piece 18 until the motor (presently to be described) has accumulated sufficient power to shift the piece 18 suddenly and with great rapidity, so that in an instant after its end leaves one of the sockets 16 its other end will contact with the socket at the opposite end, and thus reduce the interruption of the current to the minimum duration of time. This motor for thus shifting the portions 18 may be constituted by a spring or other suitable power; but I preferably employ a vacuum-chamber or dash-pot, which is caused to accumulate its power by the act of shifting the switch-lever.

As shown in the drawings, the shiftable pieces 18 are connected together by a cross-head, constituted by two pieces of insulation 21 22 and a pintle 23, having its end embedded in each of said portions 21 22. Each of the portions 21 22 is secured to the side of one of the pieces 18 by means of transverse screws or bolts 24, the sides of the members in the opposed faces of the blocks 12 13 being open part way around, as shown more clearly in Fig. 2, so as to accommodate the blocks of insulation 21 22.

25 represents the cylinder of the dash-pot, whose end is provided with a perforated lug 26, through which the pin 23 passes. The lug 26 is held at a central point on the pin 23 by a coil-spring or washer 27, arranged on each side thereof and bearing against one of the blocks 21 22 and also serving to force the blocks apart and to hold the pieces 18 in firm electrical connection with the blocks 12 13.

28 represents the piston of the dash-pot, having the rod 29, passing through the end of the cylinder and being secured by bolt 30 to a bar 31, preferably composed of insulation, and having an operating-handle 32. The ends of this bar 31 are connected to the free ends of a pair of arms 33, whose opposite ends are pivoted at 34 to the sides of the blocks 12 13. With this arrangement it will be seen that when the handle 32 is thrown from the position shown in Fig. 1 to a corresponding position at the opposite end of the base 1, the distance between the bar 31 and the pivot-pin 23 being increased, the piston 28 will be pulled toward the other end of the cylinder 25 and creating a vacuum thereunder will induce the pieces 18 to pull away from the sockets of the blocks 7 8 and shoot toward the blocks 2 3. This movement of the pieces 18, however, will not occur until the vacuum under the piston 28 has about reached its maximum power, the grip of the sockets 16 holding the pieces 18 against movement until such degree of force has been reached, whereupon they will let go suddenly and allow the vacuum to impart its maximum force to the pieces 18 at the beginning of their movement. When the handle 18 is thrown back to its present position, the operation will be reversed.

If the suction of the dash-pot is alone depended upon for pulling the shifting piece 18 away from the socket 16, it might under some conditions be insufficient for the purpose. In order, therefore, that the initial movement of the piece 18 may be induced by positive means, the cylinder 25 and rod 29 are so proportioned in length that the piston 28 will come against the head of the cylinder before the handle 32 has reached the limit of its throw, and consequently the further movement of the handle will be exerted upon the piece 18 directly through the intermediary of the rod 29 and cylinder 25 without depending upon the power of the vacuum. In other words, the stretch of the elastic medium or connection constituted by the cylinder 25, piston 28, and rod 29 is of less extent than the throw or movement of the shiftable contact-pieces. It will also be seen that the distance between the pivot of the lever or arm 33 and its point of connection with this elastic medium is greater than the distance between such point and the point of connection of the shiftable contact and such elastic medium, whereby the latter point of connection will remain at a point between the pivot of the lever and its free end when the parts are in their normal posi-

tion. By this arrangement the tendency of the elastic connection or dash-pot is to hold the contacts together until the lever has been pulled upwardly or outwardly to a position almost at right angles to the contact-pieces 18, and the dash-pot does not begin to pull the contacts asunder until the lever has passed this position going toward the opposite end of the switch. When the ball 19 is once released from the socket 16, the vacuum will very rapidly continue the movement and shoot the ball at the other end into the opposite socket.

Instead of the lock just described, consisting of the socket 16 and ball 19, it may be desirable in some instances to employ a positive lock that will hold the pieces 18 absolutely at rest and in engagement with the contacts 16 until the handle 32 has about reached the limit of its throw, so as to insure sufficient power in the vacuum to shift the pieces 18 with the requisite rapidity. An example of a positive lock is shown in Figs. 3 to 6, inclusive. In this form of the invention the shiftable contacts are preferably composed of flat bars 35, let into suitable recesses in the opposed faces of the blocks 12^a, to which the conductors 14 15 are connected, only one of such blocks 12^a being shown in the drawings, but the other being similar to that shown and occupying a position corresponding to the block 13. (Shown in Fig. 1.) The bar 35 slides back and forth in the block 12^a like the bar 18, and when at one extremity of its movement it is received between a block 7^a and the contact-spring 16^a, the block 7^a being connected to the conductor 10 and being duplicated on the opposite side and opposite end of the base 1. The under side of the bar 35 is provided with a notch 36, in which engages a transversely-sliding catch or bolt 37. (See Fig. 5.) This bolt or catch 37 is held up in place with its tooth 38 in engagement with the notch 36 by means of a blade-spring 39, so that when the spring is not resisted the tooth 38 will prevent the endwise movement of the bar 35. The hub of the arm 33 is provided on each side with a bevel or cam 40, which when the arm reaches its horizontal position, as shown in Figs. 1 and 3, will engage with a shoulder 41 on the bolt 37 and force such bolt downwardly or in a direction to carry the tooth 38 out of the notch 36, thus permitting the bar 35 to slide past the bolt 37 without interference. The arm 33 does not reach this position, of course, until the dash-pot has acquired its maximum power. As soon as the bar 35 is released, therefore, it instantly breaks the contact with the spring 16^a and enters between the block 7^a and spring 16^a at the opposite end of the base 1, as before described with reference to Fig. 1.

In both forms the axis of the pivot 34 passes through the piece 18 and bar 35, so that when the arm 33 reaches the limit of its movement the pull will be lengthwise thereof.

Having thus described my invention, what

I claim as new therein, and desire to secure by Letters Patent, is—

1. A device for the purpose described having in combination two isolated contacts each adapted to be connected with one limb of an electric system, a longitudinally-shiftable contact-piece adapted to connect alternately with said contacts and being in electrical communication with another limb of said system, an oscillatory lever or handle pivoted at a point between said contacts, an elastic connection between said lever or handle and said shiftable piece, and means for retarding the movement of said shiftable piece while in electrical communication with either of said contacts, substantially as set forth.

2. A device for the purpose described having in combination two isolated contacts each adapted to be connected with one limb of an electric system, a longitudinally-shiftable contact-piece adapted to connect alternately with said contacts and being in electrical communication with another limb of said system, an oscillatory lever or handle pivoted at a point substantially midway between said contacts and having the axis of its pivot passing through said shiftable piece whereby said handle or lever may rest substantially parallel with said shiftable piece, an elastic connection between said shiftable piece and lever, and means for retarding the movement of said shiftable piece while in electrical communication with either of said contacts, substantially as set forth.

3. A device for the purpose described having in combination two pairs of isolated contacts each of which is adapted to be connected with one limb of an electrical system, a pair of longitudinally-shiftable contact-pieces adapted to be forced into electrical communication with said pairs of contacts alternately at opposite ends, means for holding said shiftable contacts each in electrical communication with one limb of said system, an insulated cross-head extending between said shiftable pieces, an oscillatory pivoted arm or lever having elastic connection with said cross-head, and means for retarding the movement of said shiftable pieces while in electrical communication with either of said contacts, substantially as set forth.

4. A device for the purpose described having in combination two pairs of isolated contacts each adapted to be connected with one limb of an electric system, a pair of shiftable contact-pieces adapted to be forced into connection with either pair of said contacts, a pair of blocks in which said shiftable pieces slide, each of said blocks being adapted to be electrically connected with another limb of said electric system, a two-part cross-head extending between said shiftable pieces, means for forcing the parts of said cross-heads away from each other, an arm or lever pivoted between said pairs of contacts and having an elastic connection with said cross-head, and means for retarding the movement

of said shiftable pieces while in electrical communication with either pair of said contacts, substantially as set forth.

5 5. A device for the purpose described having in combination two isolated contacts each adapted to be connected with one limb of an electric system; a longitudinally-shiftable contact-piece adapted to be reciprocated alternately into contact with said isolated con-
10 tacts; a pivoted oscillatory lever and an elastic connection between said lever and shiftable contact-piece; the distance between the pivot of said lever and the point of connection of said lever with said elastic connection
15 being greater than the distance between said point and the point of attachment of said elastic connection to the shiftable contact-piece when the elastic connection is in its retracted condition, substantially as set forth.

20 6. A device for the purpose described having in combination two isolated contacts each adapted to be connected with one limb of an electric system, a longitudinally-shiftable contact-piece adapted to connect alternately
25 with said contacts and being in electrical communication with another limb of said system, an oscillatory lever or handle pivoted at a point between said contacts, an elastic connection between said lever and said shiftable
30 piece, and means for retarding the movement of said shiftable piece while in electrical communication with either of said contacts; the point of connection between said elastic connection and said shiftable piece being nor-
35 mally at a point between the pivot of said lever and its free end, substantially as set forth.

7. A device for the purpose described having in combination two isolated contacts each adapted to connect with one limb of an elec-
40 tric system, a longitudinally-shiftable contact-piece adapted to connect alternately with said contacts and being in electrical commu-

nication with another limb of said system, an oscillatory lever or handle pivoted at a point between said contacts, an elastic connection 45 between said lever or handle and said shiftable piece, and means for retarding the movement of said shiftable piece while in electrical communication with either of said contacts; the stretch of said elastic connection being 50 less than the movement of said shiftable piece whereby the shiftable piece will be pulled away from the isolated contact with positive power, substantially as set forth.

8. A device for the purpose described hav- 55 ing in combination two isolated contacts, a lever pivoted between said contacts, a longitudinally-shiftable piece arranged to connect with either of said contacts, the cross-bar 31 secured to said lever, an elastic connection 60 secured to said shiftable piece and having the bolt 30 passing through said cross-bar 31, and the handle 32 composed of non-conducting material secured to said cross-bar and inclos- 65 ing said bolt 30, substantially as set forth.

9. A device for the purpose described hav- ing in combination two isolated contacts each connected with one limb of an electric sys- tem, a longitudinally-reciprocating contact- piece 18 having electrical communication with 70 another limb of said system, an oscillatory lever pivoted between said isolated contacts, a cylinder having pivotal connection at one end with said reciprocating piece, a piston in said cylinder having a piston-rod pivotally con- 75 nected to said lever, the movement of said piston with relation to said cylinder being shorter than the movement of said reciprocating piece, substantially as set forth.

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