

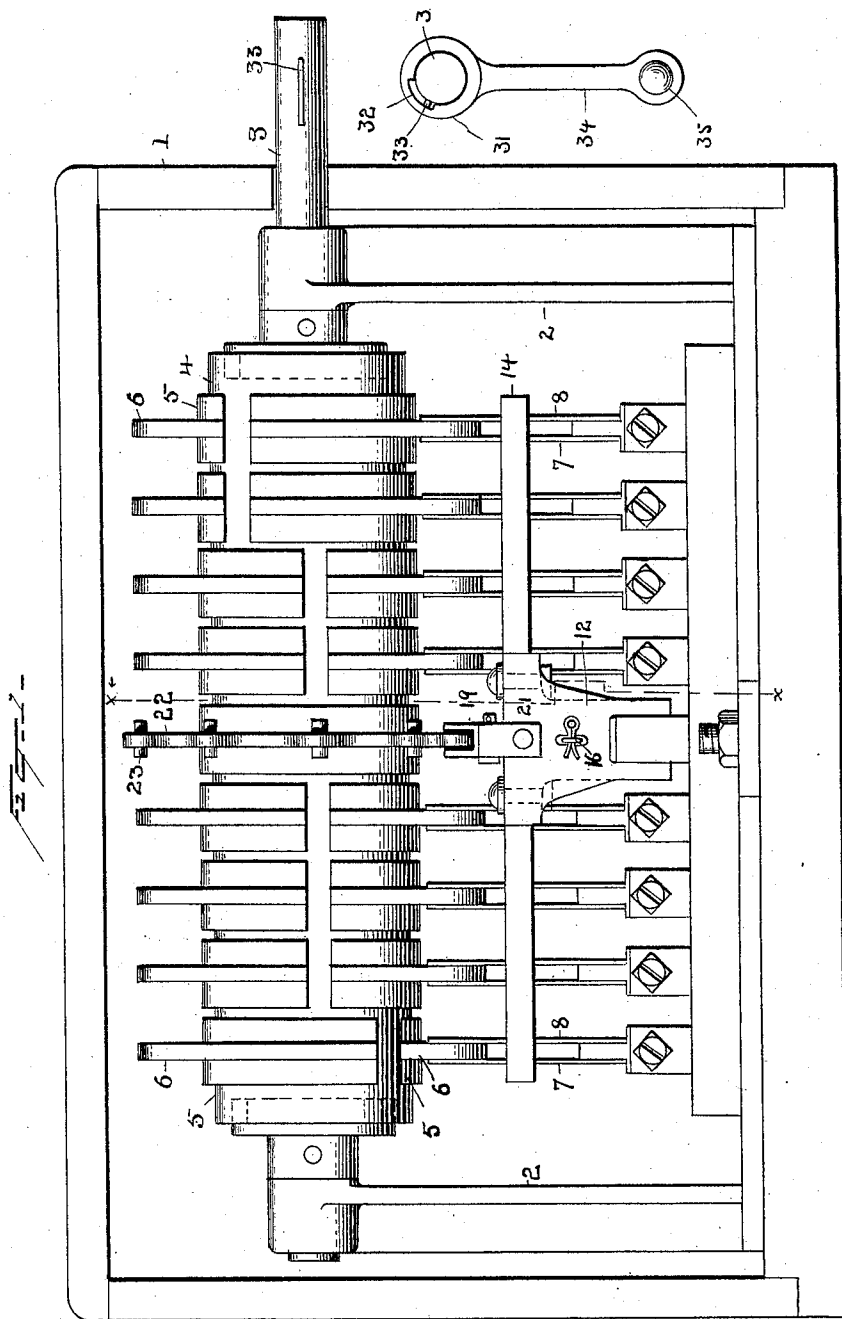
(No Model.)

4 Sheets—Sheet 1.

R. LUNDELL.
DOUBLE SNAP SWITCH.

No. 486,215.

Patented Nov. 15, 1892.



Witnesses
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W. F. Oberly,

Inventor
R. Lundell
By his Attorneys
Sylvester Seely.

(No Model.)

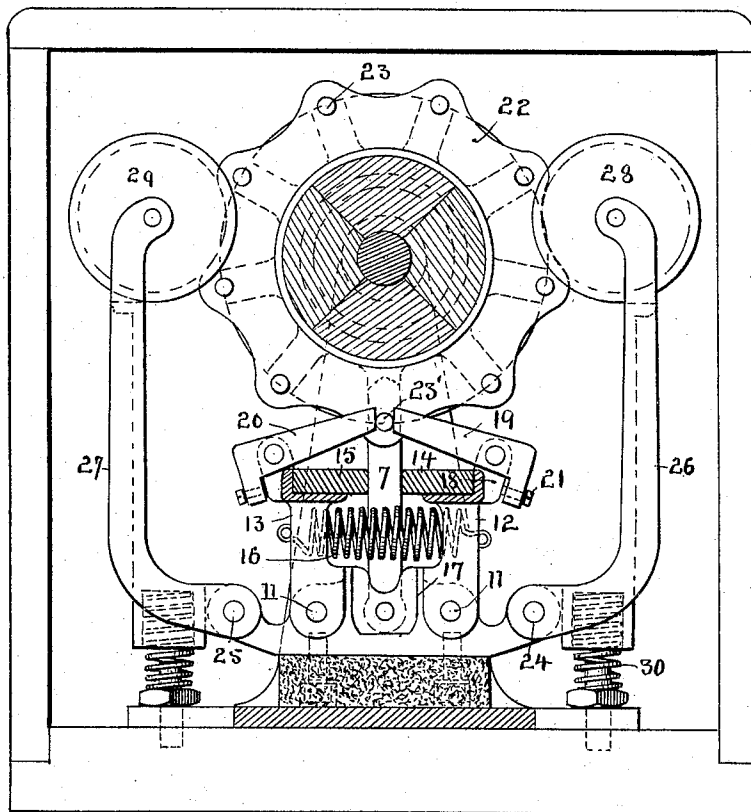
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Fig. 2.



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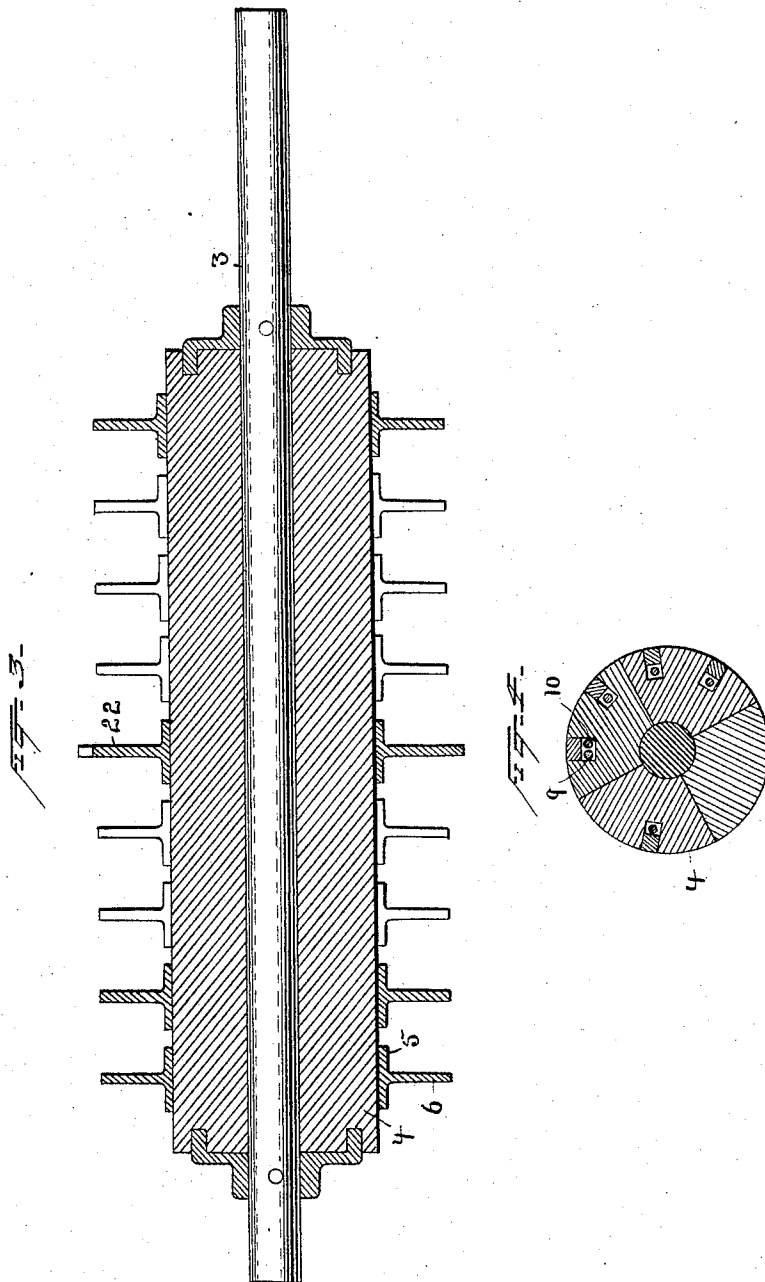
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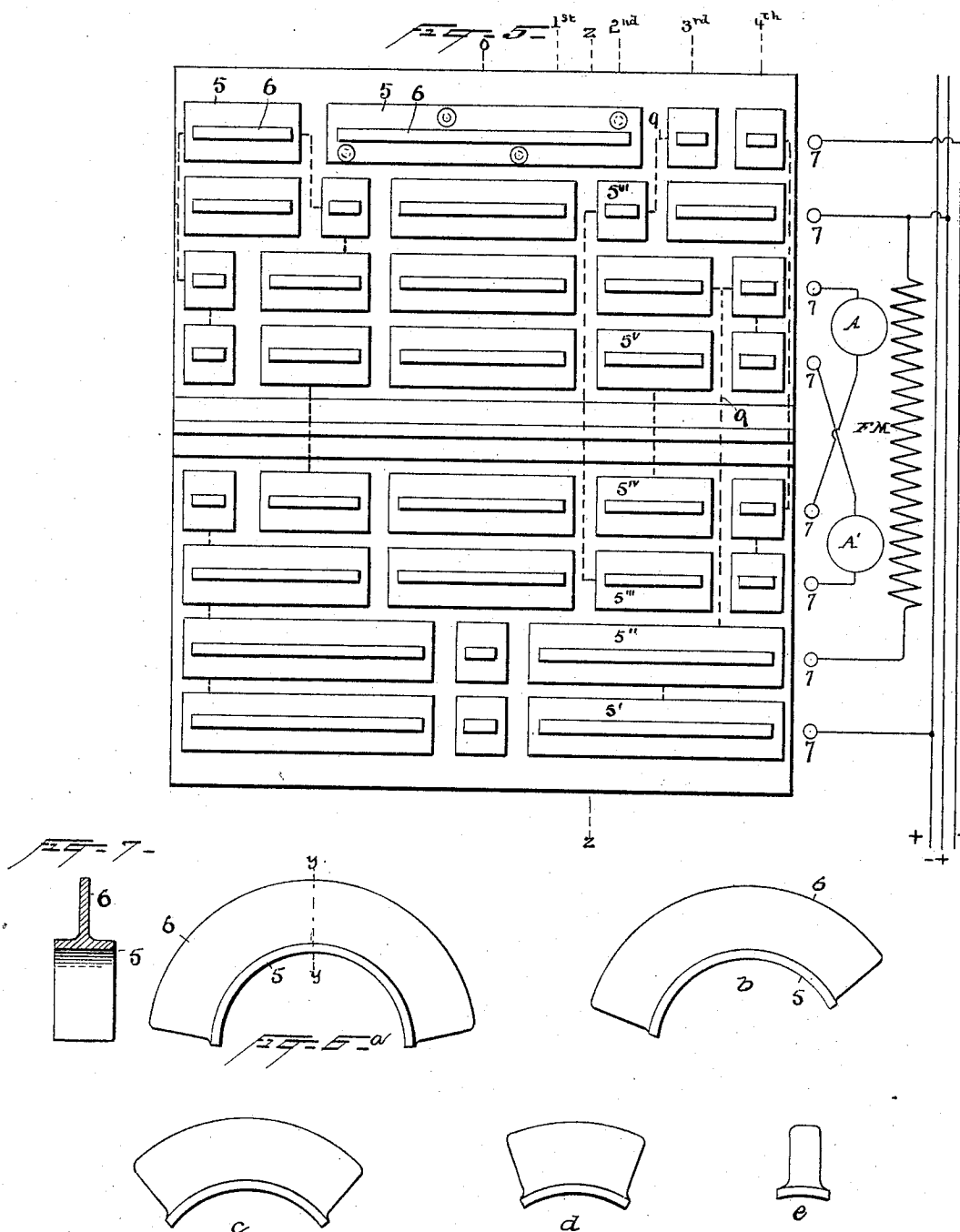
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UNITED STATES PATENT OFFICE.

ROBERT LUNDELL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
EDWARD H. JOHNSON, OF SAME PLACE.

DOUBLE SNAP-SWITCH.

SPECIFICATION forming part of Letters Patent No. 486,215, dated November 15, 1892.

Application filed February 10, 1892. Serial No. 421,021. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LUNDELL, a citizen of the United States, residing in New York city, county and State of New York, have invented a certain new and useful Improvement in Double Snap-Switches, of which the following is a specification.

The present invention relates to switches for making and breaking electrical circuits by means of an instantaneous or snap movement.

The main objects of the invention are to provide an improved form of apparatus of the character indicated, and especially to provide a switch which can be moved forward or backward or which can be moved in either of two directions—that is, to the right or to the left—from its normal or open position, and will in both cases when moving in each direction have the snap action referred to.

The invention consists in the several features of construction and in the combinations hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a side view of the switch mechanism, the front of the case being removed and some of the minor parts of the switch being omitted. Fig. 2 is a cross-section on line *x x* of Fig. 1. Fig. 3 is a central longitudinal section of the switch drum and contacts, the section being taken to cut the contact-plates on line *x x* of Fig. 5. Fig. 4 is a cross-section of the drum. Fig. 5 illustrates one arrangement of contact-plates which may be adopted, the view showing the surface of the drum developed, and showing, also, a diagram of circuit, &c. Figs. 6^a, 6^b, 6^c, 6^d, and 6^e show side views of the several contact-plates; and Fig. 7 is a section of one of said plates on line *y y* of Fig. 6^a.

It is sometimes desirable to provide a switch which can be moved in one direction to close or to commutate a circuit and which can be moved backward to break or reverse the circuit connections, and it is also sometimes desirable to provide a switch which can be moved in one direction to close or commutate a circuit through an apparatus in one direction and in the opposite direction to close or commutate the circuit of said apparatus in a different direction. So far as I am aware no

such switch having a snap action, whether moved toward the right or toward the left, has been constructed prior to my invention. In my application, Serial No. 416,782, filed January 2, 1892, is described one system requiring a switch of this character—that is, one movable toward the right and toward the left at different times. In said application is described a three-wire or compensating system, to which a motor having several field-magnet and armature coils is connected through a switch adapted to change the connections of the several coils in such manner as to vary the speed of the motor without materially changing its torque. The present switch, as illustrated, is adapted for use in such a system, the motor to be controlled having two armature-coils and a shunt-field-magnet winding, as described in said application.

In the accompanying drawings, 1 is an inclosing case, in which are standards 2, supporting the shaft or spindle 3, on which is the wood or other insulating-cylinder 4, which is secured to the spindle. On the surface of the insulating drum or cylinder are any suitable number or arrangement of contact plates or devices. The form which I prefer is that illustrated in the drawings, consisting of curved metal plates 5, provided with vertical webs or flanges 6, the plates 5 being adapted to fit the surface of the supporting-body. As shown in Fig. 5, these plates and their flanges are of various lengths, in order that the circuits may be commutated in the desired order. These flanged contact-plates are arranged in parallel circumferential lines or rows, which are interrupted at suitable points, and long gaps are avoided by putting in idle plates of the same shape as those which are actually used as switch-plates. This causes the action of the switch to be more uniform, since the friction offered by the contact-springs will be the same whatever the position of the switch-body, and this would not be the case were the idle plates omitted. Below the cylinder are co-operating contact-springs 7 8, the number depending on the arrangement of circuits to be controlled. The springs or plates 7 8 are pivoted at their lower ends, as indicated in Fig. 2, and at their upper ends embrace the flanges 6, thus electrically connecting the springs with

said flanges. The devices to which the springs 7 8 are pivoted are provided with suitable binding-screws for securing the circuit-wires thereto.

5 Referring to Fig. 5, it will be seen that the central row of flanged plates are entirely disconnected from each other and from all other plates on the switch. Therefore when the switch stands so that the springs 7 8 make
10 contact on a median line—that is, a line passing lengthwise of the cylinder through this row of plates—the circuit with which the switch is connected is open. Several of the plates at either side of the center are shown
15 connected by dotted lines 9, these lines indicating conductors passing from one plate to the other, preferably through grooves 10 (see Fig. 4) in the wooden drum. The drum and its contacts constitute one member of the switch
20 and the pivoted springs 7 8 constitute a second member of the switch.

Pivoted at 11 are two upright arms 12 13, carrying longitudinal bars or strikers 14 15, preferably of wood, extending by all of the
25 springs or plates 7 8. A spring 16 connects these two pivoted arms and tends to hold them in the position shown in Fig. 2—that is, with one edge of each bearing against the springs 7 8. The arms 12 13 when in the position
30 shown in Fig. 2 bear against any suitable stop—for example, flanges 17—so that the spring cannot under any circumstances move said parts farther in the direction of said flanges than shown. Carried by these arms
35 are lugs 18, to which are pivoted detent, trip, or releasing levers or devices 19 20, the inclination or position of which can be readily and delicately adjusted by means of screws 21 or similar devices. The adjacent ends of
40 the two devices 19 20 span the corrugated or scalloped ring 22 at the center of the drum 4 and rest at either side of one of the transverse pins 23, carried thereby. Pivoted at 24 25 are arms 26 27, carrying at their upper ends
45 rollers 28 29, adapted to rest in the depressions of the scalloped ring 22 and to ride over the elevated portions thereof and constituting centering devices adapted to bring the movable body or member of the switch to
50 rest with the several successive points of contact exactly in line with the springs 7 8 as the switch is successively moved. The levers 26 27 are provided with springs 30, tending to hold them in the position shown. The switch
55 may be operated by means of any suitable handle, but preferably by one allowing lost or independent motion. In Fig. 1 such a handle is shown, and consists of a sleeve 31, adapted to fit the spindle 3 and having a cut-away portion 32 of considerably greater width than the rib or projection 33 on the spindle and having an arm 34, provided with a handle 35.

The operation of the switch described is as follows: When the handle is placed on the spindle and turned—for example, toward the right—the pin 23' will be carried toward the

left and will carry before it the device 20 and the strip 15, tilting the arm 13 on its pivot and putting the spring 16 under increased
70 tension. As the switch-drum is turned by the handle the upper ends of the springs 7 8 will move along with the plates on the drum, being carried along by the friction due to the force with which they grasp the flanges 6. At
75 the same time the wheels 28 29 will be forced back by the elevated portions of the scalloped ring, thus compressing springs 30. When the switch-drum has been moved a certain distance, it will be evident that the pin 23' 80 will be released by or will slip off from the end of the device 20, thus allowing the spring 16 to contract, carrying the strip 15 suddenly back against the springs 7 8, forcing them off from the flanges 6, to which
85 they are at that time connected, and carrying them suddenly along onto the next succeeding contact-line of the flanges indicated by the dotted line marked 1 in Fig. 5, thus giving an instantaneous closure of the circuit.
90 If the switch-drum be turned further, the same movement would be repeated, the switch-contacts being instantaneously moved from the first contact position to the succeeding one, (marked 2,) and so on. When
95 the switch is returned to its normal or open position—that is, when it is moved toward the left—each change of circuit connections will be made by the spring action, as in the forward movement. The parts are so proportioned that the rounded elevated portions of
100 the ring 22 are carried by the wheels 28 29, so that the latter press against the ring beyond the dead-center just at the moment that the pins 23 are released. In this manner the
105 springs 30 coact with spring 16 to throw the contacts. The main object, however, of the wheels 28 29 and the springs 30 is to insure the stoppage of the drum, so that the line of contact on the drum shall be exactly in line
110 with the springs 7 8 when the drum comes to rest. The handle by means of which the drum is moved, as already indicated, is constructed to allow an independent or lost motion between it and the drum-spindle, so that
115 when the spring acts it is free to move the drum independently of the handle.

In Fig. 5 is shown, diagrammatically, a three-wire circuit, a motor having two armature-coils A A' with separate commutators, a
120 shunt field-magnet F M, and contact devices represented by the circles 7 and corresponding to the contact-springs 7 8 of Fig. 1, these contact devices being connected to the positive, negative, and neutral wires of the circuit and to the motor-coils, as shown. By tracing the circuits closed by the switch as it is moved it will be found that when the switch is in position so that connect is made on the line marked "1" with the devices 7 the field-magnet circuit only is closed, the contact-plates 5' 5'' serving to contact the two lower contact devices 7. In the second position of
130 the switch the plates 5', 5'', 5''', 5^{iv}, 5^v, and

5^{vi} are brought into operation and connect the two armature-coils in series between the positive and neutral mains, at the same time maintaining the field-magnet circuit closed.

5 In the third position of the switch the two armature-coils will be in series between the positive and negative mains, while in the fourth position of the switch said coils will be in multiple arc between the same conductors.

10 Suppose that when the switch was in its normal or open position it had been desired to close the circuit by means of the contacts on the opposite side of the central line. In this case the handle would have been turned
15 toward the left, carrying the pin 23' toward the right and acting on the device 19, arm 12, strip 14, spring 16, &c., in exactly the same manner as already described in connection with the devices on the other side.

20 While a single spring is shown connecting the pivoted arms 12 13, it is evident that each arm may have a separate spring, one end of which is secured to a suitable fixed part of the apparatus. It is also evident that the
25 switch may be used without employing the spring-press rollers 28 29, although its operation would be less perfect, and that the arrangement of contact-plates on the drum which has been indicated is merely illustrative and that the invention is not confined
30 to this arrangement or to any particular number of contact-plates or springs. While I prefer to have the contact-plates provided with vertical flanges on the sides of which
35 the co-operating springs make contact, this is not essential.

What I claim is—

1. The combination, in a switch, of a switch member having contacts, a handle for moving
40 it, a spring for throwing said member when the latter has been moved a predetermined distance, a second switch member, and an operating-spring therefor released at or about the same instant that the first-mentioned
45 spring throws its switch member, substantially as described.

2. The combination, in a snap-switch, of two switch members, one of which is provided with a suitable handle for moving it and with
50 contacts and the other of which has contact devices adapted to make contact therewith, a spring put under tension by movement of the first-mentioned switch member and acting on said member to throw it suddenly when
55 the latter has been moved a predetermined distance, a second spring, also put under tension by movement of said first switch member, and means operated by said second spring for throwing the second switch member,
60 whereby the circuit is made and broken by a double spring action, substantially as described.

3. The combination, in a switch, of a member in the form of a drum, on the surface of
65 which are contact-plates in two series inde-

pendent of each other, movable either to the right or to the left at will, co-operating switch-contacts, one or more springs opposing the movement of the movable member, whereby
70 it or they will be put under tension by movement of the switch in either direction, and releasing devices for the springs, substantially as described.

4. The combination, in a switch, of a body carrying two sets of contact-plates on oppo-
75 site sides of a median line, respectively, forming one switch member and movable at will either to the right or left, a co-operating switch member having contact devices normally standing on said median line that is between
80 said sets of plates, a spring so connected as to be put under tension by movement of the switch in either direction, an escapement or releasing device for said spring, and means operated by such spring for instantaneously
85 changing the switch connections, substantially as described.

5. The combination, in a switch, of a body carrying switch contact-plates, pivoted plates or springs adapted to make contact there-
90 with, means for moving the body, a pivoted arm or device having a trip engaging the body, whereby the arm or device is moved by said body, a spring connected to said pivoted arm or device and put under tension by such
95 movement, said trip being made so as to disengage the connection between the body and said arm or device at a predetermined point, whereby said spring can act, and a strip or bar carried by the pivoted arm and adapted
100 to strike said pivoted contacts, whereby the connection of the switch is instantaneously changed, substantially as described.

6. The combination, in a switch, of a body, several rows of contact-plates thereon, pivoted
105 springs or plates adapted to co-operate therewith, means for moving the body and for putting a spring under tension thereby, and means for releasing said spring, and a striker moved by the spring against the pivoted con-
110 tact plates or springs, substantially as described.

7. The combination of a drum or body carrying several contact-plates in the form of curved plates having flanges or webs extend-
115 ing in planes at right angles to the axis of the drum or body and in line with each other, some of said contact-plates being idle, but of the same shape as the other plates, and co-operating pivoted springs adapted to grasp
120 and make contact with the plates, whereby the resistance to motion of the switch-body is the same in all positions, substantially as described.

This specification signed and witnessed this
4th day of February, 1892.

ROBERT LUNDELL.

Witnesses:

CHARLES M. CATLIN,
E. A. MACCLEAN.