

No. 772,914.

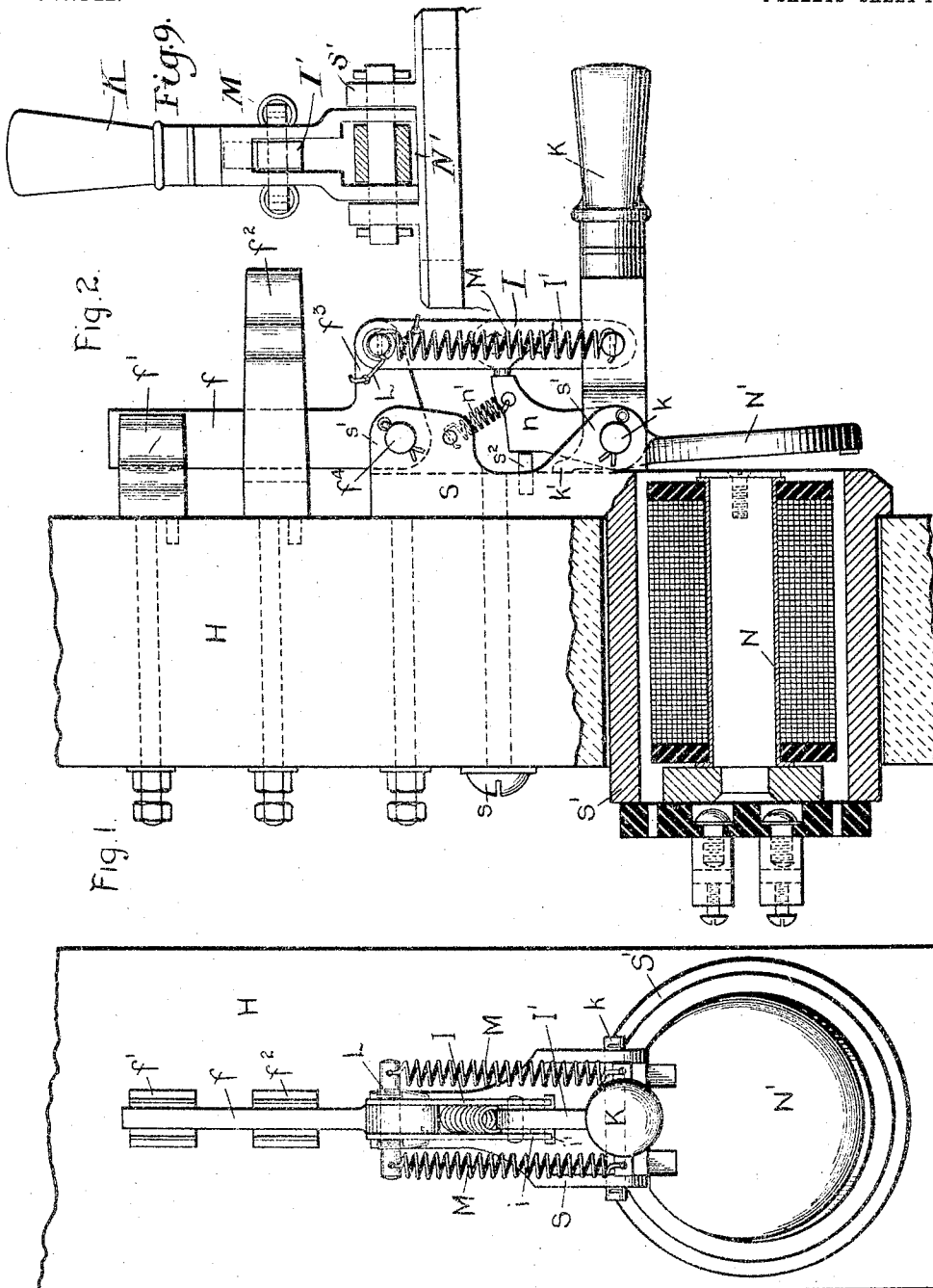
PATENTED OCT. 25, 1904.

C. C. BADEAU.
SWITCH.

APPLICATION FILED SEPT. 16, 1901.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:

Robt. L. Chapman
Alex. MacDonald

Inventor:

Charles C. Badeau.
by *Allen K. ...*
Atty.

No. 772,914.

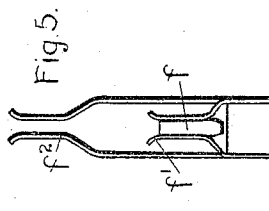
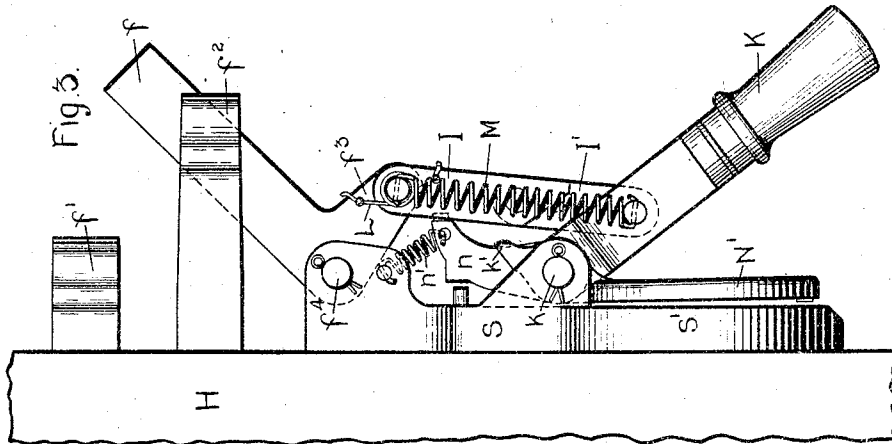
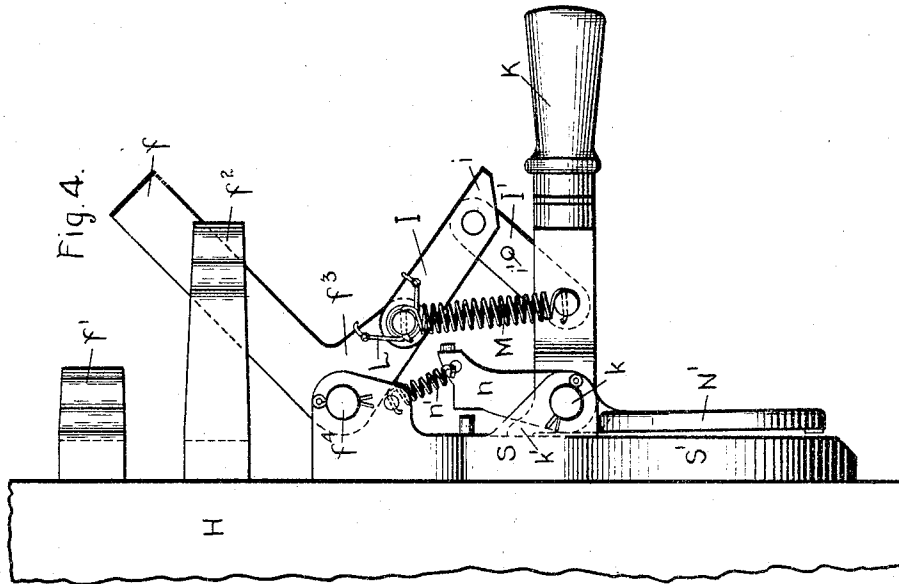
PATENTED OCT. 25, 1904.

C. C. BADEAU.
SWITCH.

APPLICATION FILED SEPT. 16, 1901.

NO MODEL.

4 SHEETS—SHEET 2.



Witnesses:

Robt. C. Chapman
Alex. F. Macdonald

Inventor.

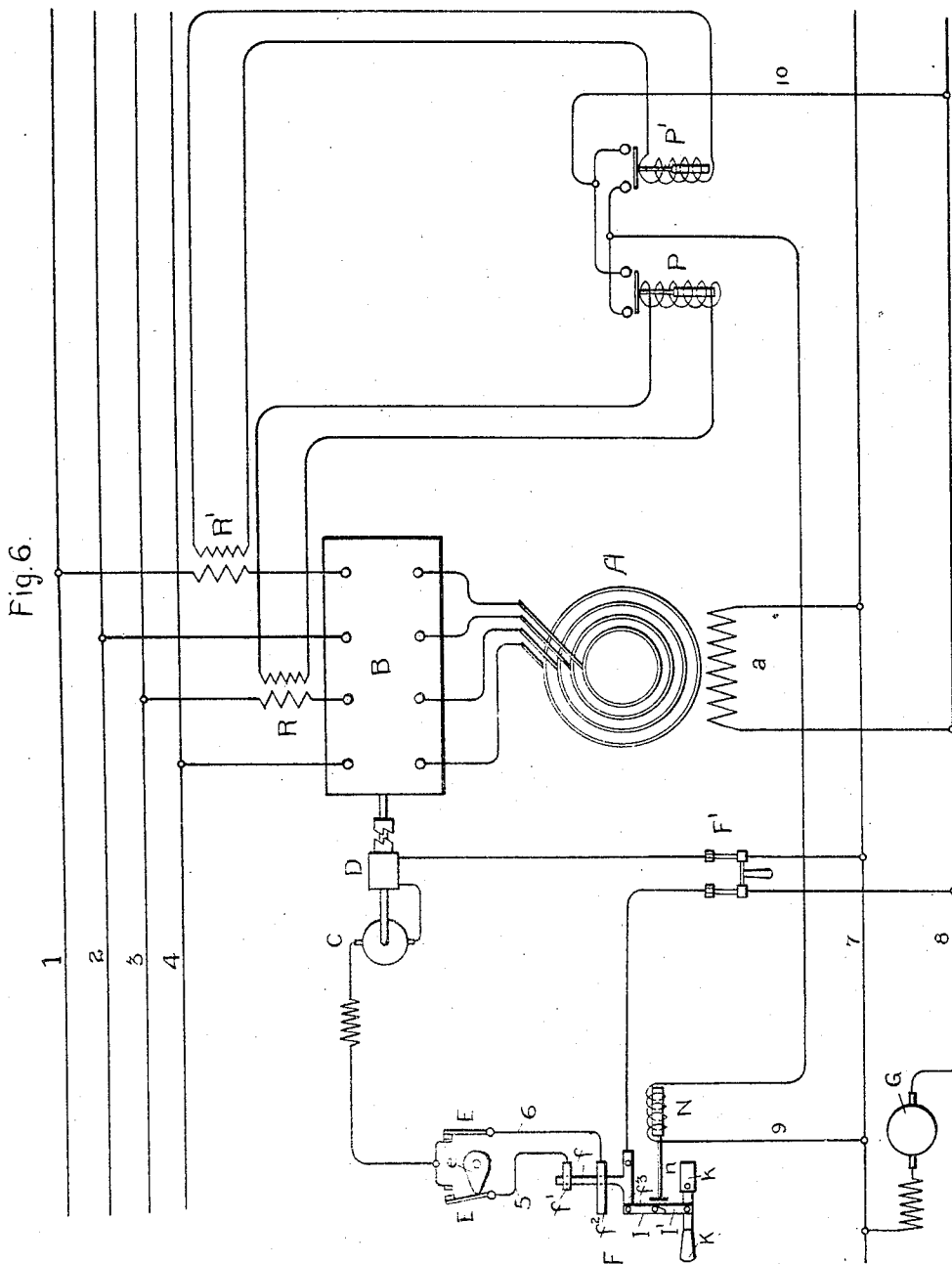
Charles C. Badeau.
by *Albert F. Macdonald*
Atty

C. C. BADEAU.
SWITCH.

APPLICATION FILED SEPT. 16, 1901.

NO MODEL.

4 SHEETS—SHEET 3.



Witnesses:

Robt. L. Chapman
Alex. F. Macdonald

Inventor.

Charles C. Badeau.
by *Albert B. Davis*
Atty

No. 772,914.

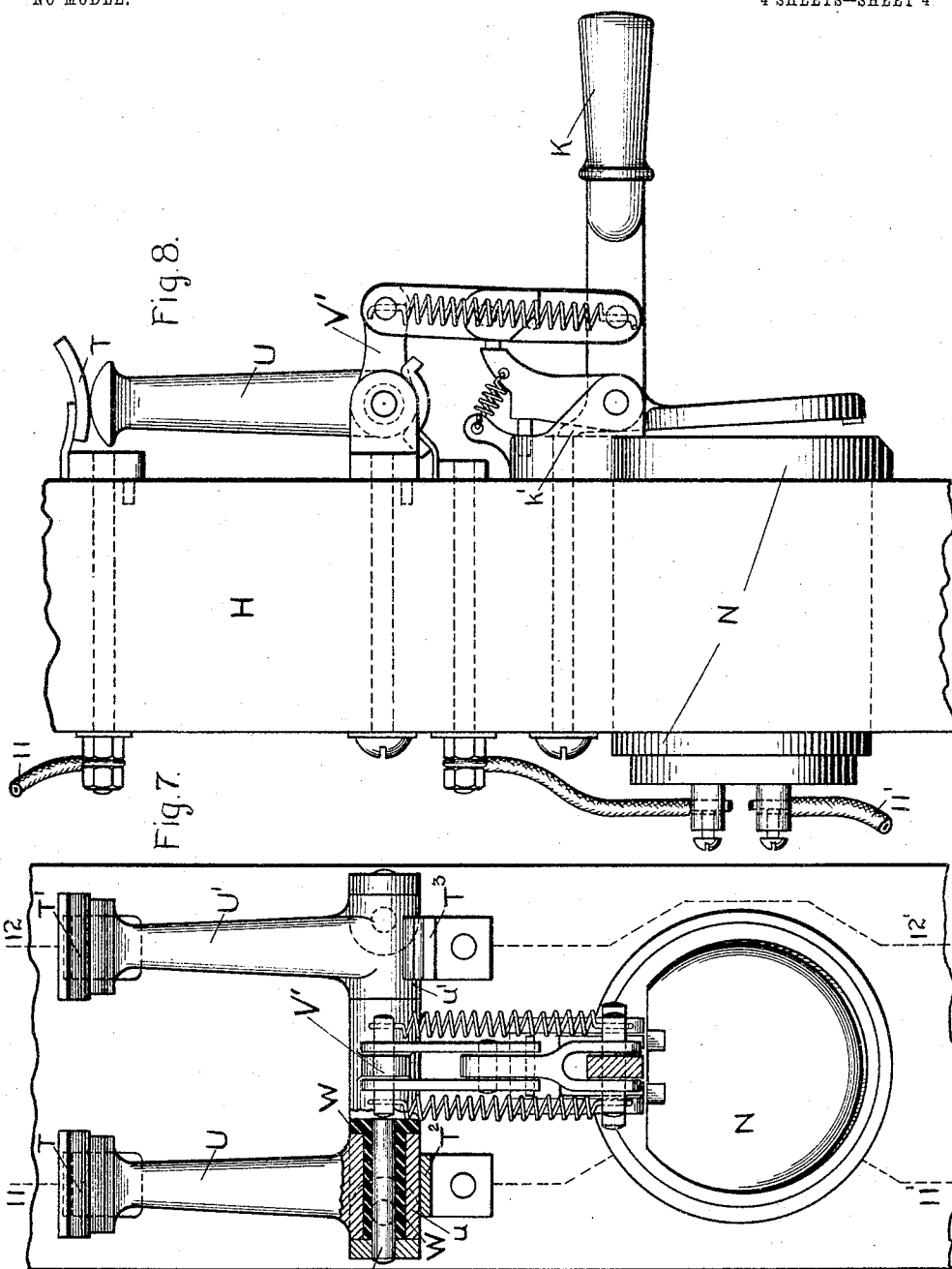
PATENTED OCT. 25, 1904.

C. C. BADEAU.
SWITCH.

APPLICATION FILED SEPT. 16, 1901.

NO MODEL.

4 SHEETS—SHEET 4



Witnesses:

Robt. L. Chapman
Alex. F. Macdonald

Inventor:

Charles C. Badeau.
by *Alfred Davis*
Atty.

UNITED STATES PATENT OFFICE.

CHARLES C. BADEAU, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SWITCH.

SPECIFICATION forming part of Letters Patent No. 772,914, dated October 25, 1904.

Application filed September 16, 1901. Serial No. 75,501. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. BADEAU, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Switches, of which the following is a specification.

This invention relates to apparatus for controlling electric circuits; and its object is to provide a switch which can be operated either by hand or automatically and will indicate by which of these two modes it has been thrown. This switch is capable of use in many kinds of installations; but it is especially designed to be a part of a system of power distribution in which high-tension currents are handled by large oil-switches operated by electric motors.

My newly-invented switch is intended to control the motor-circuit.

It will be better understood from the following detailed description of its construction, operation, and application, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a double-throw switch embodying my improvements. Fig. 2 is a side elevation of the same, partly in section. Fig. 3 is a side elevation showing the switch when manually operated. Fig. 4 is a similar view showing it when automatically operated. Fig. 5 is an end view of the contact-clips and the switch-blade. Fig. 6 is a diagram of circuits in which this double-throw switch may be used. Fig. 7 is a front elevation of a double-pole automatic circuit-breaker embodying my invention. Fig. 8 is a side elevation of the same. Fig. 9 is a detail view of the operating-handle of the type of switch shown in Fig. 2.

Referring first to Fig. 6, a high-tension alternating-current generator is shown at A, feeding into four bus-bars or mains 1 2 3 4 through a multipolar oil-switch B, in which the movable contacts are opened and closed by an electric motor C. The specific mechanism of this switch forms the subject of an application of E. M. Hewlett and Theodore Button, Serial No. 88,757, filed January 7, 1902. It is sufficient to state here that the

switch-contacts are raised and lowered by a crank-shaft driven by an electric motor which is temporarily clutched to the driving-shaft by a solenoid D in series with the motor. The motor-circuit is divided into two branches 5 6, in each of which is a circuit-closer E, actuated by a cam *e* on the crank-shaft and timed to open the motor-circuit when the crank reaches the end of its throw. The two branch circuits 5 6 are each connected with a contact *f'* *f''* of the switch F, whose movable blade *f* makes contact with one or the other of said contacts, as the case may be, and is itself connected with a source of supply, such as the mains 7 8, leading from the direct-current dynamo G and serving primarily to excite the field-coils *a* of the main generator A. The motor-circuit is also controlled by a double-pole switch F'.

Referring now to the other figures of the drawings, it will be seen that the switch F is mounted on the upright switchboard H, the circuit connections being made at the rear, as usual. The contacts *f'* *f''* are preferably U-shaped clips, in which works the blade *f*. The clip *f''* is longer than the clip *f'*, so that the blade will lie between the wide-spread sides of the clip *f''* when in contact with clip *f'*, but will engage with the inwardly-bent ends of the clip *f''* when thrown out of the clip *f'*. Any equivalent mode of causing the blade *f* to close on one or the other of two contacts may be substituted for the specific clips shown.

The switch-blade *f* is in reality an elbow-lever, and to its short arm *f''* is pivoted one link I of a toggle, the other link, I', being pivoted to a lever-handle K, fulcrumed on the switchboard at *k*. On one end of the link I, which is preferably double, as shown in Fig. 1, is a small spring L, which tends to throw the toggle past the dead-center when it straightens out. The movement of the toggle too far past the center is checked by a lug *i* on the link I abutting against a stop-pin *i'* on the link I'. One or more strong springs M are attached to the ends of the toggle and tend to pull them toward each other when the toggle is tripped.

An overload-coil N is located adjacent to the switch, being preferably inserted in a socket in the switchboard, so as to lie flush with the surface of the same, as shown. The pivoted armature N' of this coil carries a finger *n*, which stands just behind the joint of the toggle when the switch-blade *f* is closed on the clip *f'*, as shown in Fig. 2. This is the position which the switch assumes when the motor-circuit is closed to cause the motor to close the oil-switch.

The coil N is in circuit with one or more relays P P', whose coils are respectively in circuit with the secondaries of the series transformers R R' in the leads from the main generator. The relays close a circuit 9 10 from the exciter-mains 7 8 through the overload-coil N.

It will be seen that the switch-blade *f* can be moved manually by the handle K, the straightened toggle serving simply as a connecting-rod between the switch-blade and the handle; but if an overload occurs on one or more of the main leads the excessive current generated by the transformer in that lead energizes its relay, which closes the circuit of the coil N, causing its armature to kick off the toggle and permit the spring M to pull over the blade *f*. The handle K has a foot *h'*, preventing it from being moved up beyond a position in which the blade *f* is closed on the clip *f'*, thus affording a firm abutment for the lower end of the spring when it contracts.

The operation of the invention is as follows: The oil-switch B controls the connections between the generator A and the mains 1 2 3 4. This switch is operated by the motor C, whose circuit can be closed through either the clip *f'* or the clip *f''*. A cam *e*, rotated by the motor, serves to break the motor-circuit when the oil-switch has reached the end of its movement in either opening or closing, leaving the other branch motor-circuit in condition to be closed by throwing over the switch F. This can be done either by hand, as in Fig. 3, or automatically by an overload acting through the transformer R or R', its relay P or P', and the coil N. If moved by hand to close the motor-circuit through the clip *f''*, and so start the motor to open the oil-switch, the handle K must be drawn down, as shown in Fig. 3; but if the switch is thrown by the operation of the overload-coil the handle K does not move, but remains as shown in Fig. 4. The handle is therefore an indicator showing whether the switch has been thrown by hand or by an overload.

My improved switch can be constructed in compact and simple form. I prefer the arrangement shown in the drawings, in which the metallic frame S is secured to the switchboard by a screw-bolt *s* and has lugs *s'* to receive the pins *f''* and *h'*, on which are fulcrumed, respectively, the switch-blade *f* and the handle K. The lower part of the frame

is a cylindrical bushing S', which fits a hole in the switchboard and serves as a housing for the coil N. The armature N' is pivoted on the pin *h'* between the legs of the forked handle K, and a small spring *n'*, attached to the finger *n* and the upper lug *s'*, keeps the finger retracted against a stop *s''*. The contact-clips *f'* *f''* are separately secured to the switchboard above the frame S.

With but slight modification my invention can be applied to automatic circuit-breakers, so as to provide such apparatus with means whereby it will be immediately reopened if after having automatically opened on an overload it is closed by hand before the overload is reduced. When an automatic circuit-breaker opens, the attendant at once grasps the handle and closes it again. Now if the abnormal load which caused it to open is still on the line and the attendant forcibly holds the contacts closed serious injury may be done to the translating devices in circuit with the breaker. My invention obviates this difficulty by causing the overload-coil to operate through mechanism which is not under the control of the handle by which the contacts are manipulated, so that if the breaker is closed while the overload still continues the coil will instantly reopen the breaker even though the attendant still keeps the handle in the closing position.

The circuit-breaker illustrated in Figs. 7 and 8 is a double-pole single-throw switch; but the invention is applicable to other forms of circuit-breakers, if desired. The line-wires 11 12, forming the two sides of the circuit, are connected with the contact-springs T T'. Two switch-blades or contact-arms U U' are secured upon a common rock-shaft V, but insulated therefrom and from each other by insulation W. The hubs *u u'* of said arms have cylindrical surfaces to make rubbing contact with terminals T² T³, to which the line-wires 11' 12' are connected. The overload-coil N is in circuit with one side of the line, as 11 11'. The shaft V has a rock-arm V', to which is connected the actuating-handle K, provided with a foot *h'* to arrest the upward movement of the handle when the switch-arms are closed. The other parts of the circuit-breaker are the same as in the double-throw switch shown in Figs. 1 to 5. So long as the toggle remains locked, the switch-arms can be opened and closed by moving the handle K. The automatic opening is effected by the overload-coil N in the same manner as the double-throw switch; but if the attendant closes the circuit-breaker while the overload is still on the toggle is immediately tripped and the switch flies open without affecting the handle. It is thus impossible for the attendant to permanently close the switch until the main line has been relieved of its overload. It will be seen that this action is also incident to the double-pole switch shown and described, it

being impossible to hold closed the switch-blade on the clip *f'* when an overload remains on the line.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A switch provided with a switch-blade, a handle pivoted separately from the switch-blade, a double-link toggle connecting said handle and switch-blade, means for arresting said toggle when overset, and means for tripping said toggle independently of motion of the handle.

2. A switch provided with a switch-blade, a handle pivoted separately from its switch-blade, a toggle connecting said handle and switch-blade, a spring tending to pull the switch-blade toward the handle, and means for tripping the toggle independently of motion of the handle.

3. A switch provided with a switch-blade, a handle pivoted separately from the switch-blade, a toggle connecting said handle and switch-blade, means for oversetting said toggle when it straightens out, and means for tripping the toggle independently of motion of the handle.

4. A switch provided with a switch-blade, a handle pivoted separately from the switch-blade, a toggle connecting said handle and switch-blade whereby the blade may move independently of the handle, a light spring operating to move the joint of said toggle past the center, a stop to arrest said movement, and a trip-coil to collapse the toggle.

5. A switch provided with a switch-blade, a handle pivoted separately from the switch-blade, a double-link toggle between said handle and blade, a light spring bearing on one

link of said toggle, a lug on one link, and a stop-pin on the other link.

6. A switch provided with a switch-blade, a handle pivoted separately from the switch-blade, a toggle connecting said handle and blade whereby the blade may move independently of the handle, a spring attached to the ends of said toggle, and an overload-coil having a pivoted armature adapted to kick off said toggle.

7. In an automatic switch, a frame having lugs for the pivotal attachment of the operating parts and a bushing integral therewith and perpendicular thereto serving as a housing for an overload-coil.

8. In an automatic switch, the combination with a switchboard, of a frame having lugs for the pivotal attachment of the operating parts, and having also a rearwardly-extending bushing fitting in a hole in said switchboard, and serving as a housing for an overload-coil.

9. An electric switch comprising a fixed terminal, a switch-blade mounted for movement into and out of active relation thereto, an independently-operating handle, a two-link toggle between the handle and the switch-blade, means for setting the toggle off center so as to form of the blade and handle a single movable unit, and means for releasing the toggle and thereby throwing the switch without changing the position of the handle.

In witness whereof I have hereunto set my hand this 11th day of September, 1901.

CHARLES C. BADEAU.

Witnesses:

ALEX F. MACDONALD,
MABEL H. EMERSON.