(No Model.) 2 Sheets—Sheet 1.

F. C. PERKINS & J. D. KILLIP.

AUTOMATIC ELECTRIC SWITCH.

No. 598,715. Patented Feb. 8, 1898.

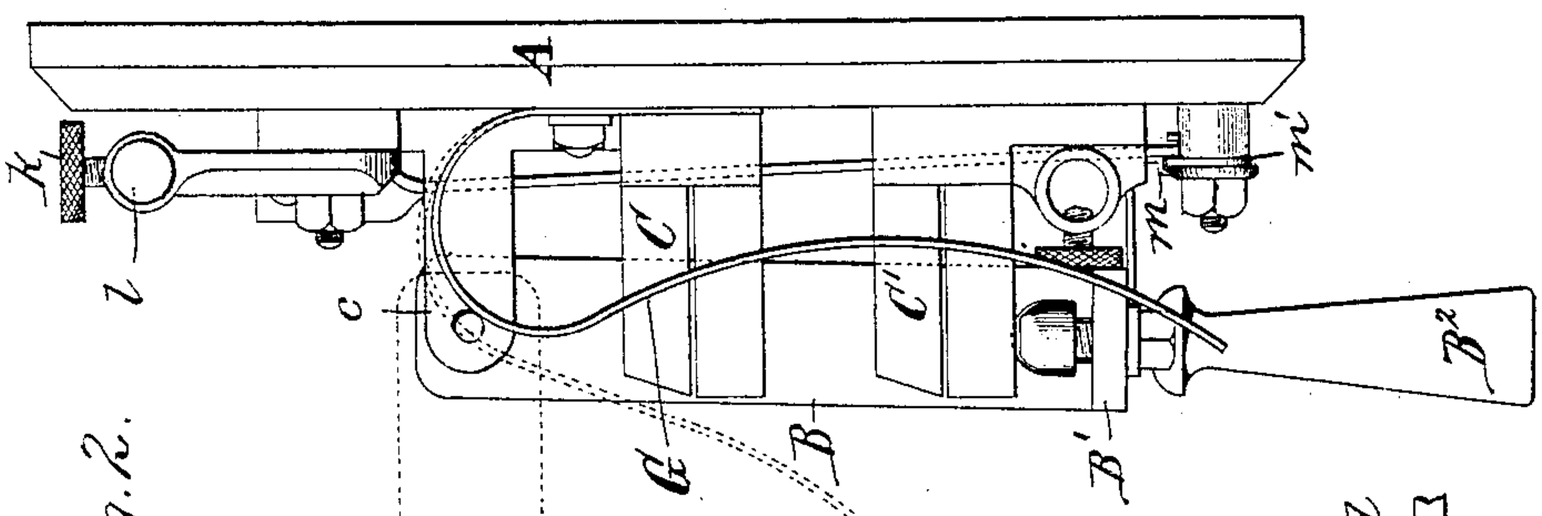

Fig. 2.

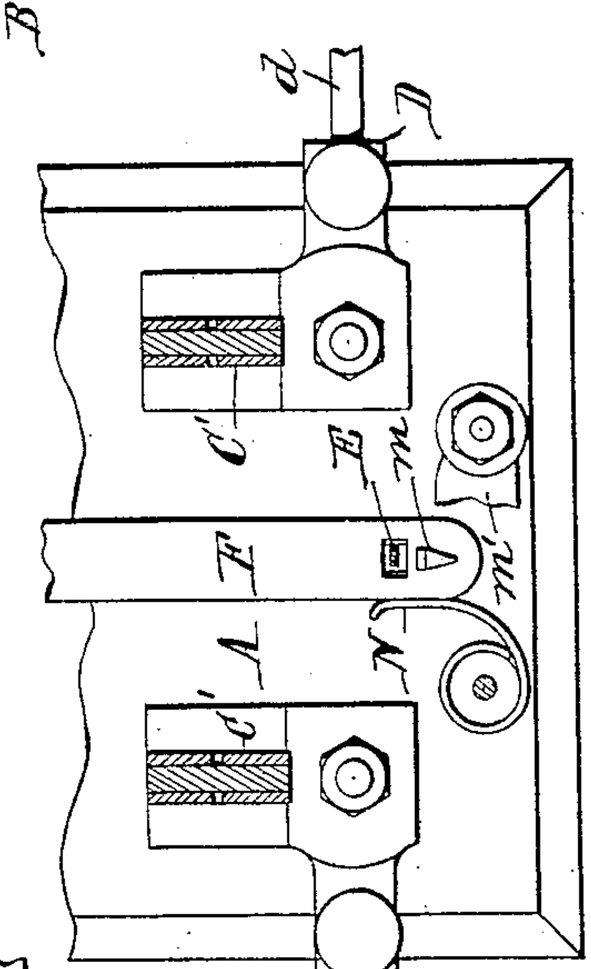

Fig. 3.

Fig. 1.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 1.

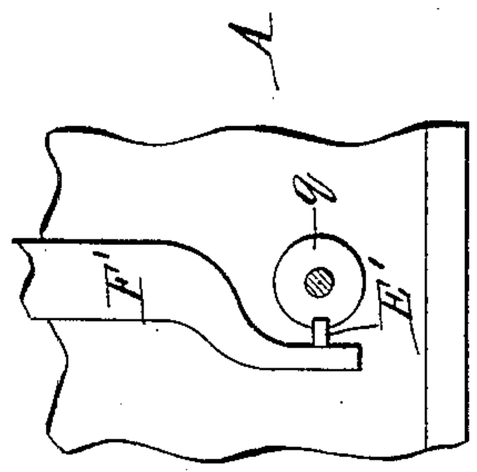


Fig. 5.

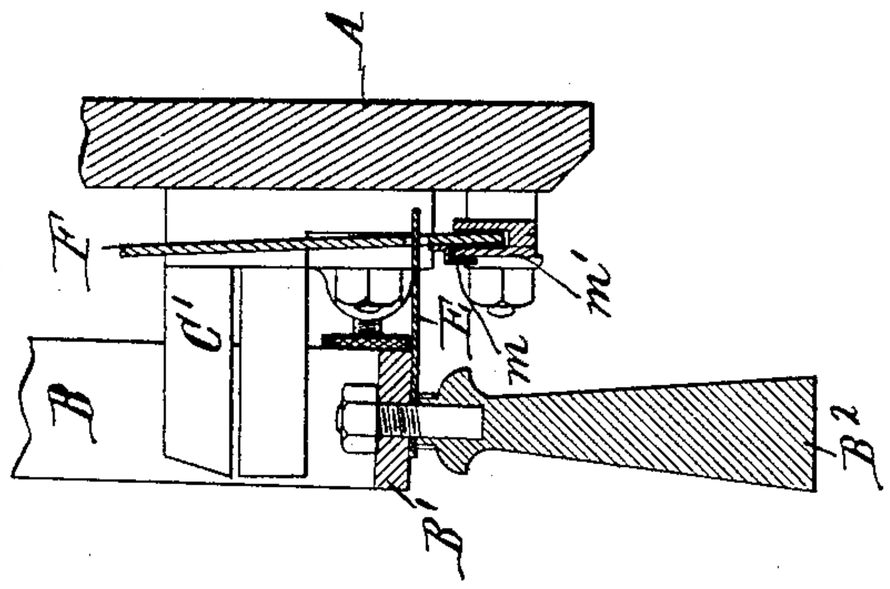


Fig. 3.

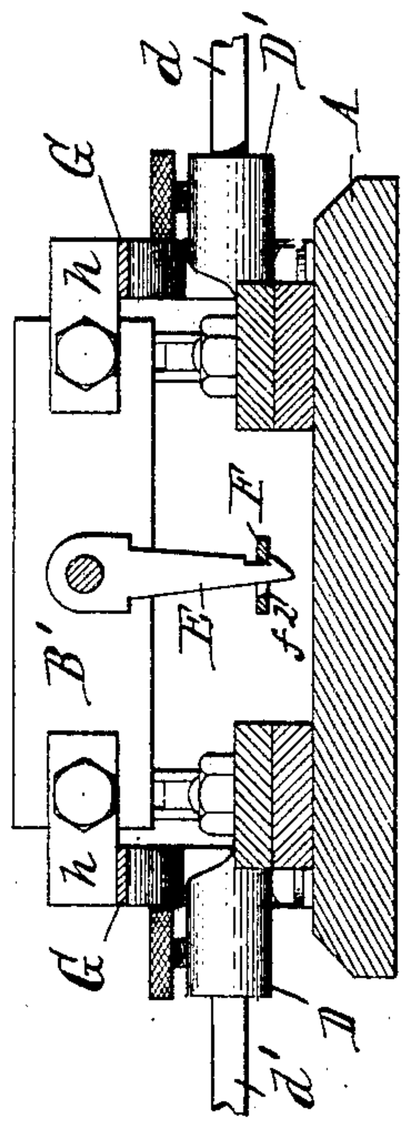


Fig. 6.

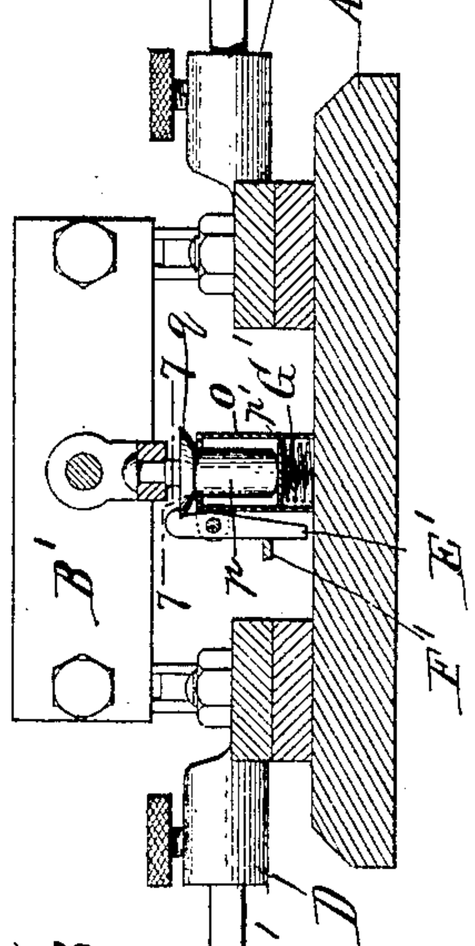
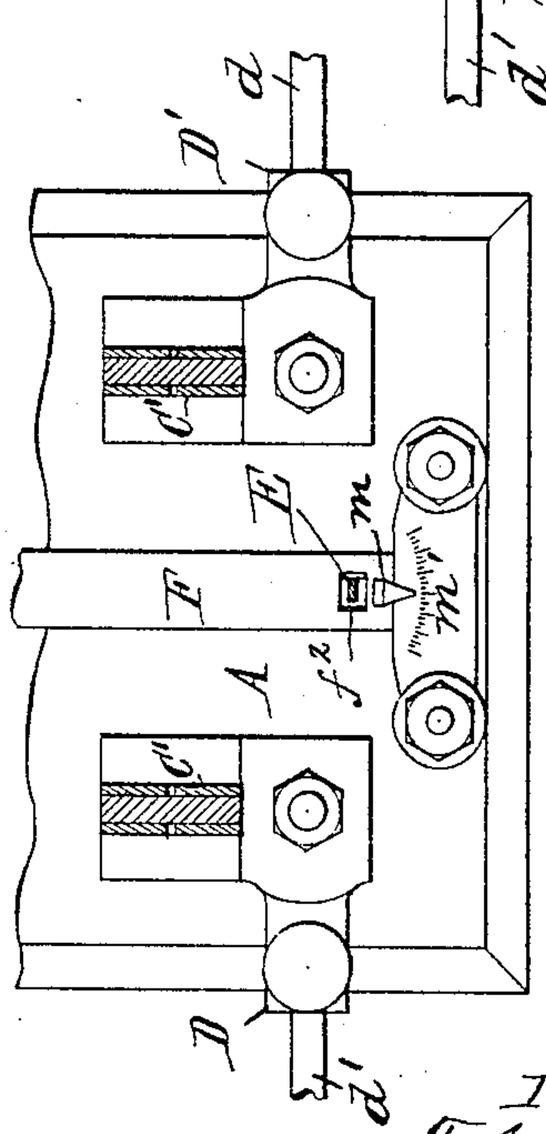


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK C. PERKINS AND JOHN D. KILLIP, OF BUFFALO, NEW YORK; SAID KILLIP ASSIGNOR TO SAID PERKINS.

AUTOMATIC ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 598,715, dated February 8, 1898.

Application filed September 25, 1897. Serial No. 652,997. (No model.)

To all whom it may concern:

Be it known that we, FRANK C. PERKINS and JOHN D. KILLIP, citizens of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Automatic Electric Switches, of which the following is a specification.

This invention relates to the class of electric switches or cut-outs which automatically break the circuit when the strength of the current becomes excessive or rises above the normal owing to short-circuiting or overloading, thus preventing burning out or other injury to the electrical apparatus in the circuit.

The object of our invention is to simplify the construction of such switches and reduce their cost of manufacture.

In the accompanying drawings, consisting of two sheets, Figure 1 is a front view of our improved switch, showing the same closed. Fig. 2 is a side elevation thereof. Fig. 3 is a view of the front end of the switch, partly in section, the plane of the sectional portion being in line 3 3, Fig. 1. Fig. 4 is a vertical section of the lower portion of the switch, showing the pointer on the locking-lever and the scale with which it coöperates. Fig. 5 is a transverse vertical section of the lower portion of the switch. Fig. 6 is a front view of the lower portion of the switch, showing a modification of the locking-catch and the spring for automatically opening the switch. Fig. 7 is a transverse section in line 7 7, Fig. 6. Fig. 8 is a sectional front view of another modification of the switch.

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

A is the base of the switch, which may be made of any suitable non-conducting material, such as slate.

B B are the metallic arms or members of the usual double switch-lever, which members are pivoted at their upper ends to lugs *c*, secured to the base A, and are connected at their opposite ends by a non-conducting cross-bar B′, having a handle B^2. The switch-levers B are adapted to enter between the usual stationary contact-jaws or elastic plates C C′, secured to the base.

d d′ are the line-wires, which are secured in sockets D D′, formed on or secured to the lower pair of contact-plates C′.

Referring to the construction shown in Figs. 1 to 5, E is a catch or notched arm extending inwardly from the cross-bar B′ of the switch-lever and adapted to interlock with a locking-lever F for retaining the switch-lever in its closed position. The locking-lever is bent or elbow-shaped and pivoted by a horizontal pin *f* to the base of one of the lugs *c* or to the base-plate A, so that its lower vertical portion *f′* swings laterally between the upper and lower pairs of stationary contact-plates C C′. The catch E engages in an opening f^2, formed in the locking-lever, and the nose of the catch is beveled, as shown, so as to interlock automatically with the edge of said opening upon closing the switch-lever.

G G are springs which automatically open the switch-lever when the same is released, so as to break the circuit and cut out the electrical apparatus controlled by the switch. In the construction shown in Figs. 1 to 5 curved springs are employed, which are secured at their upper ends to the base and engage with their free lower ends under lateral projections or extensions *h* of the cross-bar B′, these springs being strained in the closed position of the switch-lever, so as to throw the lever outward by their reaction the instant the lever is released.

I is a thermal rod, wire, or resistance included in the switch-circuit and arranged to retract or actuate the locking-lever F when the strength of the current rises above the normal, so as to disengage the same from the locking-catch E of the switch-lever and allow the springs G to open the lever. This rod or wire is secured at one end to a fixed socket or holder J, fastened to the base of the adjacent lug *c*, while its opposite end is connected with the upper short arm f^3 of the locking-lever F, the wire being preferably fastened in its sockets by set-screws *k k′*. When the switch is closed, the current entering the branch *d* of the line-wire passes through the

right-hand contact-plates C C′ and the right-hand switch-lever B, and thence through the holder J, thermal wire I, the upper arm of the locking-lever F, and the left-hand switch-lever B to the other branch *d′* of the line-wire.

The thermal wire becomes heated by the passage of the current and expands gradually as the strength of the current increases; but it is made of such a size or diameter that it does not expand sufficiently to operate the locking-lever F so long as the current remains normal; but as soon as the strength of the current exceeds the normal from any cause the increased expansion of the wire resulting therefrom causes the lower arm *f* of the locking-lever to swing in the direction of the arrow in Fig. 1, disengaging the same from the catch E of the switch-lever and allowing the springs G to throw the latter to its open position, thus automatically breaking the circuit and preventing injury to the electrical apparatus.

Any suitable material may be employed for the thermal wire, such as German silver, iron, copper, nickel, or other metals.

Upon loosening one or the other of the set-screws *k k′* the locking-lever can be adjusted to interlock with the catch E under normal conditions, the set-screws being again tightened after effecting the adjustment. The lower arm of the locking-lever is preferably constructed of spring-steel and is sufficiently elastic to allow the beveled nose of the catch to engage automatically therewith upon closing the switch-lever.

The resistance formed by the thermal wire may be varied according to the desired predetermined strength of current by employing wires of different sizes, a thicker wire being employed for a high current and a thinner wire for a low current. Within certain limits the same thermal wire may be used for currents of different strength by adjusting the wire lengthwise in one of its sockets relatively to the other, so as to increase or reduce the effective length of the wire, thereby requiring a correspondingly greater or less degree of expansion of the wire to actuate the locking-lever. In this case the locking-lever is adjusted to enter the notch of the catch E a greater distance for a high current and a shorter distance for a low current. We prefer to adjust the end of the wire secured in the holder J, and in order to permit a fine adjustment of the wire the holder is provided with an adjusting-screw *l*, which bears against the opposing end of the wire, as shown in the drawings.

In order to facilitate the adjustment of the lever for a predetermined current strength, its lower end may be provided with a pointer or index *m*, which traverses a suitably-graduated scale *m′*, secured to the base, as most clearly shown in Fig. 4. This scale and the pointer are not essential and may be omitted, if desired.

The thermal wire is preferably inclosed by a tube or jacket I′, of miconite, glass, or other suitable non-conducting material, to confine the heat and insulate the wire.

When the switch is used in connection with a comparatively low or weak current requiring a correspondingly thin thermal wire, the wire is liable to bend or buckle when the current strength exceeds the normal instead of remaining stiff and operating the locking-lever. To insure the tripping and opening of the switch with the use of such a thin wire, a spring N, Fig. 8, may be employed, which operates upon the long arm of the locking-lever and tends constantly to shift the same in the proper direction to disengage it from the catch of the switch-lever. Either a tension or a compression spring may be used for this purpose. In the drawings a compression-spring is shown. This spring is compressed when the thermal wire is cold, and when the wire expands to an abnormal degree it allows the spring to shift the lever and trip the switch for breaking the circuit. Such a spring may also be used in connection with heavy currents, in which case a flat expansion-strip may be substituted for the thermal rod or wire, if desired.

As a modification of the switch-opening device a single spring G′, arranged underneath the cross-bar B′ of the switch-lever, may be substituted for the two springs G. In this case the spring is incased in a barrel or housing *o*, secured to the base A, and the cross-bar B′ is provided with a projecting stem *p*, which bears against a follower *p′*, bearing in turn against the outer end of the spring in the closed position of the switch. In this modification the locking-catch consists of a lever E′, pivoted between its ends to the left-hand side of the spring-housing *o* and having at its upper end a hook or nose, which interlocks with a flange or shoulder *q* of the stem *p*. The lower arm of the catch E′ faces the locking-lever F′. When the locking-lever is actuated by an excessive current, it trips the catch E′, causing the latter to release the switch-lever and allowing the spring G′ to throw the lever to its open position.

Our improved switch is simpler than switches in which an electromagnet is used for controlling the lock of the switch-lever, and it can be produced at less cost than such a switch.

We claim as our invention—

1. In an automatic electric switch, the combination with a base having a contact, of a switch-lever arranged to swing at right angles to the base, a locking-lever pivoted to swing parallel with the base and adapted to interlock with said switch-lever for holding the same in its closed position, an expansible thermal rod or wire included in the circuit and secured at one end to the base and operating at its opposite end upon said locking-lever, and automatic means for opening the

switch-lever when released, substantially as set forth.

2. In an automatic electric switch, the combination with a base having a contact, of a switch-lever arranged to swing at right angles to the base and provided on its inner side with a catch extending toward the base, a locking-lever pivoted to swing parallel with the base and interlocking normally with said catch, an expansible thermal rod or wire arranged substantially at right angles to the switch-lever and having one end thereof secured to the base and its opposite end connected with said locking-lever, and automatic means for opening the switch-lever when released, substantially as set forth.

3. In an automatic electric switch, the combination with a base having two sets of contacts, of a double switch-lever arranged to swing at right angles to the base and having its members connected by a cross-bar which is provided on its inner side with a catch extending toward the base, a two-armed locking-lever arranged between the two sets of base-contacts, pivoted to swing parallel with the base and adapted to interlock with said catch, an expansible thermal rod or wire arranged transversely above the double switch-lever and having one end thereof secured to the base and its opposite end connected with the upper arm of said locking-lever, substantially as set forth.

4. In an automatic electric switch, the combination with a base having a contact, of a switch-lever arranged to swing at right angles to the base and provided on its inner side with a catch extending toward the base, a locking-lever pivoted to swing parallel with the base interlocking normally with said catch, and provided with a pointer, a scale mounted on the base and traversed by said pointer, an expansible thermal rod or wire included in the circuit and controlling said locking-lever, and automatic means for opening the switch-lever when released, substantially as set forth.

Witness our hands this 16th day of September, 1897.

FRANK C. PERKINS.
JOHN D. KILLIP.

Witnesses:
CARL F. GEYER,
KATHRYN ELMORE.