(No Model.)

3 Sheets—Sheet 1.

C. C. KRITZER.

AUTOMATIC ELECTRIC CUT-OUT.

No. 576,369. Patented Feb. 2, 1897.

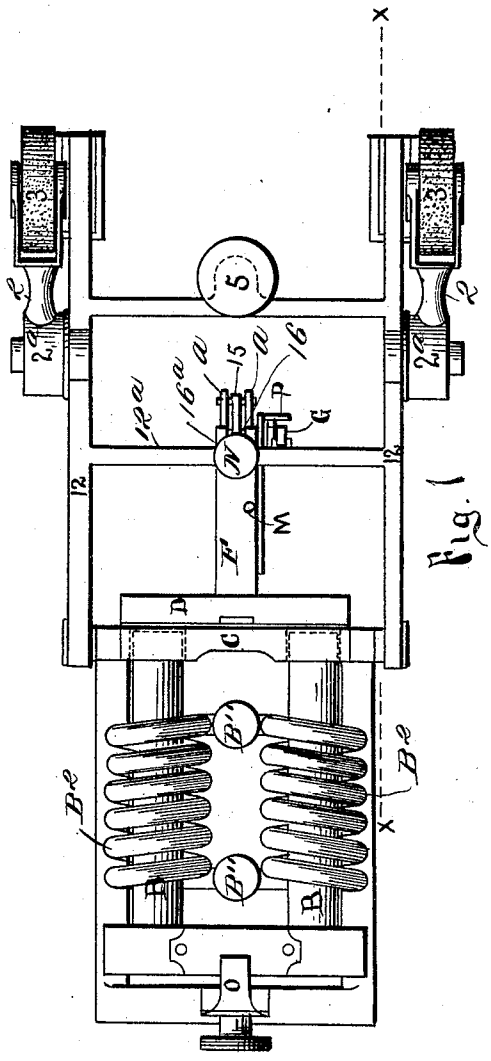

Fig. 1.

Witnesses:
C. Hondelink
W. Louis Wright.

Inventor:
Charles C. Kritzer
By Edward Taggart
His Attorney

(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

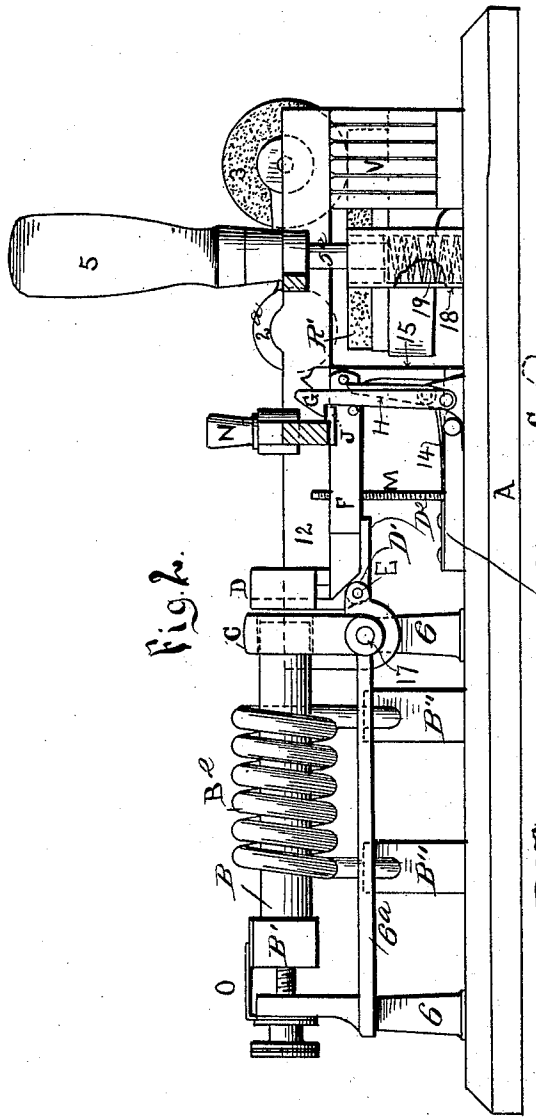
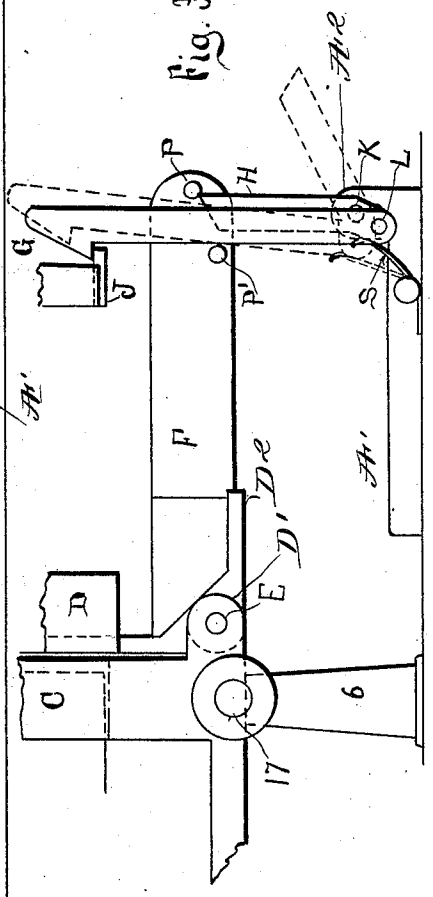


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 5

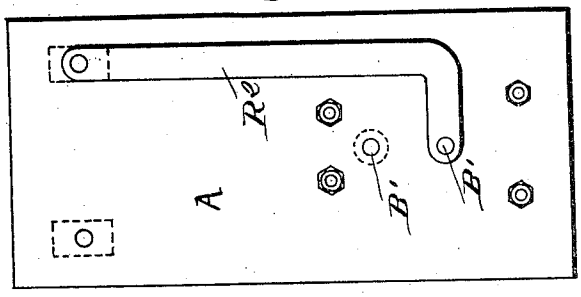

Fig. 4.

Witnesses:
C. Hondelink
M. Louise Wright.

Inventor:
Charles C. Kritzer
By Edward Taggart
His Attorney

UNITED STATES PATENT OFFICE.

CHARLES C. KRITZER, OF NEWAYGO, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO NANCY RUNNELS, OF SAME PLACE.

AUTOMATIC ELECTRIC CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 576,369, dated February 2, 1897.

Application filed November 13, 1895. Serial No. 568,848. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. KRITZER, a citizen of the United States, residing at the village of Newaygo, in the county of Newaygo and State of Michigan, have invented a certain new and useful Automatic Electrical Cut-Out, of which the following is a specification.

This invention relates to an automatic cut-out for electric circuits, said cut-out being adapted to instantaneously open the circuit upon the passage of an abnormal current.

The objects of my invention are, first, to prevent charges at the main contact-plates when the circuit is suddenly broken; second, to transfer the circuit from the main contact-plates to contacts having higher resistance and to increase this resistance from the instant that the main contact-plates begin to separate until the supplemental high-resistance contacts are themselves separated, and, third, to provide an extremely delicate adjustment of the operative parts, which may be so regulated as to respond accurately and instantaneously to any predetermined strength of current, as more fully hereinafter set forth. These objects I accomplish by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a device constructed in accordance with my invention. Fig. 2 is a sectional view on line X X of Fig. 1, showing the principal working parts of the device in side elevation. Fig. 3 is an enlarged view of the locking device which is adapted to lock the swinging frame in operative position and to release the same by the action of the armature. Fig. 4 is a side elevation of the entire device with the swinging frame turned back so as to break the current. Fig. 5 is a bottom plan view of the base-plate and the connections which pass through to the under side thereof.

In the said drawings the reference-letter A indicates the base-plate, which may be constructed of marble or any suitable material. Upon this base-plate is supported the frame to which the operative mechanism is attached. This frame is of any suitable form, being composed in the present instance of posts 6, which support the horizontal members 6^a at a proper distance above the base A. In this frame are supported the cores B B' of an electromagnet, connected at one end by a yoke B'. A thumb-screw O, swiveled in a transverse riser of the frame, is tapped into the central portion of the yoke, and by turning said screw in one direction or the other the cores B may be adjusted in the direction of their length to any degree desired, the adjustment thus obtained being very delicate. The ends of the cores are supported in openings in a transverse part C of the frame, and this support also serves as a stop for the armature D, which is arranged directly in front. Said armature is mounted upon a rock-shaft D', supported upon bearings E, which lie somewhat below the armature. Upon the central portion of this shaft is a rigid arm D^2, which projects horizontally at right angles to the shaft and armature, and on this arm is rigidly mounted a bar F, formed of suitable insulating or non-conducting material. The bar is of such length that the limited movement of the armature, under the attraction of the magnet, will give the free end of said bar a movement away from the base-plate somewhat greater in extent than the movement of the armature. Beneath said bar a plate A' is mounted on the base A, and between lugs *a* upon said plate is pivotally mounted a cam-bar 15, the cam edge of which bears upon a pin 16, supported in lugs 16^a on the end of the bar F. A spring 14, pressing upon a toe on the lower end of the bar, causes it to maintain a constant pressure upon the pin 16, and the inclined cam edge of the bar 15 allows the arm F to rise under the attraction of the magnet upon the armature D and enables the cam-bar to restore the said armature to place the instant the attraction ceases or is reduced to the normal point.

Upon laterally-projecting bearings 17 on opposite posts 6 is mounted a frame composed of side bars 12, connected by transverse bars 12^a. On the ends of the lateral bars 12 are mounted the main contact-pieces V', which enter between the two series of brushes V upon the base A, the construction being the well-known form of knife-switch. Between the ends of the lateral bars 12, preferably nearer the free ends than the pivoted ends,

are mounted arms 2, having circular boxes 2^a upon their pivoted ends. In these boxes are coiled springs, which tend to draw the arms 2 toward the pivoted ends of the bars, this movement being arrested by stop-pins 4 before the arms reach a position at right angles to the bars 12. On the ends of the arms 2 are journaled carbon rolls 3, which rest, when the frame is brought into parallelism with the base A, or substantially so, upon carbon blocks R, which rest in metal seats Q upon the base. These blocks are of such length that when the frame 12 rises the rolls 3 will travel upon their surfaces during part of the movement of said frame after the main contacts V and V′ have entirely separated. The rolls then pass upon carbon blocks R′, which are in the same supports, but separated from the blocks R by plates T, of insulating material. Upon the forward cross-bar 12^a is a handle 5, having a screw-threaded shank 5^a, tapped through and projecting below the bar, to enter a hollow post 18 on the base A, in which is a coiled spring 19. The push of this spring gives the frame a sudden and quick movement when released. Upon the other cross-bar 12^a is a small knob N, which engages with a forked spring-clamp N′, rising from between the cores of the magnets. The circuit-wire is connected to one of two posts B′, arranged in the central line of the base A between the cores B, and from one of said posts wires B^2 extend to and are coiled on the cores B, their second terminals being then carried to the second post B′. The first post is connected electrically by a conductor R^2 to one of the metallic seats containing one of the carbon blocks R and also forming the support for one of the double series of brushes V.

A screw M, tapped through the arm F and resting on the plate A′, provides an adjustable stop for the arm F.

The releasing devices are as follows: Upon the base A, at one end of the plate A′, is a rising lug A^2, and upon this lug is pivoted a latch-bar H, the lower end of which extends below the pivotal point and has a slight curvature in a direction toward the armature. On said lower end of the latch-bar is a pivotal bearing for the end of a bar G, which is provided at its upper end with a hook so placed that it can engage with a lug J on a cross-bar of the swinging frame. Upon the arm F are two rigid pins P and P′, between which the bar G may have a limited play. The pin P is placed at such a height that when the hook on the bar G is engaged with the lug J and the arm F is at its lowest point the end of the bar H will be caught by said pin, as shown in Fig. 3. A spring S bears on the lower end of the bar H below its pivotal support and normally tends to throw the upper portion of said bar toward the pin P′.

When the parts are arranged as seen in Fig. 3, there is a direct upward pull of the swinging frame, due to the pressure of the spring 15 and the springs acting upon the arms carrying the contact-rolls. This pull is transmitted through the lug J and hook-bar G to the pivotal bearing of the latter, which is below the pivotal support of the bar H and removed to one side thereof toward the armature. The force exerted is sufficient to overcome the tension of the spring S and to draw the end of the bar H against the pin P, as shown in the figure mentioned. As long as the attraction on the armature D is not sufficient to move it the engagement of the parts is preserved, but when an abnormal current passes the increased energy of the magnets draws the armature toward them and raises the drum F far enough to allow the end of the bar H to pass the pin P. The pull of the lug J now carries the hook-bar G upward and turns the bar H upon its pivot against the pressure of the spring S, thereby turning the lower ends of said bar and hook-bar G toward the magnets. By this movement the bar G is pressed against the pin P′, which acts as a fulcrum. By this movement the hook on said bar G is carried upward and off the lug J, thereby releasing the swinging frame, as shown in dotted lines in Fig. 3. Should the bar H be thrown into an inclined position, as shown in dotted lines, where the thrust of the spring S is exerted in a line passing through the pivot and the longitudinal line of the bar, or nearly so, it may cause the spring S to merely bind the bar in its inclined position. Should this be the case, it is returned to its normal place by pushing it toward an upright position, when the spring S resumes its active function and sweeps its end, which is beveled to an incline, past the pin P. Should the spring be too weak to effect this, a light pressure of the finger will be all that is necessary. Usually, however, the bar H will not be thrown back so far as this, but will be automatically reëngaged with the pin P by the spring S.

By the adjustment of the cores of the magnet the armature can be allowed to approach very closely to the magnets or can be held at any required distance therefrom. In case it is desired to have the armature act and cut off the current at a low amperage the cores are adjusted to bring them nearer to the armature. When desired to have the current cut off at a greater amperage, then the adjustment removes the cores farther from the armature.

The operation of my invention is as follows: If an abnormal current passes through the coils of the magnet, the cores B are energized so as to act upon the armature, thereby raising the arm F. As the projection F is raised the free end of the latch H is released from the pin P, when the energy of the springs, lifting the swinging frame, raises the hook G in the manner already explained, releasing the same and allowing the frame to swing, thereby breaking the current. When the swinging frame 12 has been released, its free end, carrying the rollers and the main contacts, moves

away from the stationary contacts, first separating the main contact-plates from the stationary series of brushes, whereupon the current will pass through the contact-rollers 3 and the carbon contacts R. The springs in the arms which bear these rollers will serve not only to hold the rollers in contact with their corresponding carbon surfaces, but will assist in raising the swinging frame. The rollers as the frame moves will pass along the surfaces of the carbons R until they reach and pass over the insulation between R and R', when the current will be entirely broken. By this construction the current is thrown first from the main contact-plates to the supplemental contacts, and here, by reason of the rollers passing along the carbons R, the resistance is greatly increased until the rollers finally cross the insulations T. The increased resistance is caused not only by the greater distance which the current is compelled to pass through the carbons as the rollers travel from normal position, but also by the lessening pressure-contact between the rollers and the stationary carbons. The spring 19 assists very materially in giving the initial impulse to the swinging frame.

I claim—

1. An automatic electric cut-out, consisting of an electromagnet an armature responding to the action of an abnormal current, main contact-plates, a stationary high-resistance supplemental contact-plate, and a roller of like material as the stationary supplemental contact-plate resting, when in normal position, upon the stationary supplemental contact-plate and adapted to roll along the said supplemental plate thereby increasing the resistance gradually until the roller is separated from the supplemental plate which is after the separation of the main contact-plates, substantially as described.

2. The combination in an automatic electric cut-out of an electromagnet in the circuit, an armature therefor adapted to be actuated by an abnormal current, main contact-plates adapted to be separated by the action of the armature, and a pair of supplemental carbon contact-bodies to receive and retard the current after the separation of the main contact-plates, said carbon contacts consisting of a stationary plate or block of carbon and a carbon roller adapted to be pressed against the surface of a carbon plate and to be drawn over the plate to gradually increase the length of the resistance medium before separation, substantially as described.

3. The combination in an electric cut-out of main contact-plates, a movable support carrying one of said contact-plates, a pair of high-resistance supplemental contact-bodies, one of said supplemental contacts consisting of a roller carried by said movable part and pressed upon the stationary supplemental contact and adapted to roll along the surface thereof, thereby gradually increasing the resistance until the roller passes from its corresponding high-resistance surface, substantially as described.

4. In an automatic cut-out, the combination of an electromagnet in the main circuit, an armature adapted to respond to any predetermined abnormal current, main contact-plates in the circuit adapted to be separated when released by the action of the armature, and supplemental carbon contact-bodies adapted to be separated subsequently to the main contact-plates, one of said carbon contact-bodies being stationary and the other consisting of a carbon roller supported on a moving arm and pressed against the face of the stationary carbon contact-body and carried by the movable arm so as to roll along the carbon contact-surface until it passes from contact therewith, substantially as described.

5. The combination of an electromagnet in the main circuit, an armature adapted to be actuated by the presence of an abnormal current, a swinging frame, a spring adapted to operate the frame when released by the action of the armature, a pair of main contact-plates, one of them carried by said frame, a pair of carbon contacts, one of them stationary and one of them consisting of a carbon roller carried by the swinging frame, an arm on the frame to support the carbon roller, and a spring adapted to press the roller in contact with the surface of the stationary carbon contact-body and to lessen the pressure as the frame is raised and the roller moved from its carbon contact-body, substantially as described.

6. In a circuit-interrupting device, the combination of an electromagnet in the circuit, an armature therefor adapted to be operated by the presence of an abnormal current, main contact-plates adapted to be separated by the action of said magnet, and a pair of high-resistance supplementary contacts, one of said supplementary contacts consisting of a roller adapted to roll from the other high-resistance contact, substantially as described.

7. The combination of an electromagnet in the main circuit, an armature adapted to respond to an abnormal current, a spring-actuated frame pivoted at one end, contact-plates on the base-plate, contact-plates mounted on the free end of said frame, a hook to hold the frame, and a latch released by the action of the armature said hook being carried by the latch, substantially as described.

8. The combination of an electromagnet in the main circuit, an armature adapted to respond to an abnormal current, main contact-plates, a swinging frame carrying the main contact-plates, supplemental high-resistance contact-bodies, one of said supplemental contacts carried by the swinging frame, and consisting of a roller supported on an arm attached to the swinging frame, a spring acting on said arm to press the roller-contact upon its corresponding contact and to assist in moving the swinging frame, and a spring adapted

to give the initial impulse to the swinging frame when released by the action of the armature, substantially as described.

9. In an electric cut-out the combination of a magnet, an armature to be moved by an abnormal current, an arm or projection from the armature, a swinging frame carrying contact-plates in position to close the circuit when the frame is closed, a latch pivoted to a support on the base-plate and having a free end adapted to engage with a stop on the armature projection, a catch pivoted to said latch below the point where the latch is pivoted to its support and at one side thereof, the free end of said catch adapted to engage with said swinging frame and to be released therefrom when the movement of the armature releases the free end of the latch, substantially as described.

10. In an electric cut-out the combination of a magnet, an armature adapted to be moved by an abnormal current, an arm or projection from the armature, a swinging frame carrying contact-plates in position to close the circuit when the frame is closed, a latch pivoted to a support on the base-plate and having a free end adapted to engage with a stop on the armature projection, a catch pivoted to said latch below the point where the latch is pivoted to its support and at one side thereof, the free end of said catch adapted to engage with said swinging frame and to be released therefrom when the movement of the armature releases the free end of the latch, and a spring to throw out the frame, substantially as described.

11. In an electric cut-out the combination of a magnet, an armature adapted to be moved by an abnormal current, an arm or projection from the armature, a swinging frame carrying contact-plates in position to close the circuit when the frame is closed, a latch pivoted to a support on the base-plate and having a free end adapted to engage with a stop on the armature projection, a catch pivoted to the latch below and at one side of its pivotal point, the free end of said catch adapted to engage with said swinging frame and to be released therefrom when the movement of the armature releases the free end of the latch, and a spring adapted to throw out the frame, said spring being located at or near the free end of the swinging frame, substantially as described.

12. In an electric cut-out the combination of a magnet, an armature adapted to be moved by an abnormal current, an arm or projection from the armature, having pins projecting from its side, a swinging frame carrying contact-plates in position to close the circuit when the frame is closed, a latch pivoted to a support on the base-plate and normally engaged by one of the pins on the arm a hook pivoted to the latch below its point of pivotal support and at one side thereof, the free end of said catch adapted to engage with said swinging frame and to be released therefrom when the movement of the armature releases the free end of the latch, a spring to throw out the frame, and a spring to return the armature to normal position as soon as the swinging frame has been released, substantially as described.

13. In an automatic cut-out, the combination with stationary and movable main contact-plates, of a movable frame carrying the movable plates, a plurality of stationary high-resistance contact-bodies separated from each other by insulating material, a movable high-resistance contact-body carried by said frame and normally resting upon one of the stationary contact-bodies, and means for holding said movable contact-body upon the stationary contact on which it rests and upon the adjacent stationary contact-body until the main contact-plates have completely separated, substantially as described.

14. In an automatic electric cut-out, the combination with stationary and movable main contact-plates, of a movable frame carrying the movable contact-plates, a plurality of fixed carbon contact-bodies separated from each other by insulating material and having their contact-faces in the same plane, a movable carbon contact carried by the movable frame and normally resting, when the main contacts are together, upon one of the carbon contact-bodies, and independent means for holding said movable contact upon the fixed carbon contact and for moving it on said carbon contact over the insulation and upon the adjacent carbon contact, during the movement of the frame which separates the main contact-plates, substantially as described.

15. In an electric cut-out, the combination with an armature of an electromagnet, a swinging latch pivoted to the base, a swinging catch pivoted to said latch below the pivotal point of the latch and out of the vertical line of said point and a suitable stop for arresting the movement of the latch until the same is detached by the movement of the said armature, substantially as described.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

CHAS. C. KRITZER. [L. S.]

Witnesses:
CHAS. K. CARTER,
GRACE E. MCKEE.