

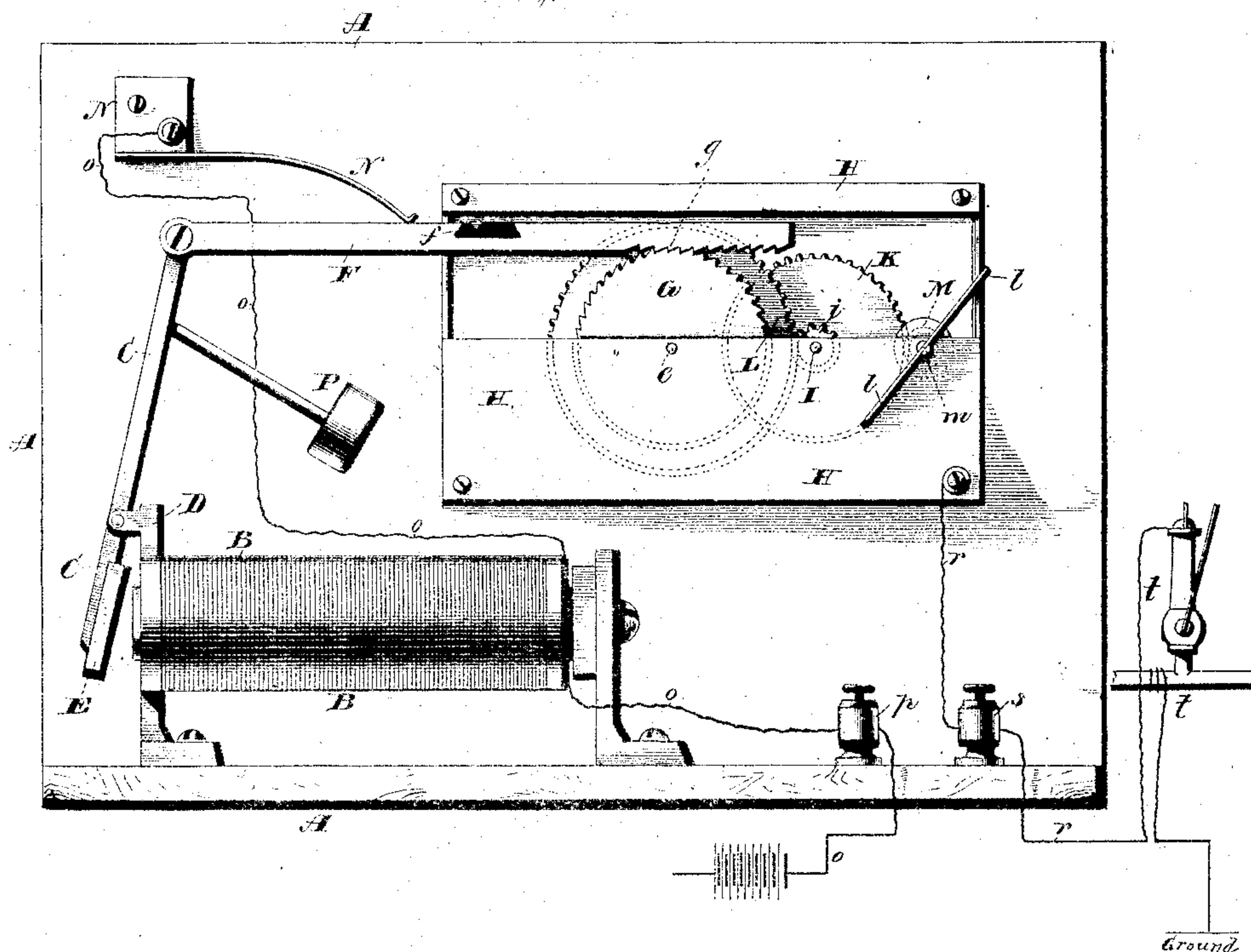
(No Model.)

M. C. HAPOLDT.  
AUTOMATIC CIRCUIT BREAKER.

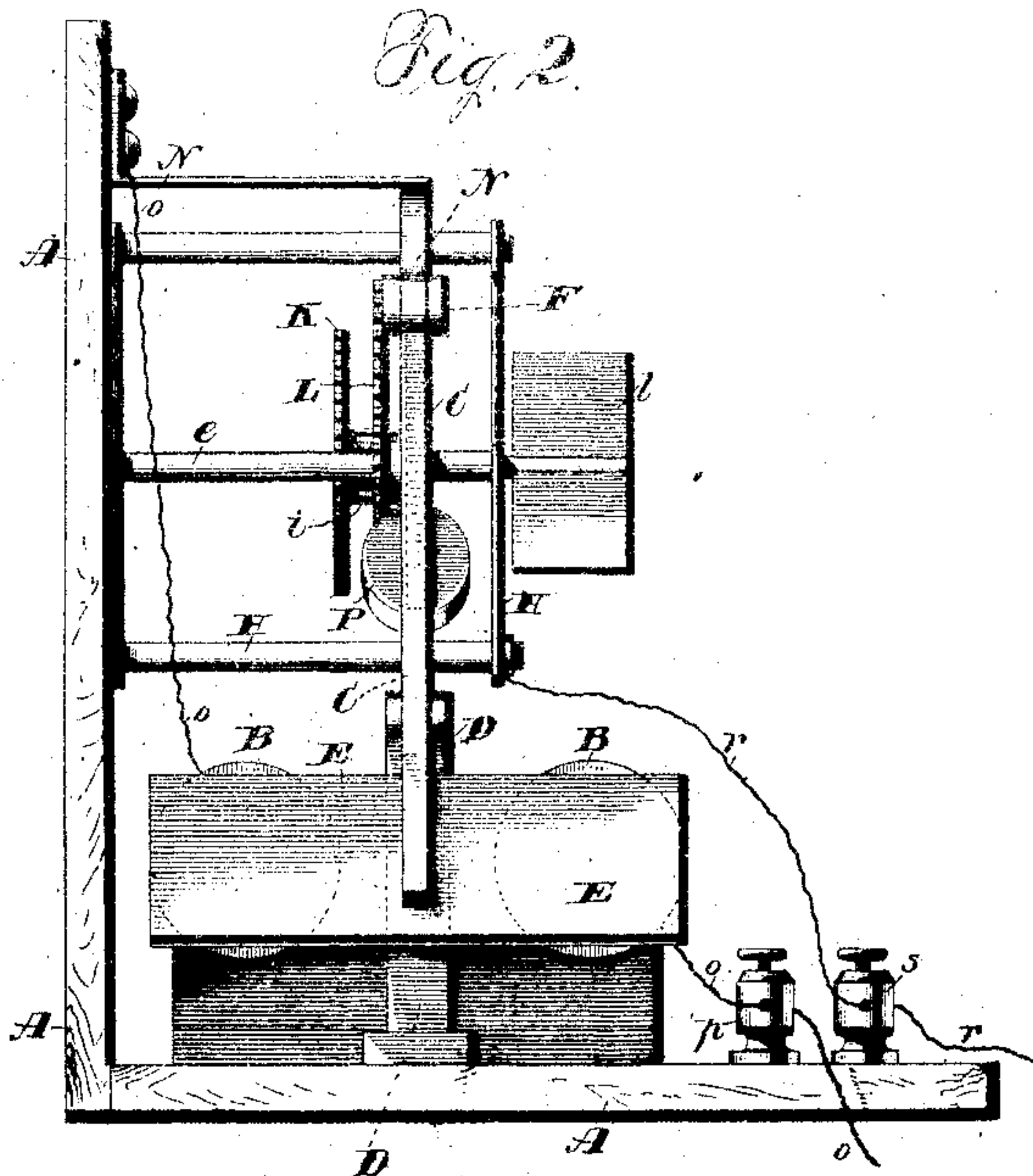
No. 422,524.

Patented Mar. 4, 1890.

*Fig. 1.*



*Fig. 2.*



Witnesses  
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# UNITED STATES PATENT OFFICE.

MARION C. HAPPOLDT, OF PROVIDENCE, RHODE ISLAND.

## AUTOMATIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 422,524, dated March 4, 1890.

Application filed June 26, 1889. Serial No. 315,580. (No model.)

*To all whom it may concern:*

Be it known that I, MARION C. HAPPOLDT, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Circuit-Breakers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters of reference marked thereon.

Figure 1 of the drawings represents a view in front elevation of my apparatus, and Fig. 2 an end elevation of the same.

The present invention has relation to that class of devices in which the electrical current is designed to be used only at intervals, and but briefly—as, for instance, in the case of electrical gas-lighting devices. As is well known, one of the principal disadvantages attending the use of this class of mechanism is the continued grounding or the short-circuiting of the current, either from defective operation of some part of the mechanism or accidental grounding between the battery and the terminal of the circuit, the consequence of such grounding or short-circuiting being the waste and rapid exhaustion of the battery employed.

To overcome this disadvantage by an automatic circuit-breaker or cut-off, which shall be simple in its construction, effective in its operation, and inexpensive in its cost, is the object of the present invention, the construction and operation of which will be hereinafter described.

To carry my invention into practice, I place at some convenient point in the circuit between the battery and the place where the electricity is to be utilized—as, for instance, in the case of electrical gas-lighting apparatus—the gas-jet upon a suitable frame-work or support A and electro-magnet B, which constitutes part of said circuit.

To the lower end of the short arm of a lever C, pivoted or fulcrumed upon an arm or bracket D, is an armature E, capable of being attracted by the cores of the magnet B when the same are sufficiently magnetized. To the other and longer arm of the lever C is a horizontally-arranged metallic bar F, hav-

ing a certain portion of its length at *f* insulated, said bar being pivotally attached, and is capable of being moved longitudinally for a certain distance by the oscillation of the lever C when the armature secured at its lower extremity is under the influence of and attracted by the electro-magnet B.

For a purpose hereinafter set forth a weight P is secured to the lever C at a point between the fulcrum *d* of the latter and the end where it is connected to contact-bar F. At its end *g*, opposite to where it is attached to the armature-carrying lever C, bar F is furnished with gear or rack teeth which engage with a gear-wheel G on a shaft *e*, having bearings in the side plates of a frame H, attached to the support A. Also having bearings in this frame H is a second shaft I, carrying a pinion *i* and gear-wheel K, said pinion meshing with a gear-wheel L on the shaft *e*, from which gear-wheel it receives motion, the gear-wheel K meshing with the pinion M on a third shaft *m*, likewise having bearings in the frame H. A fan regulator or governor *l*, secured to the shaft *m*, serves to maintain a uniform operation of this train of gears when the same are in motion.

A spring contact-plate N, conveniently located upon and secured to the support A, completes the essential elements of my apparatus, the operation of which will be found to be as follows: Suppose a circuit to be formed, as shown in Fig. 1, through a wire *o*, starting from a suitably-located battery, to a binding-post *p*, arranged on the support A, and thence through the magnet B to the contact-plate N. From this plate N the current will pass by means of the contact-bar F and the gear-supporting frame H to a wire *r*, attached to such frame and passing from it to the binding-posts *s*, thence to the points where the current is to be utilized, (one such point being conventionally shown at *t*), and ultimately grounded. Upon the circuit being closed by bringing the electrodes at *t* in contact, the current will pursue the course above described, and if the case be that of an electric gas-lighting apparatus should continue only long enough to make spark needful for the ignition of the gas, the armature C during such operation being unaffected by the magnet B; but if instead of being immediately broken the cir-



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cuit should remain closed, as by the accidentally locking together of the contacts at *t*, the continued passage of the current through the magnet B would sufficiently excite it to cause the attraction of the armature E, and through it and the lever C a longitudinal movement of the bar F, until its insulated portion *f* should come into contact with the contact-plate N, thereby effecting an automatic breaking of the circuit, and in consequence stopping undue waste of the battery. The operation of the device would of course be the same should by any means there be a short-circuiting or grounding of the current intermediate between the circuit-breaker and the point *t*. Were no means provided to prevent it, the breaking of the circuit by the attraction of the armature by the magnet would be almost instantaneous; but as this would be objectionable, chiefly because, as in the case of the lighting of gas, it is desirable to have the circuit closed long enough to insure the ignition of the gas, I employ for the purpose of retarding the movement of the armature and the consequent breaking of the circuit the train of gears operating, as hereinbefore described, in conjunction with the bar F, whose movement, effected by the armature and the lever C, to which said armature and bar F are attached, will through the rack-teeth on its under side impart motion to said train of gears, and thus hinder the breaking of the circuit for any desired period, to be determined, of course, by the relative diameters of the wheels and pinions constituting the parts of the train. In order to again close the circuit which may have been thus automatically broken, it is necessary simply to raise the spring contact-plate N out of engagement with the insulated portion *f* of the bar F, when, through the medium of the weight P, (or, if preferred, a spring or other equivalent device,) the armature will be swung away from the poles of the magnet and the other parts of the device resume their normal positions.

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As will be seen by reference to the drawings, the teeth on bar F, as well as those on the wheel with which the bar engages, are ratchet-teeth in shape, this construction offering the least resistance to a reversed movement of the bar F and rendering a quick return of the parts to their normal positions, because of the fact that the teeth will slip readily past each other without causing any movement of the train of gears.

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A circuit-breaker or cut-off thus constructed is perfectly automatic and effective in its operation, requiring no attention whatever beyond that necessary to return the parts to their normal positions after there has been an operation of the apparatus. Of course it is to be understood that modification of the apparatus can be made without departure

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from the scope of my invention, the essential idea of which is the retardation of the breaking of the circuit by mechanism positively operated by the electro-magnet.

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Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

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1. In an automatic circuit-breaking mechanism, the combination of a suitably-arranged electro-magnet, a pivoted vertically-arranged armature-carrying lever, a horizontally-arranged contact-bar connected to said lever and adapted to break the circuit by a longitudinal movement, and a retarding device, substantially as described, connected with said bar, so as to be operated thereby, substantially as specified.

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2. In an automatic circuit-breaking mechanism, the combination of an electro-magnet, an armature, a pivoted vertically-arranged lever carrying said armature, a horizontally-arranged contact-bar connected to said lever, a contact-plate bearing upon the upper side of said bar, whereby the circuit is normally kept closed, but which, through an attraction of the armature by the magnet, operates with said bar to automatically break it, and a weight attached to the armature-carrying lever, whereby when the circuit has been thus broken it may be closed and the armature and contact-bar simultaneously restored to normal position, substantially as shown.

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3. In an automatic circuit-breaking mechanism, the combination of an electro-magnet, an armature, a pivoted vertically-arranged armature-carrying lever, a longitudinally-movable horizontally-arranged contact-bar connected at one end to said lever and provided at its other end on its lower face with ratchet-teeth, and a train of gears receiving movement from the latter when moved in one direction, substantially as set forth.

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4. In an automatic circuit-breaking mechanism, the combination of an electro-magnet, an armature, a pivoted vertically-arranged armature-carrying lever, a horizontally-arranged contact-bar insulated for a portion of its length, a spring contact-plate resting upon the upper side of said bar, and a weight attached to the pivoted armature-carrying lever, whereby when the circuit has been broken by the coming in contact of the spring-plate and the insulated portion of the contact-bar it may be automatically closed after the disengagement of said spring-plate from said bar, substantially as shown.

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In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

MARION C. HAPPOLDT.

Witnesses:

E. C. PERKINS,  
 GILMAN E. JOPP.