No. 682,217. Patented Sept. 10, 1901.

F. A. MERRICK.

CIRCUIT BREAKER.

(Application filed Jan. 18, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 3.

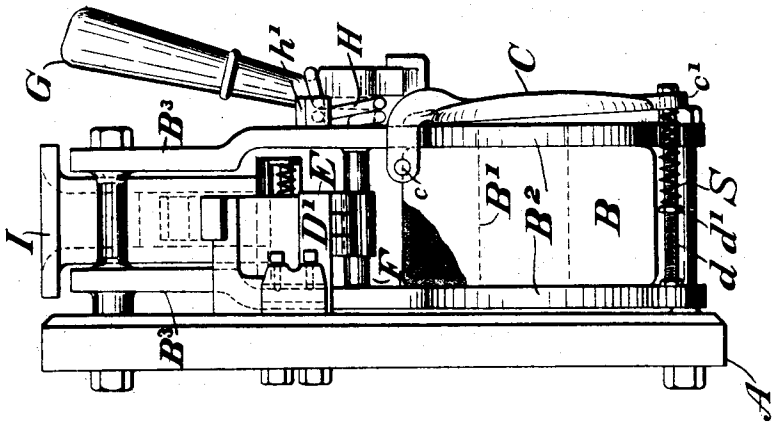


Fig. 2.

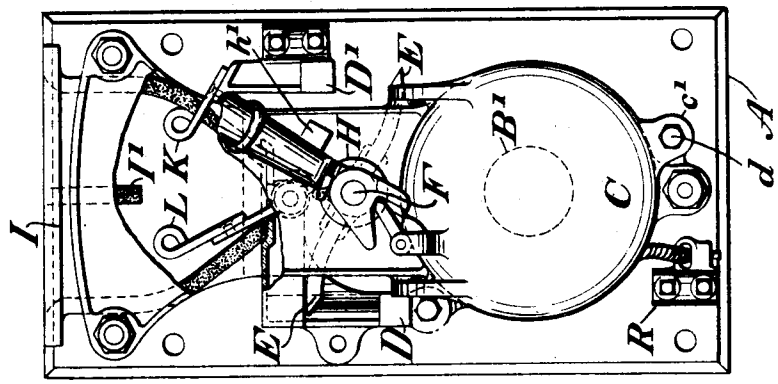
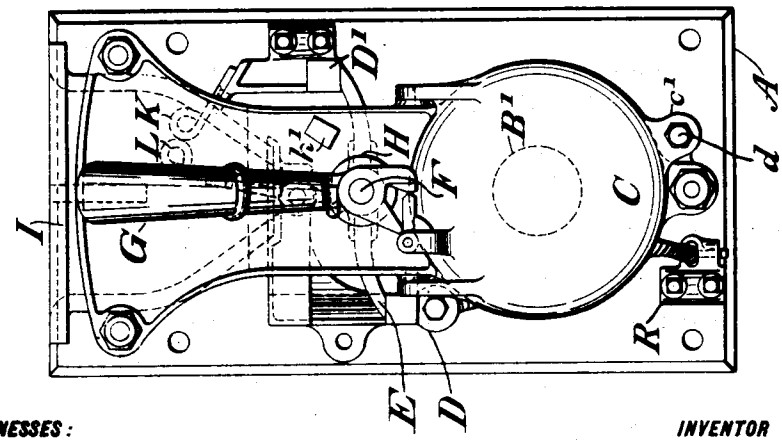


Fig. 1.



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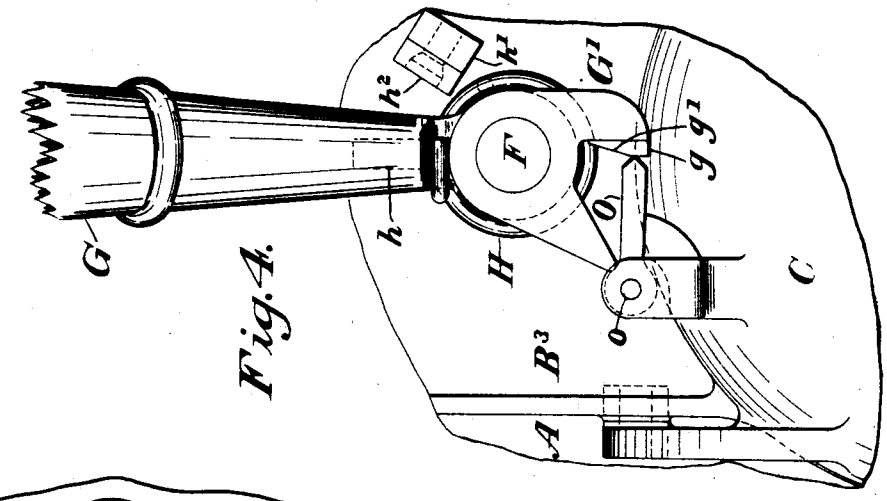

Fig. 4.

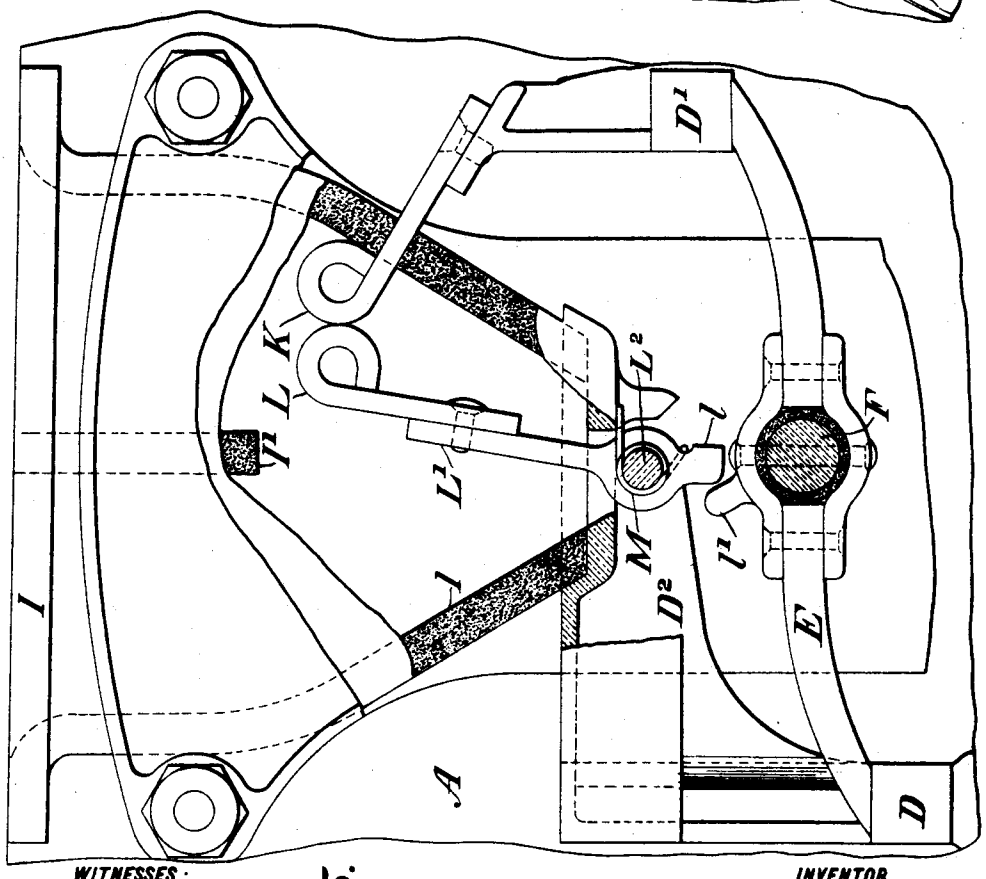

Fig. 5.

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UNITED STATES PATENT OFFICE.

FRANK A. MERRICK, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR TO THE LORAIN STEEL COMPANY, OF PENNSYLVANIA.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 682,217, dated September 10, 1901.

Application filed January 18, 1900. Serial No. 1,883. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. MERRICK, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Breakers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention has relation to certain new and useful improvements in circuit-breakers, and is designed to provide an instrument of simple and effective character by means of which an electric circuit may be automatically opened whenever from any cause the current therein exceeds in volume a predetermined point; and the invention consists in the novel construction, combination, and arrangement of parts, all as hereinafter described, and pointed out in the claims, reference being had to the accompanying drawings.

In the drawings, Figure 1 is a front elevation of a circuit-breaker embodying my invention, the parts being shown as in normal working positions. Fig. 2 is a similar view with a portion of the frame and also a portion of the arc-disrupting chamber broken away, the parts being shown in open-circuit position. Fig. 3 is a side elevation. Fig. 4 is a detail view of the trip and locking device, and Fig. 5 is a detail view of the means for actuating the movable secondary contact.

The letter A designates the base-piece of the instrument, consisting, preferably, of a slab of slate or other refractory material.

B is a magnet-coil formed of coarse insulated wire wound upon a core B′, placed at right angles to the base and having enlarged pole-plates B^2. These pole-plates are formed with somewhat massive parallel upward extensions B^3, which provide a magnetic frame through which is completed the magnetic circuit of the coil.

C is an armature hinged or pivoted at *c* to the front extension B^3 and which is normally held a short distance away from the outer pole-plate B^2 by means of a compression-spring S. This spring is coiled around a bolt *d*, secured at one end in a lug or projection of the rear pole-plate and at its other end loosely engaging an opening in the lug *c′* of the armature. One end of the spring bears against said lug and the other end against an adjusting-nut *d′*, threaded on said bolt.

D D′ designate the main contacts of the instrument, which consist, preferably, of solid pieces of brass secured to the base-plate A, one near each vertical edge thereof.

E is a bridge-piece which is carried by a shaft F and is designed to connect the two contacts D D′. The shaft F is journaled in the extensions B^3, and on its outer projecting end is secured a handle G.

H is a stiff spring seated around the end portion of said shaft, with one end engaging said handle and its other end secured in the extension B^3.

h is a stop-lug on the handle, and *h′* is a fixed coöperating stop on the part B^3 and provided with a cushion h^2.

I represents insulating material placed around the secondary contacts for the purpose of protecting the pole extensions B^3 and other metallic parts from arcs formed at such contacts. I′ is a division-plate of similar material arranged to present its edge to the arc blown against it by the action of the magnetic field.

K is a fixed secondary contact secured to the main contact D′ and projecting into the chamber I through an opening in the wall thereof.

L is a coöperating contact which is carried by a rocking lug L′, journaled on a pin L^2, secured in an extension D^2 of the contact D. The lug L′ has a projection *l*, which is arranged to be engaged by a lug or projection l^2 on the shaft F.

M is a spring coiled around the pin L^2 and bearing upon the lug *l* to normally hold the contact L against the contact K, as shown in Figs. 1 and 5.

To close the circuit, the handle G is thrown over to the position shown in Fig. 1, thereby putting the spring H in compression, and is locked in such position by means of a finger O, pivoted at *o* in a lug on the armature-plate C and having a beveled end portion which bears against the inner face *g* of one arm of a forked extension G′ of the hub portion of the handle G. The face *g* is inclined at *g′*

adjacent to the point where said finger O has its bearing, and in bringing the handle over to the position shown the opposite arm of the extension G′ engages said finger and forces it to locking position—that is to say, as the handle G is moved from the position shown in Fig. 2 to the position shown in Fig. 1 the left-hand arm of the extension G′ will come into contact with the upper surface of the finger O and force said finger downwardly into unstable engagement with the beveled inner face of the right-hand arm of said extension. One terminal of the circuit in which the instrument is included is connected to the terminal block R and the other terminal to the contact D′. The main path of the current is from terminal block R to and through the coil B, thence to contact D, through bridge-piece E to contact D′, thence to the other terminal. When the current in the circuit exceeds the predetermined point, (which may be regulated by adjusting the spring S,) the armature C is attracted toward the pole-plate B^2, thereby moving the finger O sufficiently to throw its end onto the inclined surface *g* and release the handle, which under the action of the spring H is thrown over against the stop *h*′. The initial movement of the handle causes the bridge-piece E to leave the contacts D D′, thus breaking the main circuit above described and throwing the current into the secondary path from the contact D and its extension into the lug L′ to contacts L and K to the terminal on the contact D′. This secondary circuit, however, exists only momentarily after the breaking of the main circuit, as the continued movement of the handle G and shaft F causes the lug *f* to engage the arm *l* of the lug L′, and thereby separate the contacts K and L. The arc formed by the separation of these contacts is quickly extinguished by the action of the strong magnetic field in the chamber I and with comparatively little damage to the contacts. They are, however, preferably made removable, so that they can be renewed when necessary. While the top of the chamber I is open, its lower end is substantially closed, the opening around the lug L′ being made as small as possible. This is for the purpose of cutting off the air-blast through the chamber, which tends to carry the arc above the top of said chamber. By closing the bottom of the chamber I am able to confine the arc to a large extent within its limits and to take care of the same by the action of the magnetic field and the arc-splitting division-plate I′. The circuit may be broken arbitrarily at any time by a light blow on the armature, no manual devices being required for this operation.

I do not wish to limit myself to the use of a single magnet for producing the magnetic field in the chamber I and also to break the circuit, as it is obvious that a second coil of fine wire included in the secondary circuit and wound on the same core with the coil B might be provided for the purpose of producing the magnetic field; nor do I wish to limit myself in other respects to the details of construction and arrangement which I have herein shown and described, as these may be changed without departing from the spirit and scope of my invention as pointed out in the appended claims.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a circuit-breaker of the character described, the combination with a suitable base, and a magnet-core supported at right angles thereto, and having pole-pieces formed with massive, parallel elongated extensions, of a series-connected coil wound on said core between the said extensions, main and secondary contacts, the latter being situated directly between said extensions, a locking device for normally maintaining the engagement of the respective contacts, means operated by said coil for releasing said locking device and means for effecting the separation of said contacts when released.

2. In an automatic circuit-breaker, the combination with an electromagnet having its energizing-coil in series, and provided with elongated polar extensions, a pair of fixed main contacts, a bridging-piece for connecting the same, a rotary shaft carrying the bridging-piece, a fixed secondary contact situated between said polar extensions, a coöperating movable secondary contact, and means on said rotary shaft for engaging said movable contact, substantially as described.

3. In an automatic circuit-breaker, the combination of a pair of fixed main contacts, a rotary shaft, a bridging-piece for said contacts carried by the said shaft, a spring for actuating said shaft in one direction, a fixed secondary contact, a movable secondary contact, a spring for maintaining the engagement of the secondary contacts, means on said shaft for effecting a separation of the secondary contacts, a locking device for said shaft, and an electromagnet for tripping said locking device, said magnet having massive elongated parallel pole-pieces between which the said secondary contacts are situated, substantially as described.

4. In an automatic circuit-breaker, the combination with two fixed main contacts and a single fixed secondary contact, of a rotary shaft, a bridging-piece carried by said shaft for connecting the main contacts, a spring for actuating said shaft to separate the bridge-piece from said contacts, an electromagnet for releasing said locking device, a pivoted secondary contact, and means on said shaft arranged to engage and move said pivoted secondary contact after a certain initial movement of said shaft, said magnet having extended pole-pieces between which the secondary contacts are situated, substantially as described.

5. In an automatic circuit-breaker, a ro-

tary contact-carrier having a forked lug or projection, a spring for actuating said device in one direction, an electromagnet having a hinged armature, and a finger pivoted to the said armature and arranged to make an unstable engagement with one of the forks of said lug or projection, substantially as described.

6. In an automatic circuit-breaker, a rotary contact-carrier, having a forked lug or projection, an electromagnet having a hinged armature, and a finger pivoted to said armature and adapted to be engaged by one arm of said lug or projection and thereby moved into engagement with the other arm thereof, said other arm having an inclined surface adjacent to the point of such engagement, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRANK A. MERRICK.

Witnesses:
M. E. SHARPE,
H. W. SMITH.