

No. 693,416.

Patented Feb. 18, 1902.

F. A. MERRICK & J. D. FORRER.

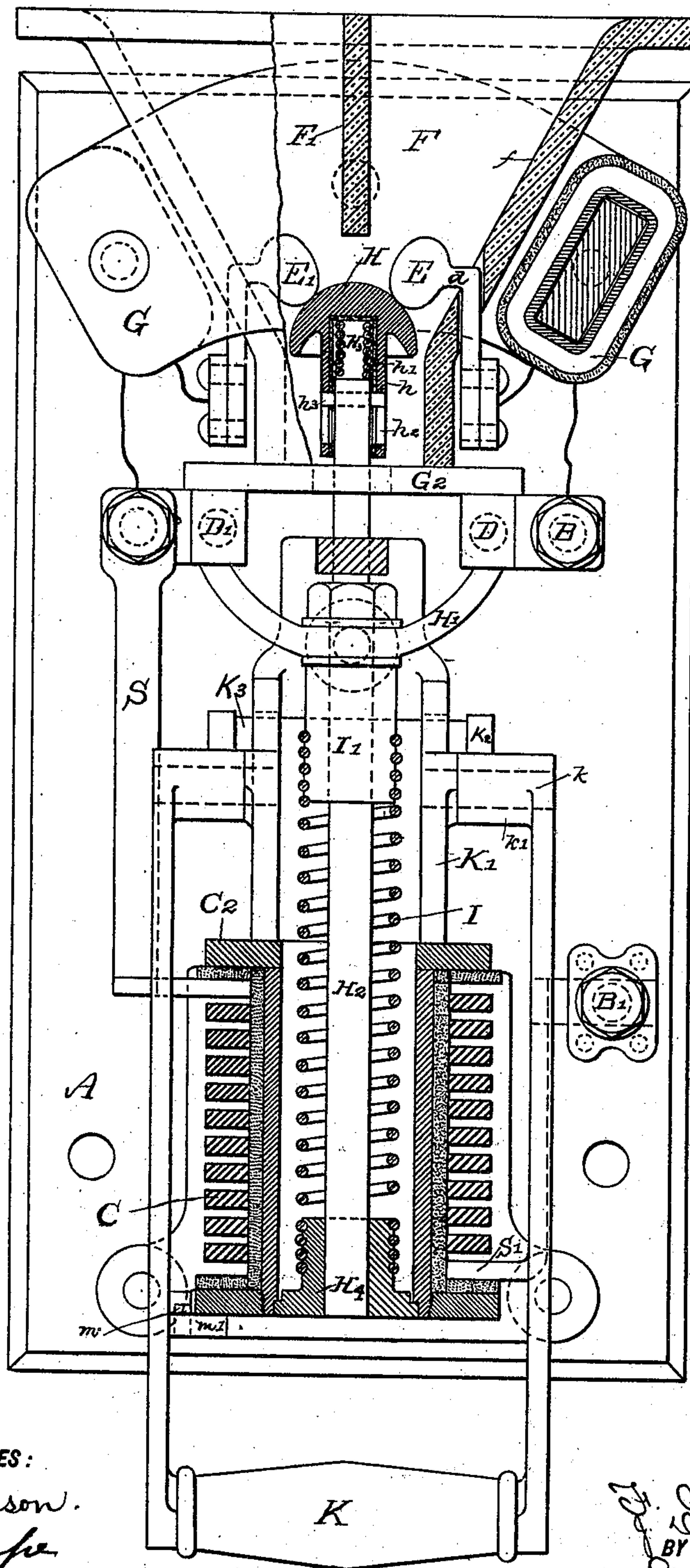
CIRCUIT BREAKER.

(Application filed Nov. 9, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



WITNESSES:  
J. E. Clarkson.  
W. E. Sharpe

INVENTORS  
F. A. Merrick  
J. D. Forrer  
BY  
Geo. H. Parmelee  
their ATTORNEY.

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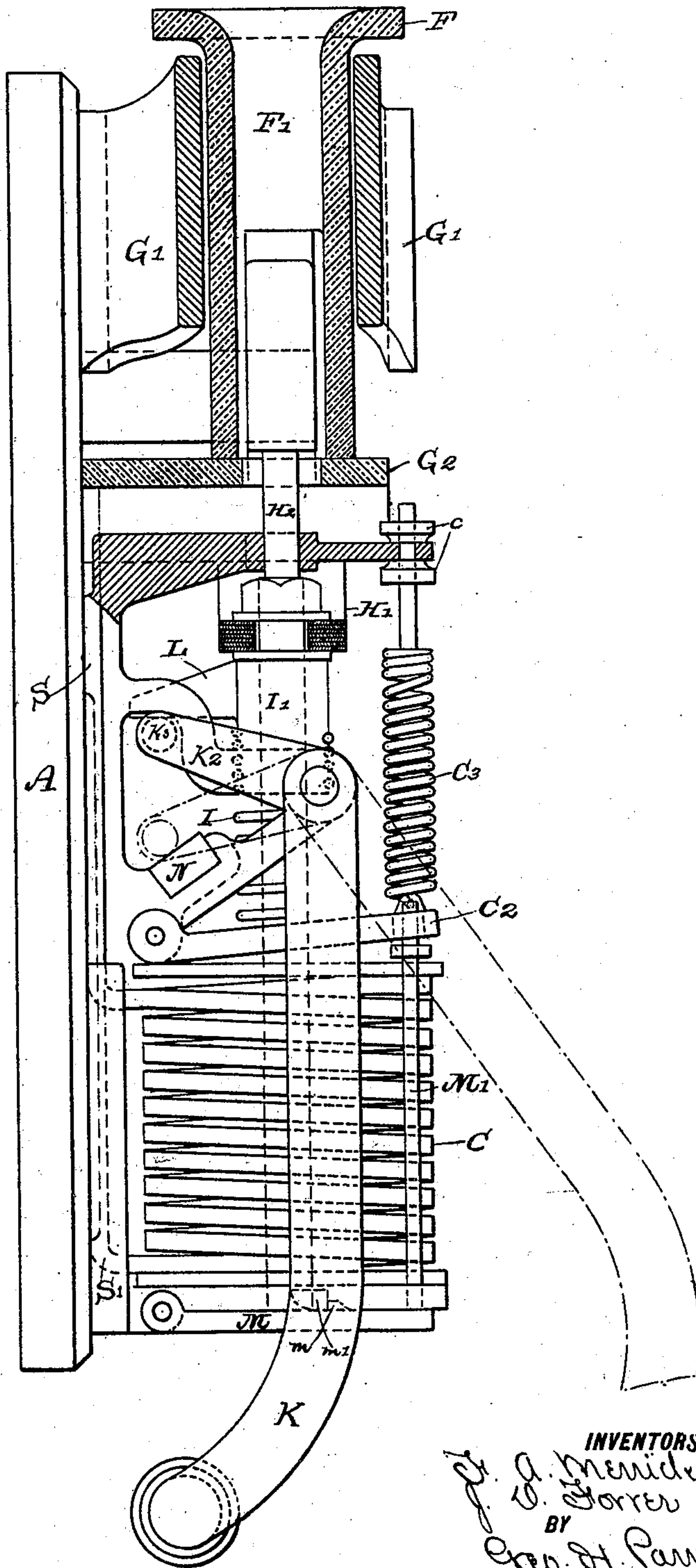
CIRCUIT BREAKER.

(Application filed Nov. 9, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



WITNESSES:  
S. E. Clarkson.  
M. E. Sharpe.

INVENTORS  
F. A. Merrick  
J. D. Forrer  
BY  
Geo. H. Parmelee  
their ATTORNEY.



# UNITED STATES PATENT OFFICE.

FRANK A. MERRICK AND JOSEPH D. FORRER, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNORS TO THE LORAIN STEEL COMPANY, A CORPORATION OF PENNSYLVANIA.

## CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 693,416, dated February 18, 1902.

Application filed November 9, 1899. Serial No. 736,353. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK A. MERRICK and JOSEPH D. FORRER, 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.

Our invention relates to certain new and useful improvements in electromagnetic circuit-breakers, and is designed to provide an improved device of this character by means of which the circuit is broken automatically when a predetermined condition arises or arbitrarily at any time by manual operation.

With these objects in view our invention consists in the provision of means of improved character for extinguishing arcs at the auxiliary contacts, in improved means for making and breaking circuit at the auxiliary contacts, and also in certain other novel features of construction and arrangement, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a view, partly in front elevation and partly in vertical section, of our improved circuit-breaker; and Fig. 2 is a view of the same, partly in side elevation and partly in vertical section.

In the drawings, the letter A designates a backing or support formed of some suitable insulating material, such as slate.

B B' are the terminals for connection of the instrument in circuit.

C is a magnet-coil connected in the main circuit between said terminals.

C<sup>2</sup> is an armature for said coil held against the normal action of the magnet-coil by a spring C<sup>3</sup>, having means, such as indicated at c, for adjusting its tension.

D D' are the main fixed contacts of the circuit-breaker, and E E' the auxiliary contacts. These auxiliary contacts, which are suitably secured to the support or backing A, are bent at d and project within an arc-extinguishing chamber F, which is formed of fire-clay or some other refractory material. This chamber is open at the top and has flaring side

walls f, and also a partition or division-wall F' at its upper portion, said wall extending down within the chamber to a point which is preferably somewhat below the plane of the upper surfaces of the contacts E E'.

G G are two electromagnets, which are designed to produce a strong magnetic field within the said chamber around the said contacts. These magnets are fixed between two iron plates or castings G', which embrace the chamber F and are spread at their end portions to receive the magnets.

G<sup>2</sup> is a slab of slate or other suitable insulating material, which extends across the bottom of the chamber.

H is a movable bridging-piece for the contacts E E', and H' is a bridging-piece for the main contacts D D'. Both of these bridging-pieces are carried by a single vertically-movable rod or plunger H<sup>2</sup>, which extends down within the hollow core of the magnet-coil C, its lower end being loosely received in a guide H<sup>4</sup>, which is secured within said coil. I is a strong helical spring coiled about the said rod or plunger, its lower end being secured to the guide H<sup>4</sup> and its upper end to a collar or enlarged portion I' of the rod.

The bridging-piece H' is preferably composed of a number of separate leaves or laminae in the usual manner, as shown in Fig. 2. The bridging-piece H has a convex contact-surface and is formed with a depending tubular portion h, having an insulating-lining h' and fitting loosely over the upper end of the rod or plunger H<sup>2</sup>, a spring H<sup>3</sup> being interposed between the upper end of the rod or plunger and the upper wall of the said portion h. The latter is formed with elongated vertical slots h<sup>2</sup>, which are engaged by pins or studs h<sup>3</sup> on said rod or plunger.

K designates a bail-shaped hand and resetting-lever, whose arms are pivoted at their upper portions to pins or studs k of a frame-piece K'. The bearing portions k' of the said arms are each formed with a rearward arm or projection K<sup>2</sup>, and the two arms or projections are connected by a cross-piece K<sup>3</sup>, which engages the under side of a lug L, which projects from the rear side of the portion I' of the rod H<sup>2</sup>.



M is an arm pivoted below the magnet-coil C and having its free end portion connected to the armature C<sup>2</sup> by a rod M'. Said arm M is formed with a lug m, which is designed to engage with a lug m' (best shown in dotted lines in Fig. 2) on the inner face of one of the arms of the lever K, thereby locking said lever and the other movable parts in the position shown in full lines in Fig. 2.

N is a cushion to receive the impact of the cross-piece k<sup>2</sup> when the circuit-breaker is operated to break the circuit, as hereinafter described.

The circuit connections when the circuit-breaker is closed are as follows: The current enters at the terminal B, passes to main contact D, through bridge H' to contact D', through conductor-bar S to and through the magnet-coil C, and thence to terminal B'. The secondary or shunt circuit through the auxiliary contacts is from terminal B to one of the magnet-coils G, thence to contact E, bridging-piece H, contact E', the other magnet-coil G, thence to conductor S, and magnet-coil C to terminal B'. Under normal conditions the parts are in the positions shown in full lines in Figs. 1 and 2, the cross-piece K<sup>2</sup> holding the rod or plunger H<sup>2</sup> against the action of the spring I and the spring C<sup>3</sup> holding the armature C<sup>2</sup> away from the magnet C. When from any cause the current flowing through the magnet-coil C increases beyond the predetermined point, (regulated by the tension given the spring C<sup>3</sup>), the armature C<sup>2</sup> is attracted against the tension of the said spring C, thereby pushing down on the rod M' and moving the arm M to disengage the lugs m and m'. The spring I is now free to act and at once lowers the rod or plunger H<sup>2</sup> and disengages the bridging-pieces H and H' from the fixed main and auxiliary contacts. Owing to the pin-and-slot connection between the bridging-piece H and the rod or plunger H<sup>2</sup> it will be seen that the said piece will remain in contact momentarily after the bridging-piece H has broken its contact. This throws the electric current into the secondary or shunt circuit, which includes the auxiliary contacts, and thereby prevents destructive arcing at the main contacts. The arc formed when the circuit is broken at the auxiliary contacts is taken care of or blown out in the well-known manner by the action of the magnets G G. We have discovered that this action of the magnets may be made much more effective by providing means of a nature to divide or split the arc, such means being so arranged that the arc is impelled or blown against it by the magnets. It is for this purpose that we provide the chamber with the division-plate F', which, as will be readily seen, being located between the contacts or electrodes in the direction in which the arc is blown, divides or splits the arc and greatly facilitates its extinguishment. It is desirable to confine the arc as much as possible within the chamber—that is to say, to

extinguish it before it reaches the top of the chamber. We therefore practically close the bottom of said chamber to cut off the blast of air which would otherwise pass through the chamber and tend to blow the arc above the top of the same. This air-blast has heretofore been relied upon to assist in the elongation and disruption of the arc; but by reason of the division plate or wall we are enabled to dispense with it, and thus largely prevent any appearance of arcs at the top of the chamber. To reestablish the circuit, the lever K is brought back manually to the position shown in Fig. 2 and the lugs M M' are engaged. This movement of the lever lifts the rod or plunger H<sup>2</sup>, putting the spring I under tension, and reengages the bridges H H' with their respective contacts. The upward movement of the rod or plunger tends to compress the spring H<sup>3</sup>, and the said spring actuates the bridge-piece G' to engage the contacts before the bridge-piece H' has been moved sufficiently to engage the contacts D D'. By depressing the armature C<sup>2</sup> manually the circuit may be arbitrarily broken at any time desired. It will be noted also that the shape and arrangement of the contacts H and E E' is such that the engagement between them is very quickly made and broken, there being no dragging or sliding of one contact-surface upon another. The shape of the contacts also protects them considerably against the destructive effects of arcs.

We do not, however, wish to limit ourselves to the particular construction and arrangement of parts which we have herein shown and described, as various changes in details may be made without departing from our invention. We would also call attention to the fact that the improved arc-extinguishing device which we have herein shown and described is applicable to various kinds of switches and other instruments which have contacts or electrodes which it is desirable to protect against the destructive effects of arcs.

Having thus described our invention, what we claim, and desire to protect by Letters Patent, is—

1. The combination of a chamber having side and bottom walls of refractory material, fixed contacts extending into said chamber through its side walls, a movable contact extending into the chamber through its bottom wall, a division-plate of non-conducting material within said chamber adjacent to the fixed contacts, and means for producing a magnetic field in the said chamber.

2. In a circuit-breaker, the combination of fixed main and auxiliary contacts and a plunger carrying main and auxiliary contact-bridging pieces, the main contact-bridging piece being fixed to said plunger, and the auxiliary contact-bridging piece movably sleeved thereon, and means whereby both the said piece and the plunger have limited independent movement.

3. In a circuit-breaker, the combination



with main and auxiliary contacts, and a plunger carrying main and auxiliary contact-bridging pieces, the latter being sleeved upon the upper end of said plunger, a spring interposed between the said piece and the plunger, and a pin-and-slot connection between said piece and the plunger.

4. In a circuit-breaker, the combination with the plunger which carries the movable contacts, of a magnet-coil in the main circuit, an armature-lever, a spring acting upon said lever in opposition to said coil, a bifurcated hand-lever embracing said coil and having an arm which engages a projection on said plunger, a spring acting upon said plunger in opposition to said lever, a pivoted catch-arm engaging the handle-arm of said lever, and a connection between said catch-arm and the armature-lever.

5. In a circuit-breaker, the combination of the reciprocating rod or plunger which carries the movable contacts, the spring for actuating the said plunger in one direction, the hand-lever for actuating the same in the opposite direction, the magnet-coil, the armature-lever at one end of said coil, the pivoted catch-arm at the opposite end of said coil arranged to engage and lock the hand-lever, and a connection between the armature-lever and said catch-arm.

In testimony whereof we have affixed our signatures in presence of two witnesses.

FRANK A. MERRICK.  
JOS. D. FORRER.

Witnesses:

MYRTLE E. SHARPE,  
H. W. SMITH.