

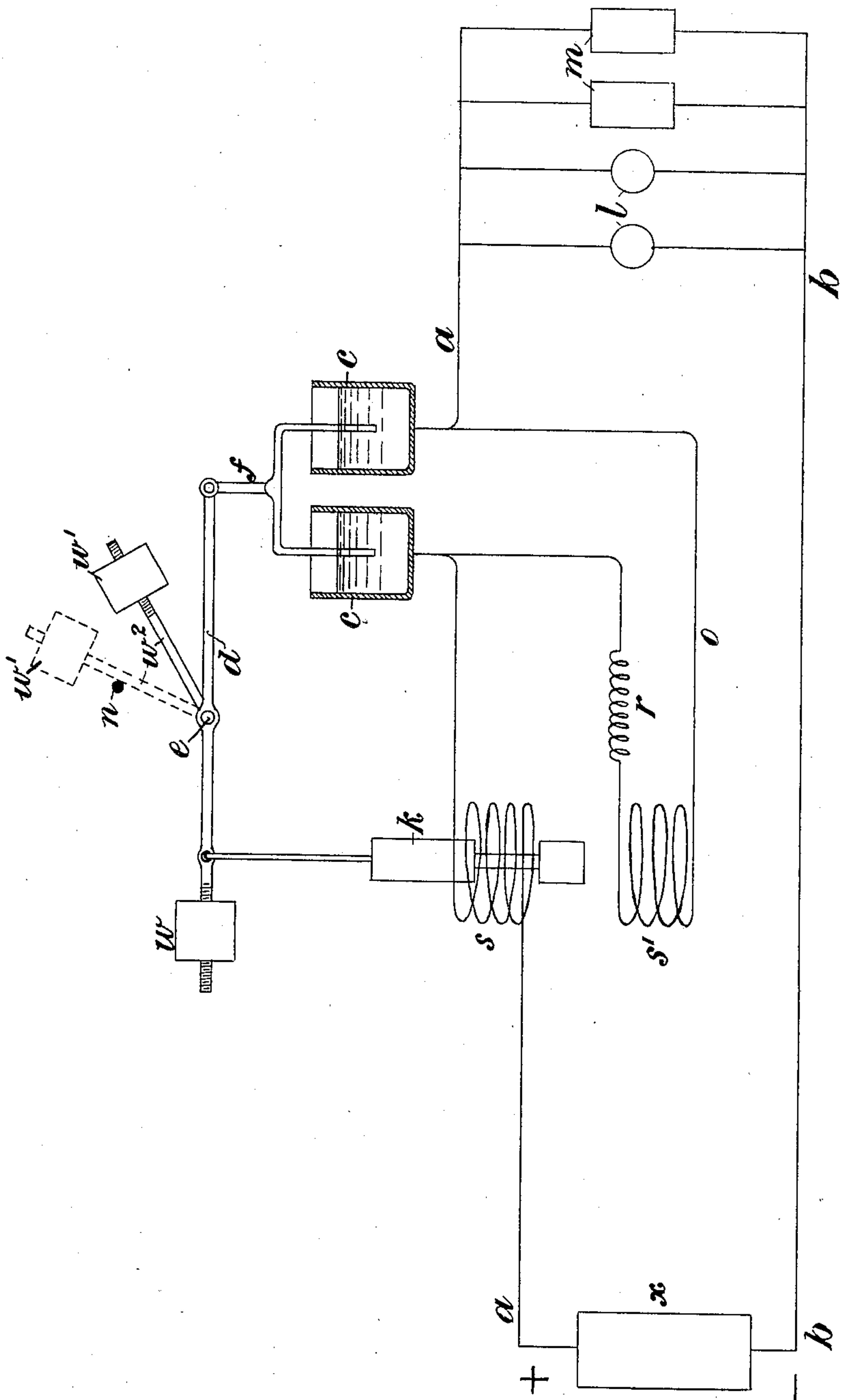
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Patented Aug. 21, 1900.

A. B. HOLMES.
CONTROLLING ELECTRICAL CURRENTS.

(Application filed Apr. 11, 1899.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

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CONTROLLING ELECTRICAL CURRENTS.

SPECIFICATION forming part of Letters Patent No. 656,324, dated August 21, 1900.

Application filed April 11, 1899. Serial No. 712,665. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR BROMLEY HOLMES, a subject of the Queen of England, and a resident of Liverpool, England, have
5 invented certain new and useful Improvements Connected with the Controlling of Electrical Circuits, of which the following is a specification.

This invention has reference to the controlling of electrical circuits such as those of electric-light and power-service systems; and it has more particularly for its object to provide a mode of controlling such circuits by which when a short circuit or overload
15 arises the abnormal current so caused shall be reduced and the circuit automatically restored to the normal condition when the cause of overload has been removed. According to this invention (in the case of a short-circuit
20 overload taking place in the circuit) the object and effect referred to are attained by causing, by a controlling mechanism operating and arranged as hereinafter described, the normal circuit to be broken and the current
25 to be passed through a secondary connection or branch of the main circuit in which a resistance is employed. In the carrying out of this mode of controlling the circuit there is employed a mechanism of an automatic kind
30 so arranged that when an excess of current takes place it causes the main circuit or line to be broken and the current to be passed through the secondary connection containing the resistance, and it keeps the main-line circuit broken until the short circuit or overload
35 is rectified.

The diagrammatic drawing hereto annexed illustrates the invention.

In the drawing the lines *a* and *b* may represent two conductors—namely, the supply and return—of a circuit supplying electrical energy to lamps *l* or a motor *m* or other mechanism or thing absorbing electrical energy.

x may represent the source of the electrical
45 supply.

The automatic electrical device for opening and closing the main-circuit conductor *a* in circumstances such as referred to consists of a solenoid *s*, forming part of the circuit and
50 through which the whole current passes, two cups *c*, containing mercury, forming the terminals at the point of opening and closing

the circuit on the line *a*, a contact-fork *f*, working in connection with the mercury-cups *c*, a core *k*, operated by the solenoid *s*, and a lever
55 *d*, fulcrumed at *e* and suspending from one arm the core *k* and from the other a fork *f*. The lever *d* will be approximately balanced by the adjustable weight *w* on one arm of the lever *d*. 60

The weight *w'* on the arm *w*² tends always to keep the forks *f* in the mercury in the cups *c* and the core *k* out of the solenoid *s*, so that there is always a moment on the side of the lever-fulcrum *e*, acting against the core *k*. 65

The secondary or branch circuit (designated *o*) connects the two parts of the circuit-line *a*, terminating in the two cups *c*. This branch circuit has a resistance *r* in it and a solenoid
70 *s'* directly under the solenoid *s*, such solenoid being so arranged in relation to the solenoid *s* and the core *k* that it acts upon the core when such core has first been moved down to come under its active influence by the main-line solenoid *s*—that is, whenever an excess-
75 ive current from causes as specified has taken place.

In action when a fault in the circuit takes place—say a short circuit—and an excess of current passes through the main conductor *a*
80 the solenoid-core *k* is drawn down by the solenoid *s* and the fork *f* is withdrawn from the mercury in the cups *c* against the weight *w'*, and consequently the direct main circuit-line *a* is opened. As the fork *f* leaves the mer-
85 cury terminals the current will pass by way of the branch circuit *o*, and the core *k* having been brought under the action of the second solenoid *s'* it will be held by this second or branch circuit solenoid and will keep the main-
90 line circuit by way of the terminal cups *c* open, and it holds the weight *w'* up in the position shown in dotted lines against a stop *n*. This condition will exist so long as an excess
95 of current is passing. Of course the resistance *r* in the branch circuit *o* prevents the line or section of a line on which the apparatus is used being damaged, and the lamps, motors, or what not used in the circuit are thus protected from injury. When the fault
100 or overload in the circuit has been removed, the circuit through the main line *a* by way of the cups *c* and fork *f* is restored by this automatic mechanism through the weight *w'*—

namely, as soon as the normal current passes through the circuit the force of the solenoids on the core k becomes less than the moment of the weight w' , and consequently the arm of the lever carrying the fork f is moved down, the fork f enters the mercury in the cups c , and the normal or main circuit by way of these cups and fork is reestablished.

This invention may be usefully applied to circuits supplied by accumulators, feeders of electrical railways, or the connections of sections of a line of electrical railway, the feeders for electric light or power of an electricity-supply station, or the protection of a number of dynamos working in parallel, and similar or analogous applications.

What is claimed in respect of the herein-described invention is—

1. In an electric circuit, a circuit opening and closing device, adapted automatically to normally close and keep closed the main circuit; an electromagnetic device connected with said opening and closing device, and operated by the current passed through the main-current wires, and adapted to actuate said device and open the main circuit when an excess of current takes place, and a branch circuit connecting the two ends of the line on either side of the point at which the circuit is closed and broken, and through which the whole current is adapted to pass when the said main circuit-line is opened, a resistance on said branch circuit, and an electromagnetic device on and operated by the current passed through said branch circuit, and directly connected with the said circuit opening and closing device in the main circuit-conductor, and adapted to keep the said main circuit open by its action on said circuit opening and closing device, while an excess of current continues, substantially as described.

2. In an electric circuit, comprising supply

and return conductors a and b , an electricity-supply source x , and an electricity-consuming apparatus—as $l m$ —on the said circuit; a circuit opening and closing device on the conductor a ; a solenoid s on the conductor a between the source x and said opening and closing device; a core k connected with said opening and closing device, and operated by the solenoid s , to open the said circuit; a branch circuit o connecting the two parts of the main conductor a on either side of the terminals of the opening and closing device; a resistance r on the branch circuit o ; a solenoid s' on said circuit, adapted to influence the core k in the same direction as the solenoid s to open the main circuit; and a weight or spring connected with the opening and closing device, and acting in a contrary direction to the solenoids, and normally adapted to close the said circuit and keep it closed; substantially as set forth.

3. The combination in the main conductors a and b , of an electric circuit, of the solenoid s on the conductor a ; contact-terminals c ; connecting and disconnecting device f working in connection with c ; a core k working in connection with the solenoid s to open the main circuit by withdrawing the contacts c ; a lever d connecting the core k and contact device f ; a weight w' connected with the lever d and tending normally to operate the connecting device f , and to close the circuit; the branch circuit o ; a resistance r thereon; and solenoid s^2 adapted to operate on the core k in the same direction as the solenoid s , as set forth.

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

ARTHUR BROMLEY HOLMES.

Witnesses:

JOHN HENDLEY WALKER,
FRANK E. FLEETWOOD.