(No Model.)

A. G. WATERHOUSE.

ELECTRIC SAFETY CUT-OUT DEVICE.

No. 463,086. Patented Nov. 10, 1891.

Fig. 1.

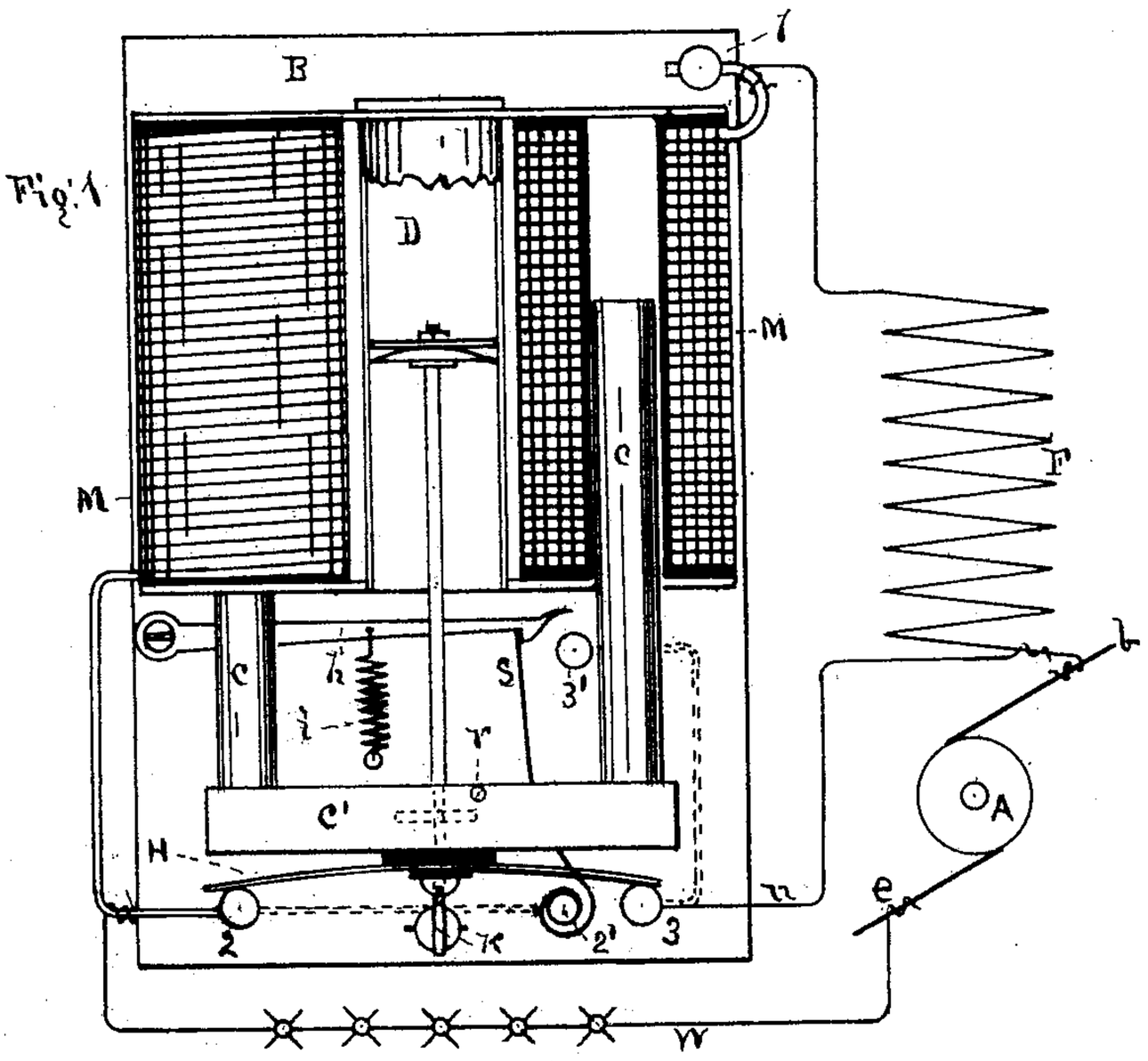


Fig. 2.

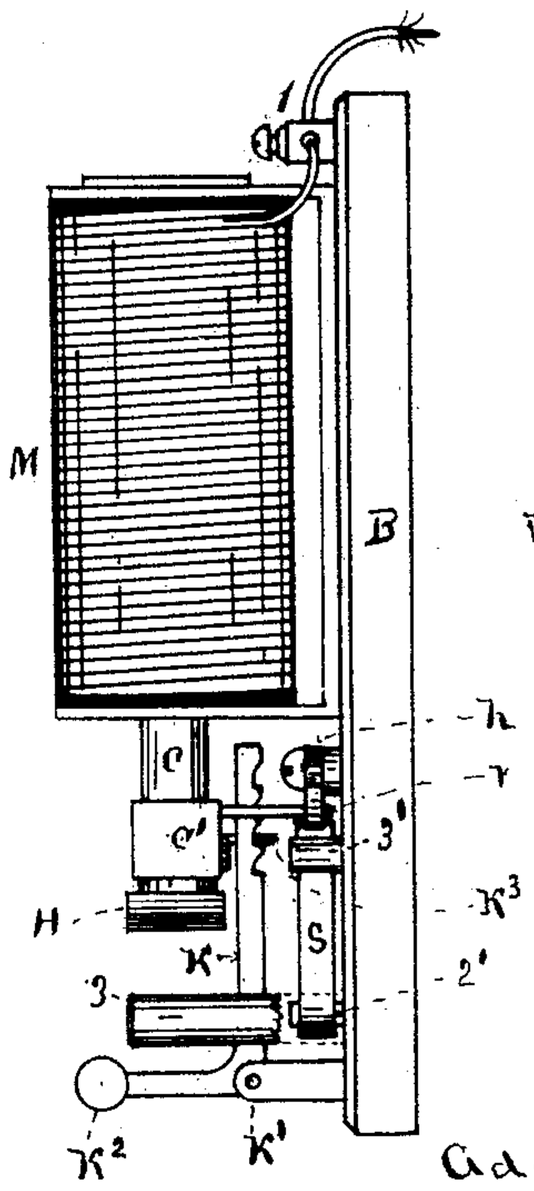
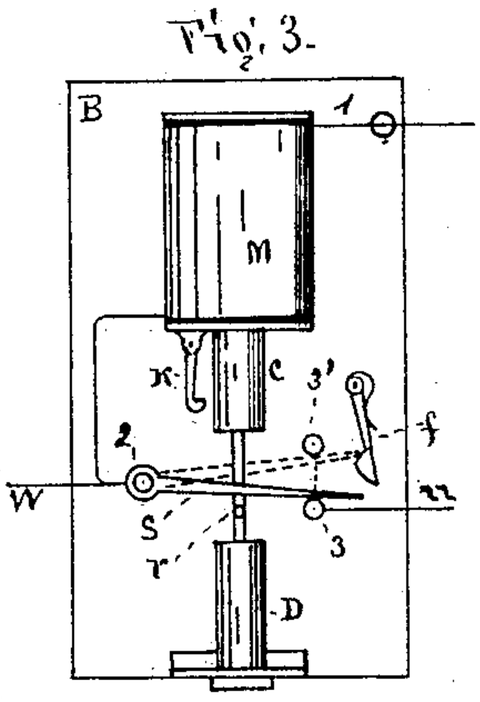


Fig. 3.



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ELECTRIC SAFETY CUT-OUT DEVICE.

SPECIFICATION forming part of Letters Patent No. 463,086, dated November 10, 1891.

Application filed June 24, 1891. Serial No. 397,364. (No model.)

To all whom it may concern:

Be it known that I, ADDISON G. WATERHOUSE, a citizen of the United States, and a resident of Hartford, in the State of Connecticut, have invented a new and useful Electrical Safety Cut-Out Device, of which the following is a specification.

My invention consists of an improvement in automatic safety cut-out devices applicable to dynamo-electric machines and kindred apparatus by which the electrical energy is arrested when any unusual or dangerous change occurs which may interfere with the natural condition of the electric circuit or the safety of the machine.

My invention consists of an apparatus which, when applied to a dynamo-electric machine, is capable of performing two duties: first, of immediately short-circuiting the field-magnets of the dynamo when for any reason the current generated by said dynamo raises above a fixed quantity or to a degree which would endanger the safety of the machine, and, second, in short-circuiting the field-magnets in case the electrical circuit breaks or becomes open or has introduced into it an extra resistance which taxes the dynamo beyond its maximum capacity. To perform this second duty the instrument works by means of a slow motion, which enables it to paralyze the field-magnets after the working circuit has been broken for a certain period, but not quickly enough to act during the short periods in which the circuit is broken or the current interrupted by reason of the machine flashing or temporary interruption and starting of the current.

One of the features of this invention consists of a device which will paralyze the field-magnets of a dynamo after the working circuit becomes either permanently open or has introduced in it a resistance which taxes the machine beyond its maximum capacity, but will not paralyze the field-magnets during any short interruption of the current—such as, for instance, when the machine flashes.

A more complete description of the invention is given by referring to the accompanying drawings, in which—

Figure 1 is a front elevation of an instrument embodying my invention, with a diagram of its electrical connections to a dynamo; and Fig. 2 is a side elevation of Fig. 1. Fig. 3 is an equivalent form of mechanism.

In Fig. 1, A represents an armature, and F the field-magnets, of a dynamo-electric machine. *b e* are the two main brushes. The instrument embodying my invention consists of the electro-magnet coils M M, fixed to the board B. In the coils M M are the two arms of the movable armature *c c*, joined together by the yoke *c'*. The electrical current which passes through the coils M M is proportioned so that when such current is at its normal quantity it just supports the armature *c*. When the current increases beyond its normal quantity, it draws *c* up with considerable force, and when the current breaks or falls below a given quantity the armature *c* falls or gravitates downward. The electrical connections and passages are as follows: The current first passing from brush *b* passes around the field-magnet coil F to the binding-post 1, then around the magnet-coil M M to binder 2, and out from 2 to the lamps or working circuit W. The binding-post 3 has a conductor *n* leading back to the field-magnet coil F near the brush *b*. The contact-point 3' is electrically connected to 3. The point 2' and spring S are electrically connected to binder 2. The armature yoke *c'* is provided with a metallic spring-plate H, which when the armature is down bridges across and electrically joins the terminals 2 and 3. This makes a short circuit for the current passing from brush *b* to 3, through H to 2, and out on W, thereby preventing the current from going around the field-magnets F and magnet-coils M M to 2. This of course paralyzes the field-magnet F and also the coils M M. On the other hand we will suppose the armature and plate H to be raised from 2 and 3 and the current from the dynamo started from brush *b* around the field F to 1, then around M M to 2, which would energize the magnet M M and hold the armature *c* up, so that the pin *r* will rest against the hook *h*, but not press up against it hard enough to overcome the tension of the spring *i* and lift it. In this condition we will suppose the current, owing to

some short circuit on the line W, should raise in quantity to a point that would endanger the dynamo. In such case the magnets M M would pull the armature *c* with such force as to cause the pin *r* in the yoke *c'* to lift the hook *h* and relieve the contact-spring S, which would allow S to snap against the contact-point 3', thereby short-circuiting the field F by offering a short passage around the same, *via* brush *b* on wire *n* to 3, then through wire shown in dotted lines to 3', then down on spring S to point 2', then on wire shown in dotted lines to terminal 2, instead of through field F, magnet M M to 2. As I have shown, the fields of the dynamo will be cut out, first, in case the current raises too high; second, in case the main current stops, owing to a break in the working circuit, and, third, in case an unusual resistance is introduced in line W, which will lower the current, so that it cannot support the armature *c*.

Fig. 2 shows a side view of Fig. 1, showing one of the coils M, armature *c*, yoke *c'* with contact-plate H. It also shows the pin *r* fixed in *c'* and the hook *h*, which holds the spring S. In starting the dynamo the armature *c* and plate H must first be raised from the terminals 2 and 3, and for this purpose I provide the prop K, which is pivoted at K' and counterbalanced at K^2 when the armature *c* is raised, so that the plate K^3, which is fixed to the armature-yoke *c'*, will engage in one of the notches of the prop K, so as to enable K to support the armature *c*. As soon as the currents starts it will raise the armature *c* and plate K^3 out of the notch in K, and the counter-weight K^2 will swing the prop forward, so that the armature *c* will be free to settle down and not catch in any of the notches in K. When *c* is supported by the current, it often happens that the resistance on the line W becomes too great on account of the lamps not feeding properly. In such case the machine flashes and the current breaks when the lamps instantly feed together and then the current picks up. In such case it is not desirable for the machine to be cut out, and to prevent the armature *c* from acting too quickly I provide the armature *c* with a dash-pot D, or a retarding mechanism, which will allow the armature to move up quickly, but prevent it from moving down too fast, so that the machine will have a reasonable time to pick up its current when broken by a temporary cause; but in case it fails to pick up within a reasonable time then it shows there is some permanent break, which may lead to dangerous results, and to remedy this the dash-pot D allows the armature *c* to slowly settle and permanently cut the machine out, as shown. Any form of dash-pot may be used or any form of retarding mechanism which will allow a quick movement one way and a slow motion the other for the purposes described.

I know automatic devices have been used to cut out the field-magnets of a dynamo in case a short circuit or break in the current occurs; but the peculiar point in my invention is, first, an instrument which will cut out the machine in case a permanent break occurs to the main circuit, but that will not cut it out when temporary breaks of flashes occur, and, second, in the combination, in the same instrument, of means which will instantly cut out the dynamo in case a short circuit occurs which would endanger the safety of the dynamo.

Fig. 3 shows an equivalent mechanism showing a single electro-magnet M, different form of contacts, a dash-pot D, adapted for glycerine or liquids, and a slip-hook K, instead of a prop, for supporting the armature *c*. The lower contact, as in Fig. 1, is produced by gravitation of the armature, while the upper cut-out is caused by the bridge or arm *s*, having its end snap past the spring *f*, which holds it secure against the contact-piece 3' after the arm *s* has been raised by the armature *c*, through the means of the pin *r*.

What I claim as my invention is—

1. A cut-out mechanism provided with terminals which are electrically connected to the extremes of the field-magnet coil or coils of a dynamo-electric machine, with an electro-magnet placed in the circuit of said machine having a movable armature provided with a plate or bridge capable of electrically connecting said terminals, said armature being provided with a dash-pot or retarding mechanism, a prop or hook for supporting said armature, adapted for withdrawing its support when the current energizes the said electro-magnets, substantially as and for the purposes set forth.

2. A cut-out mechanism consisting of an electro-magnet M and armature *c*, provided with a contact-plate H and dash-pot D, in combination with terminals 2 and 3, between which the plate H forms a bridge, substantially as and for the purposes set forth.

3. A cut-out mechanism consisting of an electro-magnet and a movable armature provided with a dash-pot or retarding mechanism and a prop or hook for supporting said armature, adapted for withdrawing its support when the current energizes said electro-magnet, in combination with terminals which are connected to the extremes of the field-magnet coil or coils of a dynamo-electric machine, said terminals being provided with a snap-switch adapted for being permanently closed by the extreme action of the said electro-magnet, and also for being closed when said magnet becomes inactive or reduced in strength, substantially as and for the purposes set forth.

4. A cut-out mechanism consisting of an electro magnet or magnets M and movable armature provided with a dash-pot D or retarding mechanism, and a prop K, adapted

for supporting said armature when the magnet M is not energized, said armature being provided with a bridge H, adapted for closing the terminals 2 and 3 when the armature is at the lowest end of its stroke, in combination with a snap-switch S, adapted for being liberated by the upper movement of the armature C, whereby the terminals 2 and 3 will be permanently closed, substantially as and for the purposes set forth.

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Witnesses:

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