

(No Model.)

H. H. CUTLER.
CIRCUIT CONTROLLER FOR ELECTRIC MOTORS.

No. 585,511.

Patented June 29, 1897.

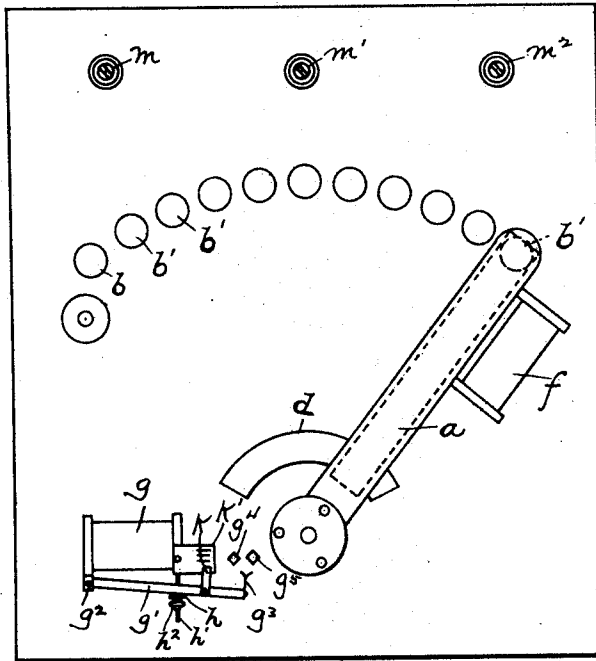


Fig. 1.

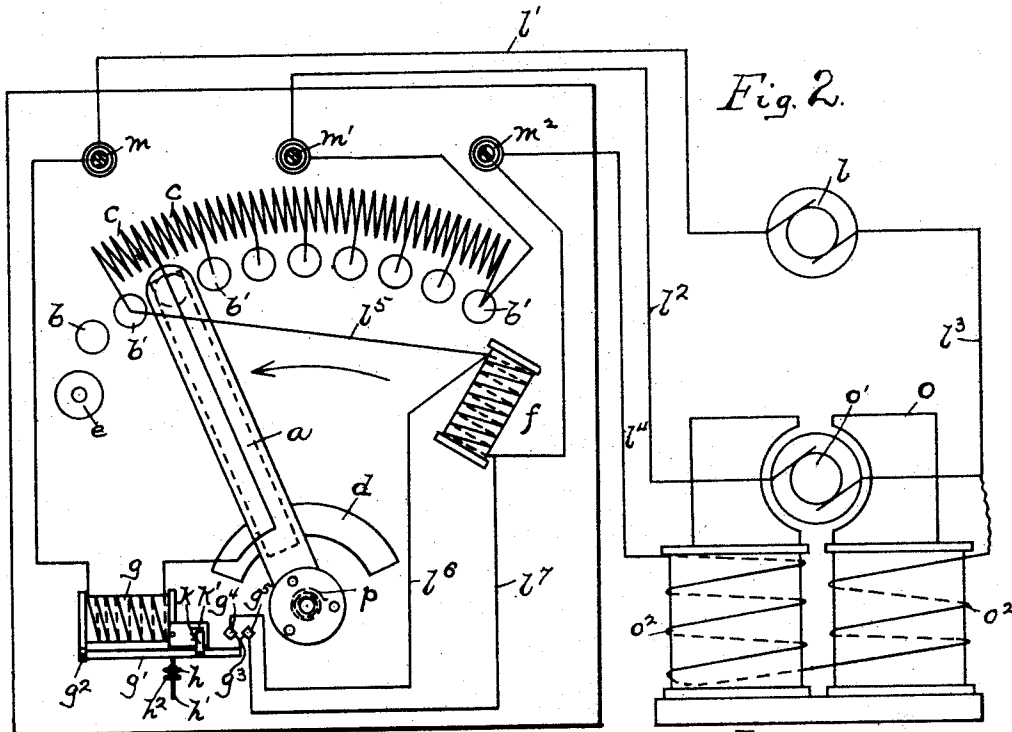


Fig. 2.

Witnesses:

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UNITED STATES PATENT OFFICE.

HENRY H. CUTLER, OF CHICAGO, ILLINOIS.

CIRCUIT-CONTROLLER FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 585,511, dated June 29, 1897.

Application filed January 8, 1897. Serial No. 618,456. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. CUTLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Circuit-Controllers for Electric Motors, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a circuit-controller for electric motors, my invention relating more particularly to a combined motor-starter and automatic circuit-breaker, my object being to provide apparatus whereby upon the flow of an abnormal current through the electric motor the starting resistance may be cut into circuit and the circuit opened, thus protecting the motor and preventing damage thereto, adjusting means being provided whereby the apparatus may be adjusted to respond to a current of any predetermined current strength.

In the running of electric motors a starting resistance is provided which is included in the motor-circuit when the motor is started to prevent the flow of an excessive current, the resistance being cut out step by step as the speed of the motor increases, the resistance being maintained entirely out of circuit during the normal running of the motor. In automatic motor-starters a retaining-electromagnet is usually provided which serves to maintain the contact-arm or movable element of the starting resistance or rheostat in position to exclude the starting resistance from the circuit during the normal running of the motor. A releasing-electromagnet is provided which upon the flow of an abnormal current through the motor acts to deenergize the retaining-electromagnet, thus permitting the contact-arm of the rheostat, through the agency of a spring or otherwise, to move over the rheostat-terminals to cut in the resistance step by step and then open the motor-circuit.

In accordance with the present invention the releasing-magnet is provided with adjusting means whereby the same may be adjusted to cause the retaining-magnet to release the contact or switch arm at any predetermined current strength.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is a plan view of the circuit-controller of my invention, showing the contact-arm maintained in position to exclude the resistance from the armature-circuit. Fig. 2 is a diagrammatical view showing the circuit connections and illustrating the contact-arm in the act of cutting the resistance into the armature-circuit.

Like letters refer to like parts in the several figures.

A contact-arm *a* moves over a series of terminals *b' b'*, between which are connected coils *c c* of the starting resistance. Near the journal upon which the contact-arm is pivoted is provided an arc-shaped contact-plate *d*, with which the under face of the contact-arm or a spring provided thereon makes contact, whereby circuit may be completed from the contact-plate through the contact-arm to a terminal of the rheostat. Upon the left of the terminals *b' b'* is provided a dead terminal *b*, and when the contact-arm rests in engagement therewith the motor-circuit is open. A stop or buffer *e* is provided for limiting the movement of the contact-arm. When the contact-arm is moved into engagement with the terminal *b'* upon the extreme right, the contact-arm rests in the magnetic field of the retaining-electromagnet *f* and is maintained by the attraction thereof in said position. A releasing-electromagnet *g* is provided with an armature-lever *g'*, pivoted at *g²* and carrying at the end a contact *g³*, which, when the armature is attracted, engages the contact-terminals *g⁴ g⁵* to electrically connect the same. When the armature-lever is unattracted, it rests upon a nut *h*, screwing upon a threaded rod *h'*. By raising or lowering the nut *h* the air-gap between the armature-lever and the pole of the electromagnet may be adjusted to cause the armature to respond to a current of any predetermined strength. A lock-nut *h²* is provided for maintaining the nut *h* in its adjusted position. An index *k* is carried upon the armature-lever *g'* and is situated opposite a scale *k'*, whereby the index may be adjusted to register with a mark upon the scale which indicates the strength of the current at which the armature-lever will be at-

tracted. The releasing-magnet may thus be adjusted to respond to any predetermined maximum current strength.

The circuit may be traced from the generator or source l over conductor l' to the binding-post m , thence through the releasing-magnet g to the contact-plate d , thence through the contact-arm a to the terminal b' , with which the arm is in contact, thence to the binding-post m' , conductor l^2 , through the armature o' of the motor o , and back to the source l by the conductor l^3 . From the conductor l^3 a branch extends through the coils o^2 of the motor, thence by conductor l^4 , binding-post m^2 , through retaining-electromagnet f , and by conductor l^5 to the terminal b' upon the left. The field-coils and the retaining-magnet f are thus connected in parallel with the armature. From the ends of the retaining-magnet f extend conductors l^6 l^7 to the contact-terminals g^4 g^5 , respectively.

When the motor is at rest, the contact-arm a rests upon the dead terminal b , thus maintaining the circuit open. When it is desired to start the motor, the contact-arm is moved over the terminals b' , thus closing the motor-circuit and cutting the starting resistance from the armature-circuit step by step until the contact-arm is in engagement with the terminal b' upon the extreme right, as illustrated in Fig. 1, when the starting resistance is removed wholly from the armature-circuit. The contact-arm a is maintained in this position by the retaining-magnet f . The normal flow of current through the motor-armature, and consequently through the releasing-magnet g , is insufficient to cause the attraction of the armature-lever g' , but when the flow of current exceeds the predetermined maximum the armature-lever g' is attracted, thus moving the contact g^3 into engagement with the contact-terminals g^4 g^5 , thus electrically connecting same, thereby closing the shunt-circuit about the retaining-magnet f to deenergize the same and release the contact-arm a , which, by means of a spring p or otherwise, is moved over the rheostat-terminals to cut in the resistance step by step, and finally upon reaching the terminal b to open the motor-circuit. It is impossible to start the motor again without cutting in the starting resistance, the circuit-controller thus acting to place the parts in such condition that the starting resistance must be included in cir-

cuit and then cut out step by step in starting the motor.

While I have illustrated my invention in connection with a shunt-wound motor, it is equally applicable to other types of motors. The term "electromagnet" as used in the description and claims comprehends both electromagnets in the restricted meaning of that term and solenoids.

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

1. The combination with a circuit-controlling arm or element, of a retaining-electromagnet for locking the same in position, means for moving the same when released to alter the condition of the circuit, a releasing-electromagnet for deenergizing said retaining-electromagnet upon the flow of an abnormal current, and means for adjusting said releasing-electromagnet to cause the same to respond to a predetermined current strength, substantially as described.

2. The combination with a circuit-controlling arm or element, of a retaining-electromagnet for locking the same in position, means for moving the same when released to alter the condition of the circuit, a releasing-electromagnet for deenergizing said retaining-electromagnet upon the flow of an abnormal current, and means for adjusting the air-gap between the armature and the pole of said releasing-electromagnet to cause the same to respond to a predetermined maximum current strength, substantially as described.

3. The combination with a circuit-controlling arm or element, of a retaining-electromagnet for locking the same in position, means for moving the same when released to alter the condition of the circuit, a releasing-electromagnet for deenergizing said retaining-electromagnet, means for adjusting the air-gap between the armature and the pole of the releasing-electromagnet, and a graduated scale and index for indicating the current to which the releasing-magnet responds, substantially as described.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

HENRY H. CUTLER.

Witnesses:

IRVING USNER,
W. CLYDE JONES.