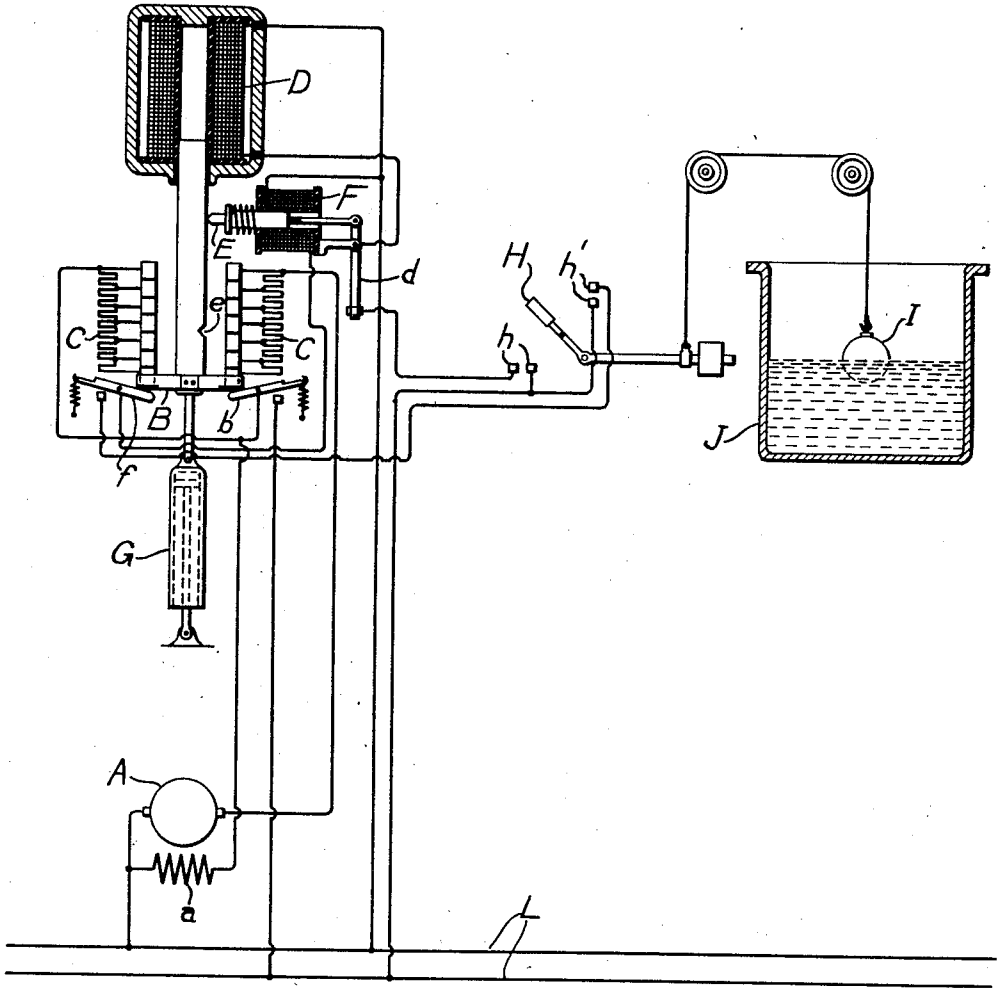
No. 851,811. PATENTED APR. 30, 1907.

C. D. KNIGHT.

AUTOMATIC MOTOR STARTER.

APPLICATION FILED MAY 25, 1906.



Witnesses:
Burchard V. Kelley
H. Mulford

Inventor:
Charles D. Knight.
by Albert G. Davis
Atty.

UNITED STATES PATENT OFFICE.

CHARLES D. KNIGHT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

AUTOMATIC MOTOR-STARTER.

No. 851,811. Specification of Letters Patent. Patented April 30, 1907.

Application filed May 25, 1906. Serial No. 318,697.

To all whom it may concern.

Be it known that I, CHARLES D. KNIGHT, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Automatic Motor-Starters, of which the following is a specification.

My invention relates to the automatic control of devices from a distance, and particularly to automatic starting-switches for electric motors.

Starting-switches have been arranged heretofore with magnet windings controlled from a distance for moving the switches from off to running position to start the motor. Such switches have also been provided with means for cutting out the operating magnet when the switch is moved and connecting in circuit a smaller locking or retaining magnet for holding the switch in running position; the switch being arranged to return automatically to starting position when the retaining magnet is de-energized. With such an arrangement the retaining magnet is continually energized, as long as the motor is running.

My invention consists in providing a magnetically operated switch with a latch which automatically engages and retains the switch in running position, so that the operating magnet may be de-energized when the switch is moved and the switch retained in running position without the expenditure of current for this purpose, and with a second magnet winding, which is arranged to disengage the latch to stop the motor. This winding, as well as the main operating winding, is in circuit only momentarily, and consequently may be made of small size. Furthermore, no current is employed while the motor is running, except that in the motor itself, so that the efficiency of the device is increased.

My invention will best be understood by reference to the accompanying drawing, which shows diagrammatically an automatic motor starter arranged in accordance with my invention.

In the drawing, A represents the armature, and *a* the field winding, of a shunt-wound motor controlled by the starting switch B, which is arranged when moved to cut out resistances C from the armature circuit, and which is operated by the solenoid D.

b represents a switch contact, which for convenience is shown separate from the main switch-member B, which is arranged to break the motor circuit when switch-member B is returned to its lowest position by gravity.

E represents a spring-actuated latch adapted to engage a notch *e* in the core of solenoid D when switch-member B is in running position. The movement of this latch into the notch shifts the switch *d* so as to open automatically the circuit of magnet winding D.

F represents a second magnet winding adapted when energized to withdraw latch E so as to allow switch-member B to fall to its lowest position.

f represents a switch which breaks the circuit of magnet winding F when switch-member B is in its lowest position.

G represents a suitable retarding device, such as a dash-pot operatively connected to the switch-member B adapted to retard its upward movement, but to permit its free downward movement.

The magnets D and F are controlled by the switch H at the distant point, which I have shown as controlled by a float I and a tank J, supposed to be supplied by a pump (not shown) driven by a motor A. When the water in the tank J falls below a certain level, the downward movement of float I brings switch H into engagement with the contacts *h*, thereby closing a circuit from the lower line-wire L through contacts *h*, through switch *d* and magnet winding D to the upper line-wire L. Magnet winding D consequently draws up switch-member B retarded by dash-pot G. The first movement of switch-member B allows switch-member *b* to close, thereby closing the motor-circuit across the line-wires L. The further movement of switch-member B gradually cuts out the resistances C to bring the motor up to speed. When all the resistances are cut out, the notch *e* is brought opposite the spring latch E, which enters the notch holding switch-member B in running position. At the same time the circuit of solenoid D is broken by switch *d*.

When the pump driven by the motor A has raised the water-level in tank J to a certain height the switch-member J is brought into engagement with contacts *h'*, thereby closing

a circuit from lower line-wire L through contacts h', switch f and magnet winding F, to the upper line-wire. Thus, magnet winding F is energized, withdrawing latch E and allowing switch-member B to fall. This quickly cuts the resistances C into the armature circuit of the motor, and, when switch-member B reaches its lowest position, it engages and opens the switches b and f, which break the circuits, respectively, of the motor and of the magnet F.

Although I have shown my invention applied to a shunt-wound motor, it is equally applicable to the control of any other type of motor for either direct or alternating current. When used with an alternating-current motor, my invention possesses a special advantage, in that the operating magnets are cut out of circuit except at the moment of starting, so that the losses due to eddy currents and hysteresis, which occur in alternating-current magnets, are almost wholly avoided.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, a member to be moved, a magnet winding adapted to move said member, a latch adapted automatically to engage and to release said member when moved, means for automatically de-energizing said magnet winding when said member is moved, and a second magnet winding adapted when energized to disengage said latch.

2. In combination, a member to be moved, a magnet winding adapted to move said member, a retarding device operatively connected to said member, a latch adapted automatically to engage and to retain said member when moved, means for automatically de-energizing said magnet winding when said member is moved, and a second magnet winding adapted when energized to disengage said latch.

3. In combination, an electric motor, a starting switch therefor arranged to return automatically to off position, a magnet winding adapted to move said switch to running position, a latch adapted automatically to engage and to retain said switch in running position, means for automatically de-energizing said magnet winding when said switch is in running position, and a magnet winding adapted when energized to disengage said latch.

4. In combination, an electric motor, a starting switch therefor arranged to return automatically to off position, a resistance controlled by said switch, a magnet winding adapted to move said switch to running position, a retarding device operatively connected to said switch, a latch adapted automatically to engage and to retain said switch in running position, means for automatically de-energizing said magnet winding when the switch is in running position, and a magnet winding adapted when energized to disengage said latch.

5. In combination, an electric motor, a starting switch therefor arranged to return automatically to off position, a magnet winding adapted to move said switch to running position, means at a distance for energizing said magnet to start said motor, means for automatically deënergizing said magnet winding when the switch is in running position, a latch adapted automatically to engage and to retain said switch in running position, a second magnet winding adapted when energized to disengage said latch, and means at the distant point for energizing said second magnet winding to stop the motor.

6. In combination, an electric motor, a starting switch therefor arranged to return automatically to off position, a resistance controlled by said switch, a magnet winding adapted to move said switch to running position, a retarding device operatively connected to said switch, means at a distant point for energizing said magnet winding to start the motor, means for automatically de-energizing said magnet winding when the switch is in running position, a latch adapted automatically to engage and to retain the switch in running position, a second magnet winding adapted when energized to disengage said latch, and means at the distant point for energizing said second magnet winding to stop the motor.

In witness whereof, I have hereunto set my hand this 24th day of May, 1906.

CHARLES D. KNIGHT.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.