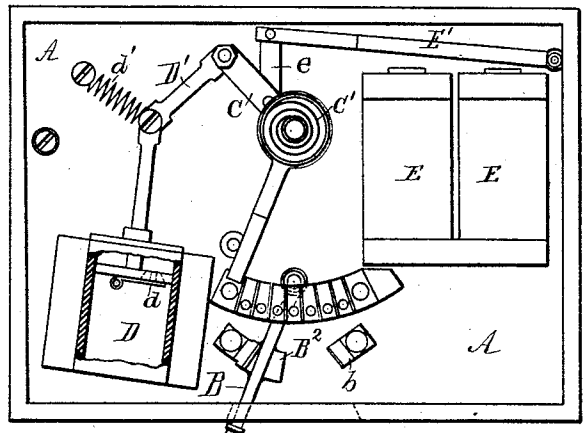
(No Model.)

H. H. BLADES.

AUTOMATIC ELECTRIC SWITCH MECHANISM.

No. 453,032. Patented May 26, 1891.

Fig. 1.



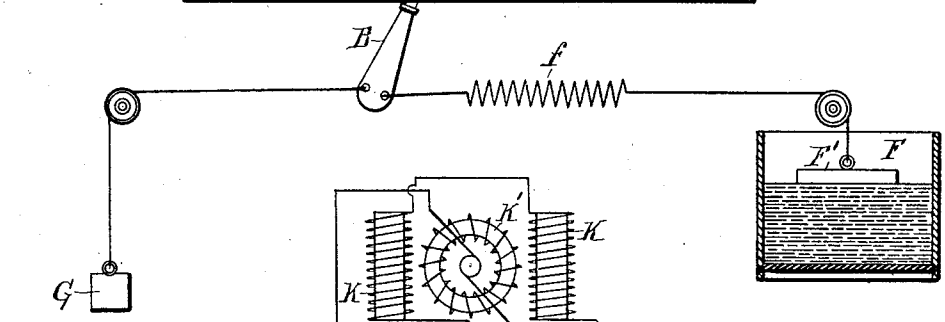


Fig. 2.

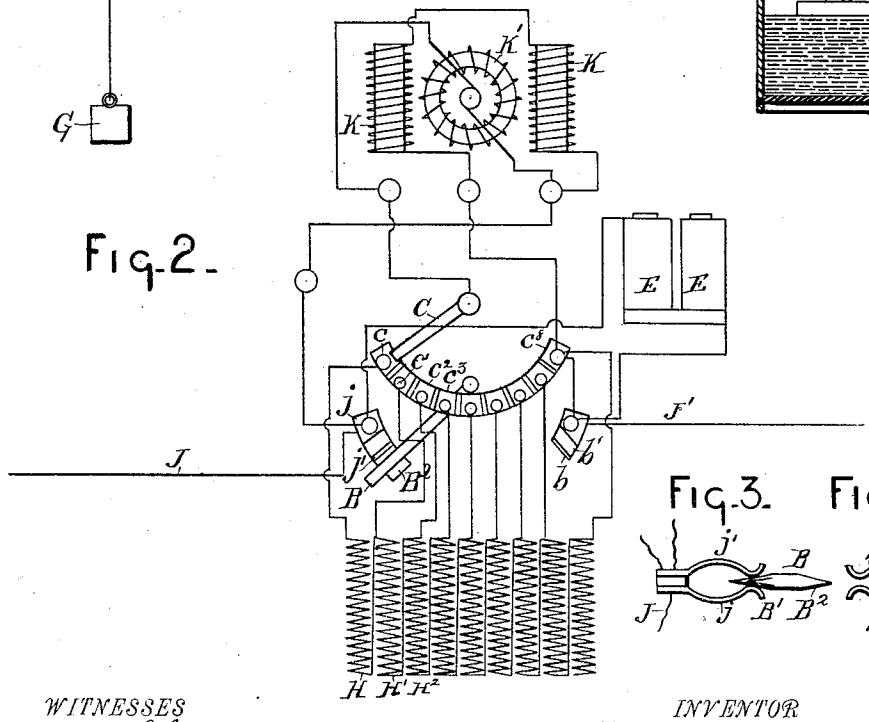


Fig. 3.

Fig. 4.

WITNESSES

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AUTOMATIC ELECTRIC-SWITCH MECHANISM.

SPECIFICATION forming part of Letters Patent No. 453,032, dated May 26, 1891.

Application filed September 19, 1890. Serial No. 365,537. (No model.)

To all whom it may concern:

Be it known that I, HARRY H. BLADES, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Automatic Electric-Switch Mechanism; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

In the drawings, Figure 1 is a plan view of a switch embodying my invention. Fig. 2 is a diagrammatic view to illustrate the operation of the said switch. Fig. 3 is a separate view illustrating the operation of the lever B and terminals *j j'*. Fig. 4 is a separate view illustrating the friction engaging device *b*.

This invention has for its object the production of a switch which shall operate automatically, and which shall at the same time guard properly the gradual introduction of current into the armature circuit or circuits. It is shown as connected with a water-tank and designed to turn on and turn off at proper times the current of the motor used to pump water into the tank and to do the same automatically as water is wasted from the tank, although of course it will be understood that it is applicable in any of the various localities where such alternate turning on and turning off of the current is required. It is also equally applicable where the switch-lever is operated by hand to turn off or turn on the current, and in that event serves to govern the gradual admission of current into the armature-circuits regardless of how quickly the operator may move the hand-lever.

In carrying out my invention, A represents any suitable switch board or case.

B is the switch-lever which admits current into the motor. This may, as above explained, be a hand-lever, or this lever may be arranged to operate automatically, as hereinafter explained.

B^2 is a metallic tongue designed to connect the motor-circuits and electro-magnet circuit which lead to *b'* with the main-line terminal *b*.

C is an automatic switch which governs the admission of current to the armature circuit or circuits. It is of bell-crank form in the drawings, and has a spring C', the tension of which serves to hold the lever in the position shown in Fig. 1 when current is off from the machine and to restore it to this position at any time that current is cut off from the machine.

D is a dash-pot provided with a valve *d*, or it might be an ordinary glycerine dash-pot, with or without the valve, if it was designed for use in a vertical position.

D' is a pitman connecting this dash-pot rod with the lever C, and a spring *d'* operates to assist the spring C' in restoring all the parts to their normal position. (Shown in Fig. 1.)

E represents one or more electro-magnets, and E' is an armature engaged by a link *e* with the lever C.

F represents a tank, which it may be presumed the motor is designed to keep supplied with water.

F' is a float connected by a cable with the switch-lever B and with the intermediate spring *f*. G is a weight connected in like manner with the lever B.

The apparatus is designed to operate as follows: Suppose the current to be off from the motor and the parts all in their normal position shown in Fig. 1, with the motor at rest. Now as water is wasted from the tank F the float F' will descend, exerting a tension on the spring *f*. As soon as this tension is sufficient to start the switch-lever it will operate to move it quickly over to the right and cause it to engage with a snug frictional contact at *b*. This serves to bring into contact two terminals which the switch-lever held apart when in its normal position and at *b* connects the motor and magnet circuits with the main line. Current at once enters the fields of the motor. Current is also shunted through the armature-circuits and the automatic switch-lever C. At the same time current passes freely through the coils of the electro-magnets E. This immediately draws down the armature E', which begins to move the switch-lever C, causing it to traverse the adjacent terminals along its sweep as rapidly as the dash-pot permits the movement to take place. Current shunted through the armature and the automatic switch-lever C arriving at the first terminal, as shown in Fig. 1, is caused to pass through a number of resistances before pass-

ing off onto the main line, and so the current taking this course of high resistance is very slight. As the lever sweeps over the adjacent terminals these resistances are successively cut out, permitting more and more current to shunt through the armature-circuits as the resistance is reduced, until finally, when it reaches the end of its sweep, the fields and armatures are on direct shunt with the full pressure of current at the terminals of both the fields and the armature. Now, if we presume the motor to be operating a pump for filling the said tank, as the tank is filled the float F′ rises and so gradually relaxes the tension of the spring *f* until the preponderance of strain on the opposite side by the weight G overcomes the frictional hold which the switch-lever B has at *b*. It therefore starts the switch and throws it quickly over to the left in the position shown in Fig. 1, the connection between the terminals at *b* is broken, and the switch-lever entering between the terminals at its normal position separates the same and cuts the current off from the motor. This will be understood more readily by an examination of the diagrammatic view shown in Fig. 2, in which *c c′ c²*, &c., represent the terminals governing the resistances. H H′ H², &c., represent the resistances. J is the main line along which the current enters, and J′ the main line along which it departs. *j* represents a terminal connected with the main line, and *j′* another terminal adapted to come into spring engagement therewith, from which lead the circuits of the fields and armature and the circuit of the electro-magnets of the switch. The switch-lever B at B′ is of non-conducting material—such as rubber, vitreous fiber, or the like—and is adapted to enter between the two terminals *j* and *j′* to separate them and so cut off the current at this point from entering the machine when in the position shown in Figs. 1 and 2. K represents the fields, and K′ the armature. Now, with the lever B in the position shown in Fig. 2 the terminals *j* and *j′* are separated. When it is desired to start the machine, this lever is thrown over to the right and the metallic portion B² closes or connects into the main line J′ the circuits centering at *b′* and makes a snug frictional engagement at this point to facilitate its automatic operation by the float and weight, as above explained. As soon as it is thrown to the right the terminals *j* and *j′* come together, and current entering through J passes freely over the circuits of the fields K and electro-magnets E. So, also, current is shunted through the armature circuit or circuits and passing down through the automatic switch C meets the opposition of all the resistances H H′ H², &c. The lever C, however, through the mechanism shown in Fig. 1, immediately begins to sweep along its terminals *c c′ c²*, &c., and as it does so the corresponding resistances are cut out of the circuit, so that it permits more and more current to shunt through the armature until the switch-lever has reached the last terminal *c⁸*, when the current no longer has to pass through any of the resistances; but the armature takes its current by direct shunt from the main line, the same as the fields. It is manifest that the moment the switch-lever B is returned to its normal position, separating the terminals *j j′*, current is wholly cut off from the motor and magnets, and the springs C′ and *d′* operate to restore all the parts to the position shown in Fig. 1. The motor, however, has not come to a standstill, and, connected up as it is on a closed circuit embracing the fields, armature, and electro-magnet, the current it may generate passing through the coils of the electro-magnet holds the automatic switch-lever C until the machine has nearly come to a standstill, when the armature lets go and the spring C′ restores all the parts to their normal position. (Shown in Fig. 1.)

I would have it understood that by the term "dash-pot" in the claims is contemplated not only a technical dash-pot, but any equivalent retarding mechanism which shall operate to retard the movement of the lever C as it is actuated by the electro-magnet.

What I claim is—

1. An automatic switch mechanism for an electric motor, the same consisting of a switch governing the admission of current to the motor, an electro-magnet on an independent shunt-circuit, an automatic switch-lever on the armature-circuit, a series of resistances with their terminals arranged to successively engage the said switch-lever, and a dash-pot to retard the motion of the lever, said lever actuated by the armature of the said electro-magnet, substantially as and for the purposes described.

2. An automatic switch mechanism for an electric motor, the same consisting of a switch for admitting current to the motor, an electro-magnet on an independent shunt-circuit, an automatic switch-lever in the armature-circuit, a series of resistance-terminals in contact with which said automatic switch is adapted to traverse, an armature to said electro-magnet adapted to operate said automatic switch, a dash-pot adapted to retard the motion of the automatic switch, and a spring or springs for restoring the automatic switch to its initial position when the current is cut off from the machine, substantially as described.

3. An automatic switch mechanism for an electric motor, consisting of an electro-magnet, an independent shunt-circuit with a movable armature, an automatic switch-lever on the armature-circuit actuated by said armature and adapted to sweep across a series of terminals governing a series of resistances, a mechanical resistance for retarding the motion of the automatic switch, and a switch governing admission of current to the motor and electro-magnet, the terminal on the main line held in spring engagement with the terminals which admit current to the motor and electro-magnet, and the last-named switch

when in its initial position serving simply to intrude between and separate said spring engagement, substantially as described.

4. The combination, with switch mechanism, substantially as described, of the switch-lever B, terminals *j j'*, terminals *b b'*, and in connection therewith a float F', and spring *f*, and a retracting-weight G, substantially as and for the purposes described.

5. The combination, with a shunt-wound electric motor on a constant-potential circuit, of a magnet on an independent shunt-circuit between the terminals of the motor, a switch adapted to open and close the armature-circuit, said switch arranged to be held in its closed position by the magnetism of the said magnet, and means for automatically retracting the said switch to its initial position when the magnet is de-energized by the cessation of the current, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

HARRY H. BLADES.

Witnesses:
MARION A. REEVE,
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