(No Model.)

I. L. ROBERTS.

AUTOMATIC ELECTRIC SWITCH.

No. 392,167. Patented Oct. 30, 1888.

Fig. 1.

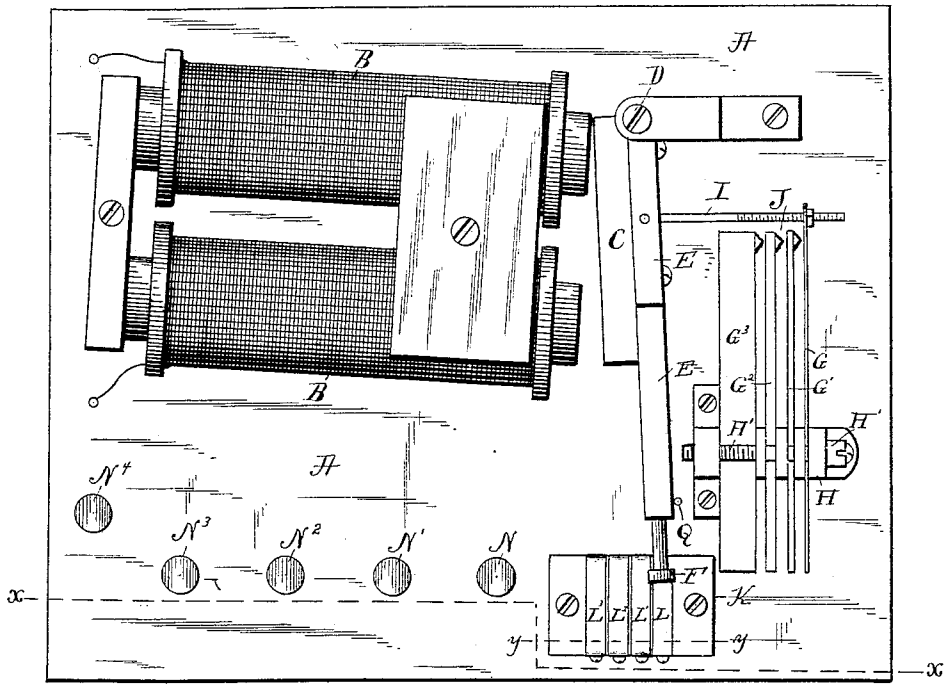


Fig. 2.

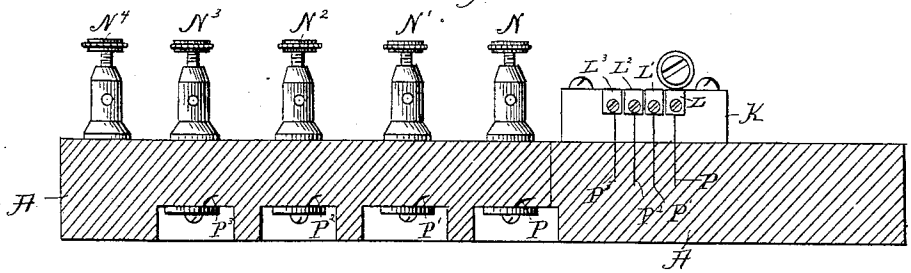
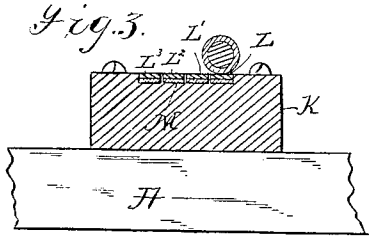


Fig. 3.



Attest.

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UNITED STATES PATENT OFFICE.

ISAIAH L. ROBERTS, OF BROOKLYN, ASSIGNOR TO THE ROBERTS-BREVOORT ELECTRIC COMPANY, (LIMITED,) OF NEW YORK, N. Y.

AUTOMATIC ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 392,167, dated October 30, 1888.

Application filed March 17, 1888. Serial No. 267,478. (No model.)

To all whom it may concern:

Be it known that I, ISAIAH L. ROBERTS, a citizen of the United States, and a resident of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Automatic Electrical Switches, of which the following is a specification.

My invention relates to automatic electrical switches intended for use in connection with a battery, a dynamo, or like current-producing apparatus, and it is so constructed that it will automatically regulate the flow of current to conform to an increase or decrease of work done by it, thus avoiding destruction or injury to any part of the electrical apparatus arising from excess of current, and also preventing waste at the battery, dynamo, or like generator.

More specifically described, the invention consists in an electro-magnet provided with a spring-controlled armature, which, as the attractive power of the magnet increases or decreases, owing to variations in the current, automatically brings into circuit an increased or decreased number of battery-cells, or of shunts on the dynamo, as the case may be.

In the drawings the same reference-letters indicate the same parts in all the figures.

Figure 1 illustrates a top view of the electro-magnet, spring-controlled armature, contact-plates, &c. Fig. 2 illustrates a vertical section on the line *x x* of Fig. 1. Fig. 3 illustrates a vertical section through the block which supports the contact-plates, on the line *y y* of Fig. 1.

A is the base or support of the apparatus.

B is the electro-magnet, preferably but not necessarily of the horseshoe form.

C is the armature. It is pivoted as at D, or in any other preferred manner.

E is a bar to which the armature is attached. It is made of a good conductor of electricity, and is provided with a roller, F, on its end, which is also a good conductor.

G, G′, G^2, and G^3 are a series of springs firmly clamped in the stud H by the clamping-screw H′ or its equivalent. The stud H is attached to the base A.

I is a rod which connects the bar E to the outermost and weakest spring, G. These springs are of successively-increasing stiffness, the spring G′ being twice as stiff as the spring G, and G^2 is four times as stiff as G, and G^3 is sixteen times as stiff as G, and so on. The tension of the springs thus conform to or may be made to conform to the law governing the attraction of an armature by a magnet—that is to say, the attractive force of the magnet increases as the square of the distance as the armature approaches the magnet, and vice versa.

J are set-off pieces, attached to the ends of the springs in order that adjoining springs may not come in contact with each other, excepting at or near their ends, which would interfere with the accuracy of their operation.

K is a block, of hard rubber or other suitable non-conducting material, attached to the base A.

L L′ L^2 L^3 are contact-plates set into or upon the block K. They are insulated from each other by sheets of mica or equivalent non-conducting material, M. The location and adjustment of the block and the contact-plates are such relative to the roller F that it will rest upon some one of said plates at all times, and so that as the bar E is oscillated on its pivot D under the attraction of the magnet the roller will move successively across said plates.

N N′ N^2 N^3 N^4 are binding-posts. The binding-posts N N′ N^2 N^3 are in electrical connection with the contact-plates L L′ L^2 L^3, respectively. The connecting-wires are shown at P P′ P^2 P^3.

Q is a stop which limits the movement of the bar E away from the magnet. It is so located that the roller F always rests upon the contact-plate L when the apparatus is not in use.

The operation is as follows, assuming that the generator be a battery and that it is employed for lighting purposes, and that ten cells of battery are required to run a single lamp, one cell being added to compensate for resistance, there being also as many additional cells in the battery as are needful for additional lamps: The wire from the eleventh cell connects with the binding-post N, and the twelfth, thirteenth, and fourteenth cells are respectively connected with the binding-posts N′, N^2, and N^3. The current from the eleven cells

above stated passes to the binding-post N, thence to the contact-plate L, thence through the roller F and bar E to the support for the pivot D, thence to and around the magnet, thence to the binding-post N^4, and thence off to the lamps and the other pole of the battery. The tension of the first spring, G, is such that it will counterbalance the attractive force of the magnet when magnetized by the current from the eleven cells before described. The roller F therefore remains upon the contact-plate L so long as the eleven cells only, or, in other words, but one light, is in use. When, however, a second light is put in circuit, the current is increased and the attractive force of the magnet made stronger. It now overcomes the resistance of the spring G and flexes it until it rests against the set-off on the end of the spring G′, the armature and its supporting-bar E, of course, moving toward the magnet and the roller F passing from the contact-plate L onto the plate L′. This brings into circuit the twelfth cell, which, with the other eleven, affords a permanent current sufficient for the two lamps. The springs G and G′ are of sufficient stiffness to overcome the increased attraction of the magnet, and the roller F is maintained on the contact-plate L′. In like manner when an additional lamp is brought into circuit, the attraction of the magnet being proportionately increased, the armature pulls the bar E with greater force toward the magnet, and the springs G and G′ are both together flexed until they rest on the "set-off" of the spring G^2, the roller F passing onto the contact-plate L^2, and the thirteenth cell is brought into circuit, and so on for the fourteenth cell and as many additional cells, each having its corresponding spring, as may be desired.

As the lamps are extinguished, the attractive force of the magnet being proportionately lessened, the springs retract the bar E and its roller F and the armature in exact correspondence with the number of lamps extinguished. Thus the switch, as before stated, automatically and accurately adjusts the current to the work to be done, and injury to the lamps or any other part of the apparatus arising from excess of current and all waste of the current are avoided.

It is obvious that the invention may be applied to a shunt-wound dynamo upon the same principle as above stated. It is also obvious that, instead of there being a single contact-point attached to the armature which engages with a series of stationary contact plates or points, the series may be so constructed as to move with the armature over a single stationary contact-point; also, that a series of springs may be made from a single piece of metal so arranged as that at predetermined points in its movement the force required to flex it shall be increased beyond the force normally required to flex a like piece of metal— as, for example, a straight spring may be used which, as it bends or flexes, will come in contact with properly-located stops—in this way causing the single piece of metal to act as a series of springs, instead of as a single spring, which would be its action were it not for such stops; also, that sets of cells, instead of single cells, and also separate batteries, may be brought into circuit and cut out therefrom by substantially the same construction of apparatus as that above shown; also, that a spring contact-finger may be substituted for the roller F, and that the method of engaging the armature with the springs may be varied, and that many other modifications in details of construction may be made and still my invention be practically employed. I therefore do not limit myself to the exact construction and arrangement of the parts as shown and described.

Having described my invention, I claim—

The combination, in an electrical apparatus, of an electro-magnet, an armature provided with a movable contact-point, a series of insulated contact plates or points adapted to be engaged by the movable contact-point, and a series of springs of successively-increasing stiffness connected with the armature, substantially as set forth.

Signed at New York, in the county of New York, and State of New York, this 21st day of February, A. D. 1888.

ISAIAH L. ROBERTS.

Witnesses:
PHILLIPS ABBOTT,
B. J. VETTERLEIN.