

T. A. WILLARD.
ELECTRIC LIGHTING SYSTEM.

No. 508,559.

Patented Nov. 14, 1893.

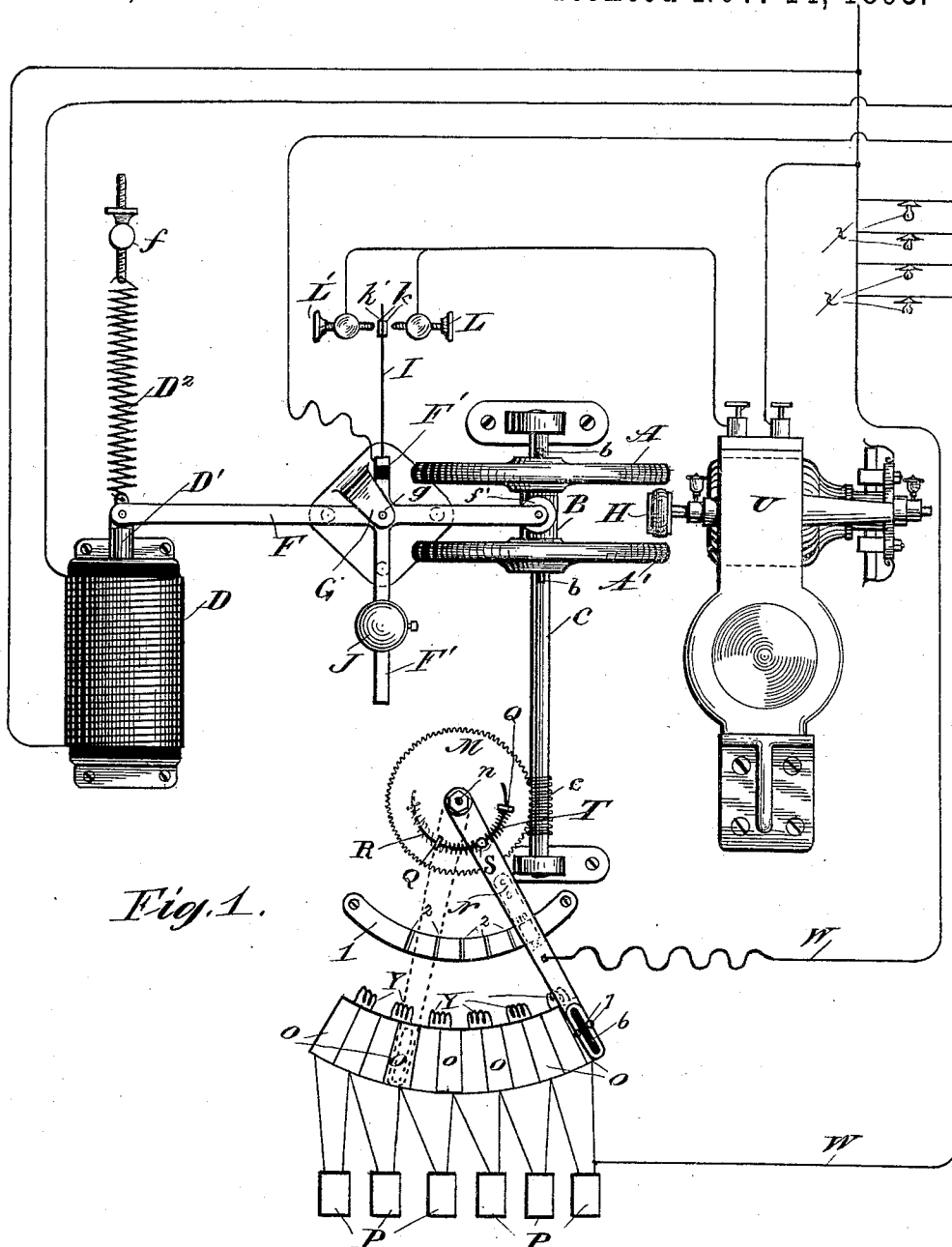


Fig. 1.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2

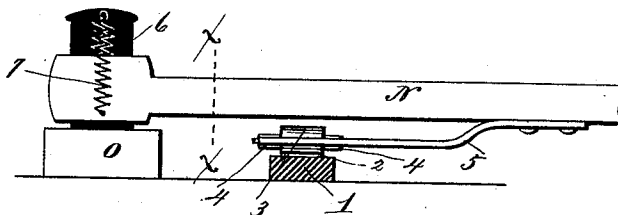


Fig. 3

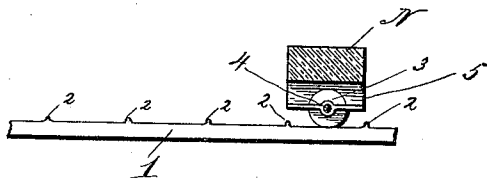
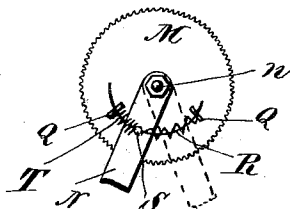


Fig. 4



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UNITED STATES PATENT OFFICE.

THEODORE A. WILLARD, OF NORWALK, OHIO, ASSIGNOR TO THE UNITED STATES WIND ENGINE AND PUMP COMPANY, OF BATAVIA, ILLINOIS.

ELECTRIC-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 508,559, dated November 14, 1893.

Application filed August 29, 1893. Serial No. 484,343. (No model.)

To all whom it may concern:

Be it known that I, THEODORE A. WILLARD, a citizen of the United States, and a resident of Norwalk, county of Huron, State of Ohio, have invented certain new and useful Improvements in Automatic Regulators, of which I hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it ap-
10 pertains to make and use the same.

My invention relates to improvements in automatic regulators for incandescent light circuits, or other circuits derived from the use of storage batteries or accumulators, in any
15 of their well known methods of use, as for cutting out cells from the main circuit, for inserting cells to obtain counter-electro-motive force, &c.

My invention consists in the apparatus described herein, and in the details of operating and spring actuated mechanism, and combination and arrangement of parts, as hereinafter described, shown in the accompanying drawings, and more specifically pointed
25 out in the claims.

In the drawings, Figure 1 is an end elevation of the device showing electrical connections. Fig. 2 is a side view of the switch lever and spring supported roller. Fig. 3 is a
30 cross section of lever on line $x-x$, showing side view of roller and bearing plate. Fig. 4 is a detail of operating gear.

In the figures, A, A', are brass or other metal disks, secured to a sleeve B, which
35 slides freely on the shaft C and moves upon the spline b , by means of which the disks will revolve the shaft when either of them are turned in either direction.

D is an electro-magnet which contains a
40 soft, longitudinally movable iron core D', pivotally attached at the outer extremity to the lever F, and D² is a coiled spring adapted to counteract the attraction of the magnet, adjustably secured to the post f . The lever
45 F, is pivoted in turn to the bearing G at g , and at the opposite extremity is provided with the wheel or roller f' , situated between the disks A, A, directly opposite the center of the shaft C. At the pivoted point g , a cross arm
50 F' is secured to the lever F, bearing at the upper extremity the spring I, and at the lower

the weight J. The spring I is provided with two platinum plates K, K', on either side of its free extremity which alternately come into contact with the screws L, L', which are pre-
55 erably pointed with platinum.

The outer end of the shaft C is provided with worm thread at c to engage the worm wheel M, to which is pivoted at n , the switch lever N, which is adapted to pass backward
60 and forward over the segments O, O, to which are connected the cells P, P.

Q, Q, are bosses raised on the face of the worm gear wheel M, through which is adapted to pass the curved bar R, secured centrally
65 to the post S upon the lever N. The coiled spring T serves to move the lever in one direction, or the other, as power is gained by compression.

U is a small electric motor, the shaft of
70 which is provided with the rubber tired pulley H, revolving between the metal disks A, A'.

W, W are the main wires, receiving the current originating from the cells P, P; and $x-x$
75 are lamps placed in parallel on the main circuit. It will also be seen that the motor U, with the metallic screws L, L', and spring I, and the electro magnet D, are also arranged in parallel on the main circuit.

The mode of operation of the device is substantially as follows: Supposing four cells to be connected with the main wires thus supplying the current to the four lamps, in parallel, the lever would be in the position shown in Fig. 1 in dotted lines. If the current gen-
85 erated by the four cells becomes too weak to glow the lamps, it will, of course, be necessary to introduce more cells into the circuit. This will then be accomplished automatically by the apparatus as follows: When the cur-
90 rent loses strength, the attraction of the magnet D lessens in intensity so as to enable the spring D² to pull out the core D', thus raising the outer end of the lever F and lowering the inner end bearing the roller f' , thus permit-
95 ting the upper disk A to engage the revolving rubber wheel H upon the motor shaft, at the same time connecting the motor wires with the main circuit by bringing one of the plates K into contact with one of the screws
100 L. As soon as the current enters the motor, the wheel H revolves and by frictional bear-

ing upon the disk A also revolves that and causes the shaft and worm thread *c* to revolve and turn the engaging worm wheel M, thus carrying over the lever N to another segment
 5 and placing another cell in the circuit. As soon as sufficient intensity is obtained in the circuit, the magnet D will pull down the lever F, disconnect the motor circuit from the main line, and thus stop the movement of the
 10 lever. Again when the current is too strong, as may occur in charging the batteries, the magnet D will pull down the lever till the roller will raise the lower disk A' into contact with the rubber wheel H, and connect the
 15 motor with the main line at *k'*, the effect of which will be to produce a reverse movement of the worm *c*, wheel M, and the lever N, and throw out a cell or as many as are necessary to restore the normal condition of the lamp
 20 circuit.

To prevent the short circuiting of cells, as far as possible, when the lever N passes over the segments, a slow movement terminating in a quick action at the moment of crossing
 25 from one segment to another, is given the lower arm N by means of the following mechanism:—

1 is a flat circular plate provided with sharp radial ridges 2 at regular intervals, corresponding to the joints between the segments O.
 30

3 is a roller adapted to traverse the plate 1 and mounted in bearings 4 upon the spring 5 which is secured to the under side of the lever N, and upon which the lever rests. The
 35 lever is pivotally secured to the worm wheel M at *n*, from which movement is transferred to the lever by means of the spring T coiled upon the curved rod R between the lugs Q, attached to the wheel M.

40 When the wheel starts to revolve, the yielding spring will have sufficient force to move the lever N over the segments O, and the roller 3 over the plate 1 until the roller strikes one of the ridges 2, which will stop the roller
 45 before the lever overlaps the next segment and hold it until by compression, the spring, has accumulated force enough to throw the roller over the ridge, which it will do in an instant, and thus reduce the time of short
 50 circuiting to a minimum, or fraction of a second, if not prevent it entirely.

G is a piece of carbon or other material adapted to make the contact with the segments O, and is controlled by the springs 7.

55 Z is a piece of insulation in the cross bar F' to prevent cross current.

Y are resistance coils, connecting the segments O with the neighboring alternate dummies which first receive the lever after passing
 60 one of the ridges 2, and greatly assist in preventing any short-circuiting of the cell.

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

65 1. In an automatically operated switch, the combination of a main battery circuit W;

lamps or other apparatus arranged in parallel in said circuit; a motor and an electro magnet arranged in parallel in said circuit, a switch lever and segments on the main circuit, and
 70 means for passing the lever backward and forward over the segments, controlled by said magnet, and consisting in the lever F, core D', roller *f'*, disks A, A'; shaft C; worm *c*; worm wheel M, and rubber wheel H on the
 75 motor shaft, with means for connecting and disconnecting the motor circuit with the main circuit consisting in the cross arm F', spring I, screws L, L', and weight J; all arranged substantially as and in the manner set forth.
 80

2. In an automatic current regulator, means for preventing the shortcircuiting of the single cells, consisting in the operating spring T, curved rod R, and posts Q, and S, with the spring 5, roller 3 and curved plate 1 provided
 85 with projected ridges 2, substantially as described.

3. In an automatic current regulator, means for preventing short circuiting of the segment plates consisting in curved plate 1, provided
 90 with ridges 2 raised at regular intervals; the roller 3, mounted upon spring 5 secured to the switch lever, and operating spring T, adapted to give increasing pressure upon the said lever until the roller passes a ridge, sub-
 95 stantially as described.

4. In an automatic current regulator, operating means therefor, consisting in an electro magnet provided with movable core D', a restraining spring D², lever F, pivoted near
 100 the center, and provided with the cross bar F', provided in turn with balancing weight J, and spring I, contact screws L, L', on a motor circuit, in combination with the motor U, wheel H, disks A' and A, and roller *f'*, sub-
 105 stantially as and for the purpose set forth.

5. In a current regulating device, the combination of a switch segment, composed of alternate direct and dummy plates, resistance coils connecting each direct plate with the
 110 adjoining dummy; a switch lever, adapted to pass over the segment, and means for giving the lever an initial slow movement, combined with a terminal quick movement at the juncture of the plates, substantially as described.
 115

6. In a current regulator, the combination with a switch segment and battery or accumulator cells connected therewith, of a pivoted switch lever and means for giving a normal slow movement to the lever with a terminal
 120 quick movement at the moment of passing the juncture of the segment plates, consisting in the curved plate 1, provided with ridges 2, a spring mounted roller 3 secured to said lever, and bearing on said plate, and actuating
 125 spring T, confined by lugs Q, Q, substantially as described.

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Witnesses:

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