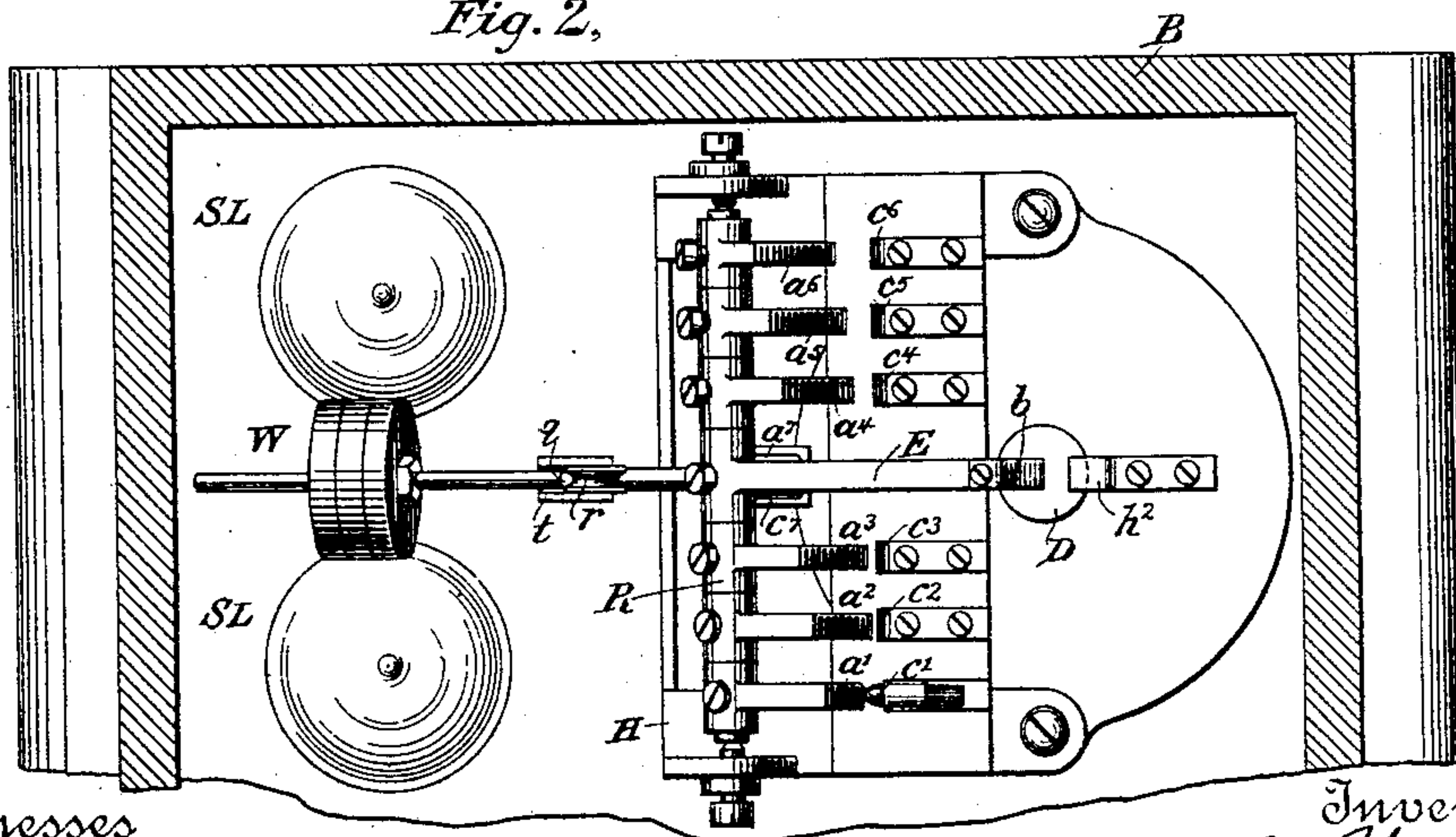


2 Sheets—Sheet 1.

REGULATOR FOR INCANDESCENT ELECTRIC LIGHTING SYSTEMS.

Patented Jan. 8, 1889.



Inventor

Merle J. Wightman,
By his Attorneys
Fowler & Fowler

(No Model.)

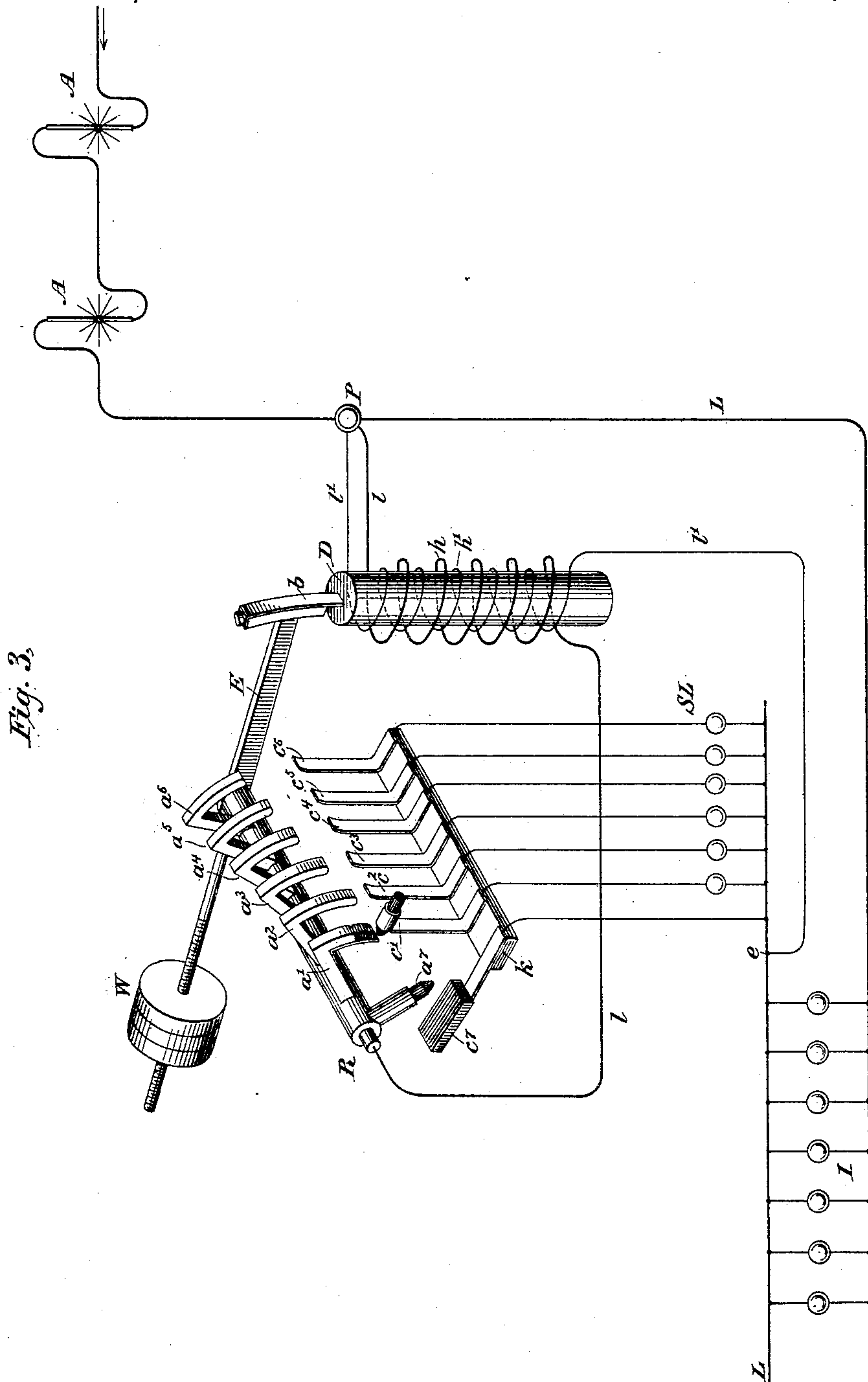
2 Sheets—Sheet 2.

M. J. WIGHTMAN.

REGULATOR FOR INCANDESCENT ELECTRIC LIGHTING SYSTEMS.

No. 395,936.

Patented Jan. 8, 1889.



Witnesses

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UNITED STATES PATENT OFFICE.

MERLE J. WIGHTMAN, OF HARTFORD, CONNECTICUT.

REGULATOR FOR INCANDESCENT ELECTRIC-LIGHTING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 395,936, dated January 8, 1889.

Application filed June 29, 1886. Serial No. 206,608. (No model.)

To all whom it may concern:

Be it known that I, MERLE J. WIGHTMAN, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Regulator for Incandescent Electric-Lighting Systems, of which the following is a specification.

My invention relates to regulators for series multiple of incandescent lamps which are placed in the same circuit with arc lamps and are supplied, therefore, with high-tension current suitable for arc lighting.

The object of my invention is to maintain constant the potential at each group of incandescent lamps by means of the current itself; and my invention consists in a regulator which automatically puts in circuit compensating resistances or safety-lamps whenever one or more of the lamps in the external circuit is in any way removed therefrom by means of the mechanism hereinafter to be set forth.

It consists, further, in providing said regulator with a cut-out for the external lamps and for the safety devices.

It consists, further, in a peculiar retracting device for the regulator.

My invention is illustrated in the accompanying drawings, in which like letters of reference indicate like parts in the several figures.

Figure 1 shows a sectional elevation of my regulator. Fig. 2 shows a sectional plan of my regulator, and Fig. 3 a diagrammatic view of the circuits and a perspective of a portion of the apparatus.

In another pending application, filed July 8, 1885, and patented July 13, 1886, No. 345,561, I have shown, (see Fig. 2,) but not claimed, a regulator like the present one. In the other form I have shown (see Fig. 1) and claim the current that passes through the coarse-wire coil, passes through the external lamps, and not through the safety-lamps, as in the present case.

Figs. 1 and 2 show the apparatus as actually constructed by me, whereas Fig. 3 shows the parts disposed so as to clearly show the operation of the apparatus.

A A represent arc lamp in a main line, L, containing incandescent lamp I, which it is the object of this invention to protect.

At each group of incandescent lamps I in the circuit L, in which there may be any number of groups, I place the regulating apparatus shown, which consists of a series of compensating resistances or safety-lamps, L, connected with the main line, as shown clearly in Fig. 3. These safety-lamps are connected by circuits with contact-springs c' c^2 c^3 , &c., mounted upon a solenoid, S, Figs. 1 and 2, consisting of two coils, h h' . The latter is in a derived circuit of high resistance from the main line and connected with it at the points P and e.

Upon a support, H, (shown in Figs. 1 and 2,) is an arbor, R, carrying curved arms a' a^2 a^3 , &c., at longitudinal and radial distances from one another, which are placed adjacent to the contact-springs c' c^2 c^3 , &c., and cooperate therewith. Secured to this arbor R is a lever, E, carrying upon one end an adjustable counterpoise, W. The other end of this lever terminates in a T-head, and suspends from its upper portion, by means of a band, b , the core D of the solenoid. A metal piece, h^2 , is mounted upon the solenoid for the purpose of limiting the play of the core D. The contact-springs are mounted upon an insulating-piece, k . The arbor R carries also a cut-out, a^i , which makes contact with a carbon contact, c^i , which is also mounted upon the insulating-piece k .

The lever E is provided with a peculiar retracting device, which consists of a roller, r , connected by a piece, t , with a retracting-spring, o , secured to the support H. The lever E is provided with a raised portion, q , and has a slight notch, g , therein for keeping the roller r , which is freely mounted upon the lever, in its normal position until after the last lamp is put in circuit, after which it gravitates to the arbor R, and thus changes the retracting leverage, and thereby the retracting force. So, too, when the roller r is adjacent to the arbor and the lever E is drawn down by the core, if the latter be liberated the lever will rise and the retracting device pass down the lever to its normal position. (Shown in Fig. 1.) The object of this device will be explained farther on.

Connected to the main line at the point P is a wire, l , embracing in its circuit the coil h , of low resistance, of the solenoid S. This line

is in electrical connection with the arbor bearing the curved contact-arms. This circuit is normally broken, but is completed by the contact of the curved arm with the springs c' c^2 c^3 , &c., which is effected in the first instance by the action of the coil h' acting upon the core which draws down the lever E.

My regulator is suitably housed in a box, B, which carries also the safety-lamps. This box is of small dimensions and may be placed at any point. I have shown two of the safety-lamps placed in the interior of the box B as a matter of convenience only. These lamps may be placed on the top of the box as the others, or all of the lamps may be placed in its interior, as desired.

I have shown the contacts c' a' made of carbon to prevent oxidation due to the sparking at the contact. These contacts are the last ones withdrawn from the circuit l , and hence there is a tendency of these contacts to burn away when the circuit is ruptured.

Instead of using incandescent lamps to compensate for the change of resistance in the group in the external circuit, I may use any form of resistance; but I prefer the incandescent lamps for this purpose.

The operation of my apparatus is as follows, (the parts being disposed as shown in the figures:) In this instance all the incandescent lamps in the external circuit are supposed to be in operation. When one or more of the latter are removed from the circuit by turning them out, or by their becoming injured in any way and the carbon filament disrupted, a rise of potential at the terminals of the lamps left in circuit due to the increase of resistance in the circuit takes place, which resistance causes an excess of current to flow through the derived circuit l' . This excess of current draws in the core D a certain distance, thereby operating the lever E, rotating the arbor, and bringing the contacts c' a' together, and thus putting in circuit the safety-lamp which is in electrical connection with the contact c' . When two lamps in the external circuit are removed therefrom, another safety-lamp will be interposed in the circuit, and thus compensate for the lamps removed from the circuit. In this instance the curved arm a^2 is by means of force exerted upon the core, through the instrumentality of the lever E, brought in contact with the contact-springs c^2 , and so on throughout the series until the last safety-lamp is put in circuit, and previous to the removal of the last lamp in the external circuit. Upon the removal of this lamp the core will be drawn in the solenoid to the end of its limit, and at this time the cut-out a^i and c^i will be put in circuit, thus short-circuiting the safety-lamps and the lamps in the external circuit. At this time I design also to have the roller r leave the notch e and pass near the arbor, thus lessening the retracting force and holding the cut-out firmly together. To place the parts in their normal position, it is necessary

to break the circuit of the solenoid, which allows the lever to rise and the roller to pass to the notch g and the retracting force to become the same as before.

Encircling the core D is a low-resistance coil, h , the purpose of which is to hold the core in the position it is placed by the fine-wire coil h' . This latter coil draws the core down, completes the circuit of the line l at the contacts, and by this means the current which previously flowed in the coil h' is now transferred to the coil h , the circuit of which was previously broken. This same action takes place throughout all the series of contacts until the cut-out is reached, when all the current passes through the coil of low resistance, by which means, in addition to the change in the retracting force mentioned above, the contacts a^i c^i , forming the cut-out, are held firmly together. Were it not for this change of retracting force the current in the low-resistance coil might not be adequate to hold the core down and keep the circuit of the cut-out intact.

I may use a number of assisting-coils brought successively in circuit and wound about the core D, each containing one or more of the compensating resistances, instead of using a single assisting-coil having branches containing the compensating resistances.

The principle of operation of my invention may be embodied in regulators of various types and be used for various other purposes without departing from the spirit of my invention.

I claim—

1. In a regulator for an electric-lighting system, an electro-magnet one of whose coils is in a constantly-closed circuit, an assisting-coil, branches, and a series of contacts in the circuit thereof, which are automatically brought into circuit and removed therefrom by increases and decreases of current in said circuits to correspond with the number of lamps in use.

2. In a regulator for an electric-lighting system, an electro-magnet one of whose coils is in a constantly-closed derived circuit, an assisting-coil, branches, and a series of contacts in the circuit thereof, said branches containing compensating resistances which are automatically and successively brought into circuit and removed therefrom by the reciprocal action of said coils due to increases and decreases of current in said circuits corresponding to changes of resistance in the external circuit.

3. In a regulator for an electric-lighting system, an electro-magnet one of whose coils is in a constantly-closed derived circuit, an assisting-coil, branch circuits, and a series of contacts in the circuit thereof, said branch circuits containing compensating resistances connected with the line which are automatically and successively brought into circuit and removed therefrom by increases and decreases of current in said circuits to correspond with

the number of lamps in use, and a cut-out circuit constituting one of said branch circuits.

4. A regulator for an electric-lighting system, consisting of circuit-controlling devices, branch circuits connected with the main line containing compensating resistances, two solenoids for controlling said circuit-controlling devices, one in a derived circuit and the other in the circuit of said compensating resistances, which circuit is normally broken, but which is completed by said circuit-controlling devices through the action of the first solenoid, as set forth.

5. A regulator for an electric-lighting system, consisting of circuit-controlling devices, branch circuits connected with the main line containing compensating resistances, two solenoids for controlling said circuit-controlling devices, one in a derived circuit and the other in the circuit of said compensating resistances, which circuit is normally broken, but which is completed by said circuit-controlling devices through the action of the first solenoid, and a cut-out for the lamps in the external circuit and for the compensating resistances brought into action by said solenoids after the last resistance has been introduced, as set forth.

6. A series multiple regulator for incandescent lamps, embodying a derived circuit containing safety-lamps in multiple arc, a series of contacts in electrical connection therewith, and two assisting-solenoids, one in the aforesaid derived circuit and the other in a derived circuit parallel therewith, for placing a greater or less number of said safety-lamps in circuit, as set forth.

7. A series multiple regulator for incandescent lamps, embodying a derived circuit containing safety-lamps in multiple arc, a series of contacts in electrical connection therewith, and two assisting-solenoids, one of low and the other of high resistance, for controlling said contacts, one located in the aforesaid circuit, which is normally broken, and the other in a derived circuit, which is always closed.

8. A series multiple regulator for incandescent lamps, embodying a derived circuit containing safety-lamps in multiple arc, a series of contacts in electrical connection therewith, and two assisting-solenoids, one of low and the other of high resistance, for controlling said contacts, one located in the aforesaid circuit, which is normally broken, and the other in a derived circuit, which is always closed, and a cut-out for both the external lamps and the safety-lamps controlled by said solenoids at a predetermined time, as set forth.

9. A regulator for a series multiple of incandescent lamps, consisting of an arbor having a plurality of curved arms mounted thereupon at different radial distances, a lever secured to said arbor substantially at right angles thereto, a solenoid composed of two coils,

one in a constantly-closed derived circuit of high resistance, the other in a low-resistance circuit parallel therewith, normally open, but closed by said curved arms, and having multiple branches containing safety-lamps, and a core for said solenoid suitably connected with and actuating said lever, for the purpose set forth.

10. A regulator for a series multiple of incandescent lamps, consisting of an arbor having a plurality of curved arms mounted thereupon at different radial distances, a lever secured to said arbor substantially at right angles thereto, a solenoid composed of two coils, one in a constantly-closed derived circuit of high resistance, the other in a low-resistance circuit parallel therewith, normally open, but closed by said curved arms, and having multiple branches containing safety-lamps, and a core for said solenoid suitably connected with and actuating said lever, an adjustable counterpoise for the latter, and a cut-out, also mounted upon said arbor.

11. A regulator for a multiple series system of incandescent lamps, having a series of contacts mounted upon an arbor, another series of contacts co-operating therewith, circuits therefrom containing safety devices connected with the main line, a solenoid and suitable connections therefor, intermediate devices for operating said lever by the current flowing in said solenoid, and a cut-out, also mounted upon said arbor, operating as and for the purpose described.

12. A retracting device for an incandescent electric-light regulator, having a pivoted lever actuated by changes of current, and safety devices cut in or out of circuit through the instrumentality of said lever and other suitable devices, consisting of a roller freely mounted upon said lever, and a retracting-spring suitably connected with said roller, whereby the retracting leverage, and thereby the retracting force, is changed at a predetermined time as the inclination of the lever increases.

13. A retracting device for an incandescent electric-light regulator, having a pivoted lever actuated by changes of current, and safety devices cut in or out of circuit through the instrumentality of said lever and other suitable devices, consisting of a roller freely mounted upon said lever, a retracting-spring suitably connected with said roller, whereby the retracting leverage, and thereby the retracting force, is changed at a predetermined time as the inclination of the lever increases, and a cut-out modified in its action by the aforesaid means.

14. A retracting device for an incandescent electric-light regulator, having a pivoted lever actuated by changes of current, and safety devices cut in or out of circuit through the instrumentality of said lever and other suitable devices, consisting of a roller freely mounted normally in a notch in said lever, a retracting-spring suitably connected in the

said roller, and an adjustable counterpoise for the lever for regulating the operation of the parts above enumerated.

15. A regulator for a series multiple of incandescent lamps, consisting of an arbor having a plurality of curved arms mounted thereupon at different radial distances, a lever secured to said arbor, a solenoid having a core governed by the reciprocal action of the current flowing in two coils connected with the

main line, which core is suitably fastened to said lever, circuits controlled by said curved arms, safety-lamps in said circuits, a cut-out, also mounted upon the aforementioned arbor, and a shifting retracting device for said lever, 15 for the purpose set forth.

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Witnesses:

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