(No Model.) 2 Sheets—Sheet 1.

E. WESTON.

SYSTEM OF ELECTRIC LIGHTING.

No. 304,882. Patented Sept. 9, 1884.

Fig. 1.

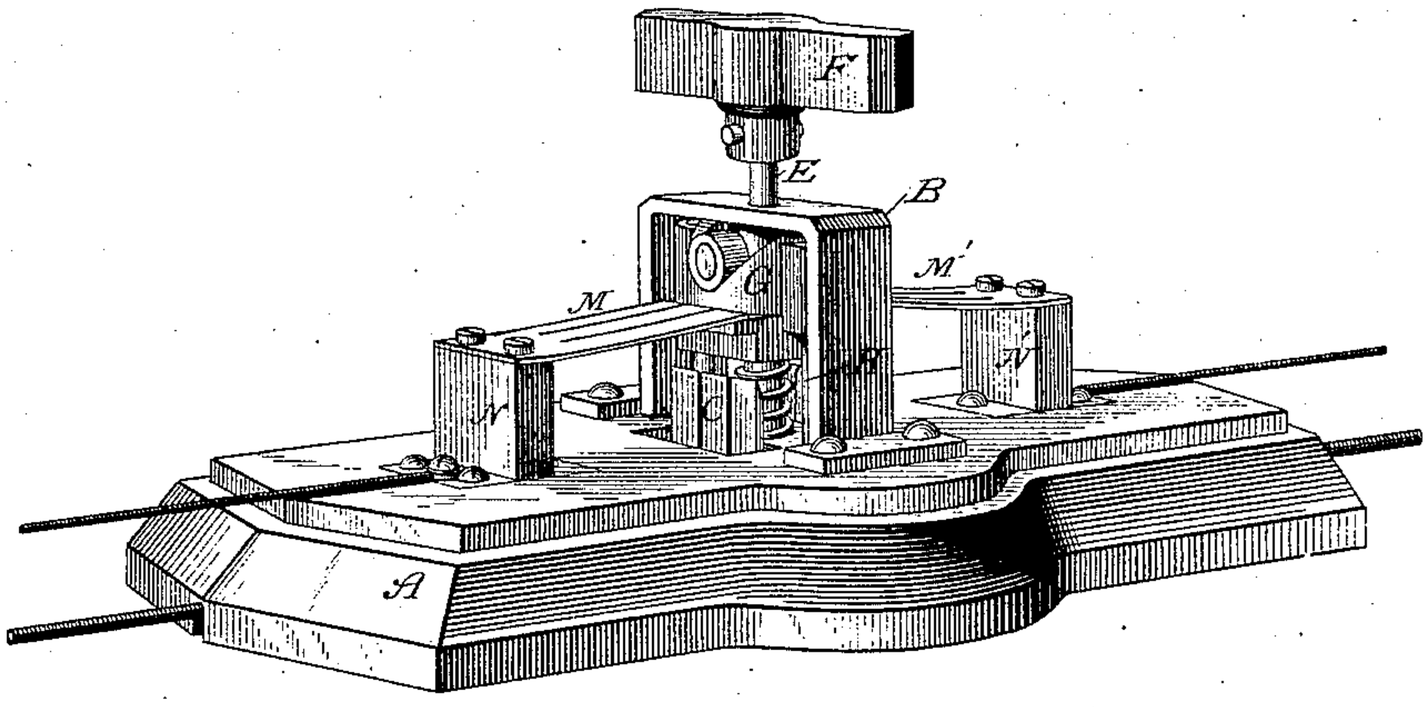


Fig. 2.

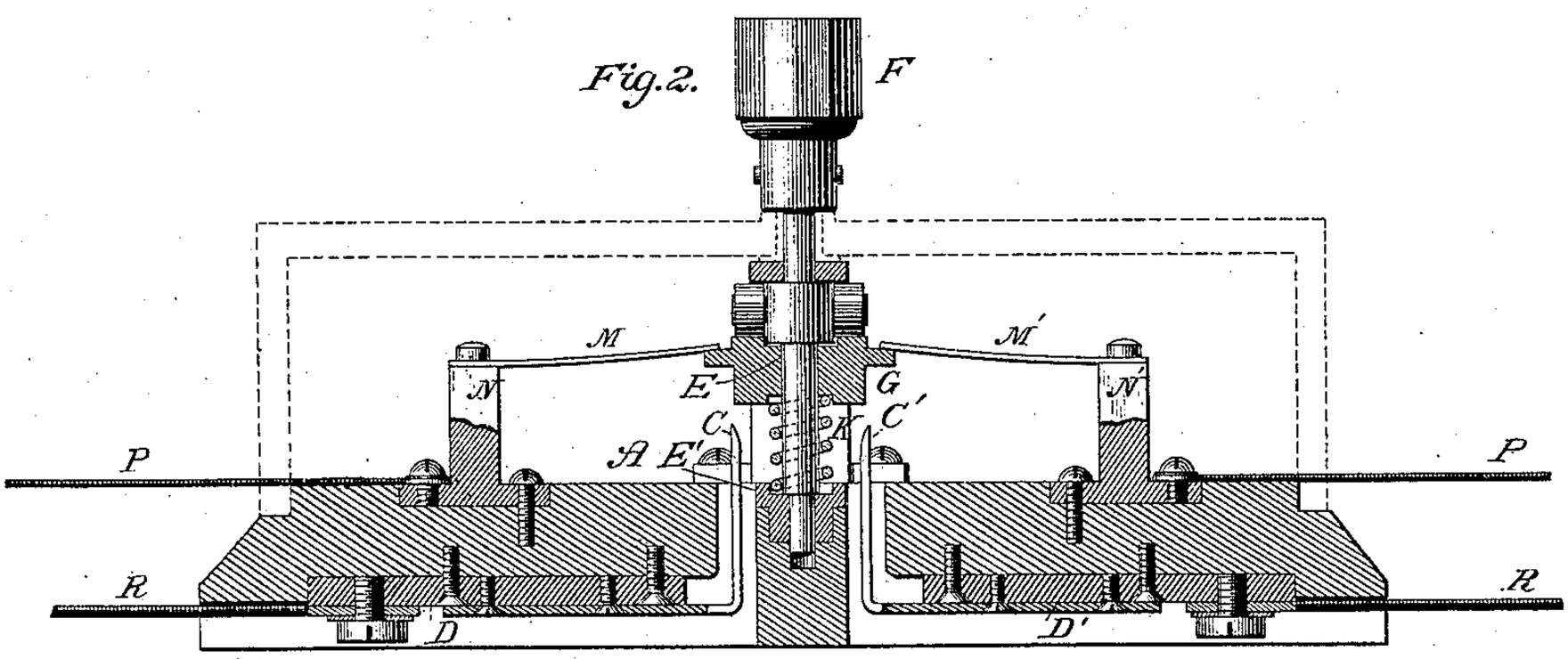
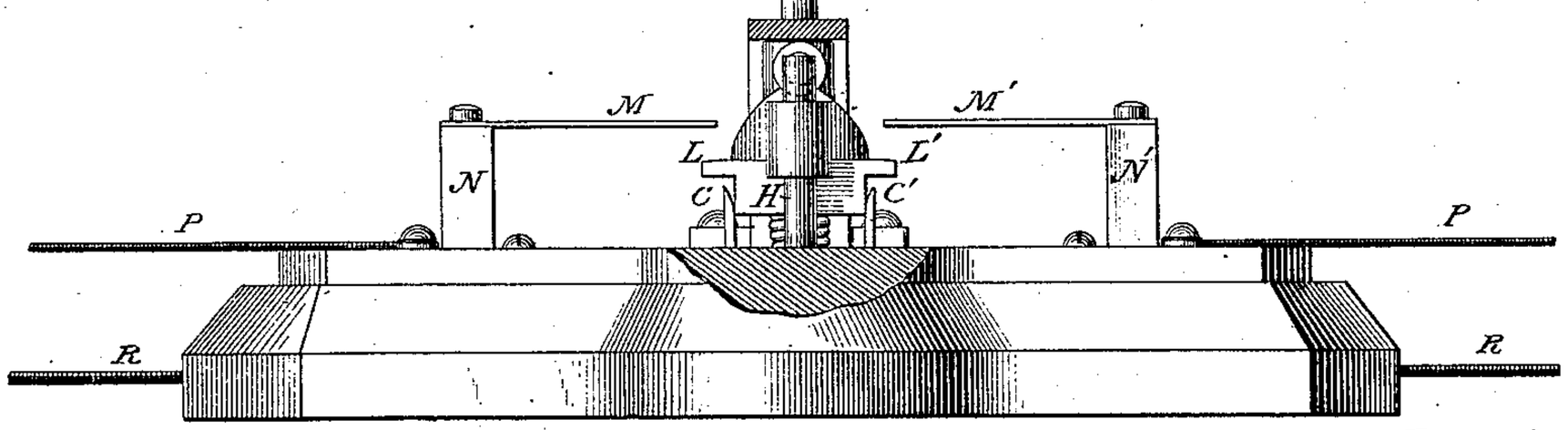


Fig. 3.



Attest:

Raymond H. Barnes.

Wm. J. Nixie

Inventor:

Edward Weston

By Parker W. Page atty.

(No Model.) 2 Sheets—Sheet 2

E. WESTON.

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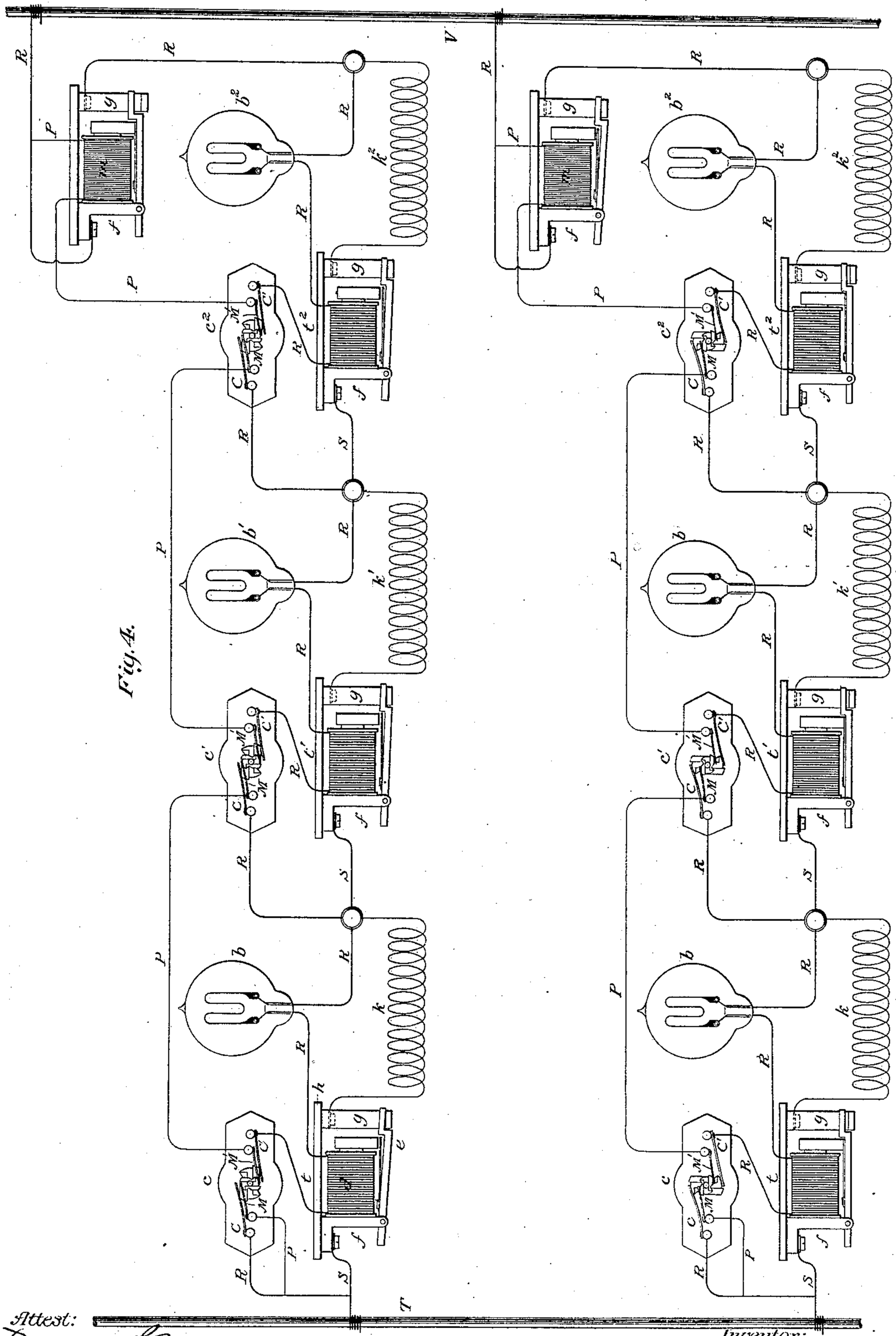

Fig. 4.

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UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE UNITED STATES ELECTRIC LIGHTING COMPANY, OF NEW YORK, N. Y.

SYSTEM OF ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 304,882, dated September 9, 1884.

Application filed February 1, 1884. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, a subject of the Queen of Great Britain, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Systems of Electric Lighting, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

In systems of electrical illumination by means of incandescent electric lamps it is often advantageous to connect two or more lamps in series in cross or multiple circuits. This arrangement, however, presents certain objections, the chief of which is that if any one or more lamps of a series give out or be extinguished the cross-circuit will be broken and the remaining lamps in the series put out. To overcome this objection various systems have been devised for re-establishing the continuity of the circuit in which a break has occurred through a path including a resistance equal to that of the lamp or lamps extinguished. Both manual and automatic means for accomplishing this have heretofore been proposed. The systems heretofore devised for maintaining the continuity of the cross-circuits and compensating for the extinction of lamps, while perhaps overcoming the chief objections to the system, make no provision for a reduction of the amount of electrical energy expended. This it is the object of my invention to accomplish. The system forming the subject of my invention combines with two or more incandescent lamps in series devices in part automatic and in part manual, or adapted to be operated by hand, which are constructed and arranged to introduce into the circuit a resistance in place of and equal to each lamp cut out or extinguished, and cut out all the resistances when the last lamp of the series is extinguished.

In carrying out my invention I make use of a switch of peculiar construction. I will first, therefore, describe the switch and then show the manner of its application, referring for this purpose to the drawings hereto annexed, in which—

Figure 1 is a perspective view of the switch. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a side elevation of the switch with certain parts cut away. Fig. 4 is a diagram illustrative of the system.

Similar letters of reference indicate corresponding parts.

A is a wooden or insulating base, to which is secured a support, B. Below this are two perforations in the base, through which extend springs C C′, secured to metal plates D D′, fixed to the under side of the base.

Passing through the support or frame B is a vertical spindle, E, turning in a step, E′, and provided with a key or thumb-piece, F. On the spindle E is a collar, G, that slides freely on the spindle and on two pins, H H, set in the plate A, and passing through ears or lugs on the collar. The upper edge of the collar G is formed as a double cam, with depressions or notches at the highest points. A pair of rollers or any equivalent therefor are carried by the spindle and bear upon the cam. A spiral spring, K, forces the collar G upward. By turning the key F, therefore, the collar G will be depressed or raised. The lower portion of the collar G presents two flat or square surfaces, with which the springs C C′ are brought into close contact, when, by the manipulation of the key, the collar is depressed.

L L′ are two flanges on the collar above the flat contact-surfaces.

M M′ are flat springs, secured to metal blocks N N′ on the base A, and are set so as to extend into the path of movement of the flanges L L′. These parts are so arranged that when the collar is depressed it establishes the circuit between springs C C′ and interrupts it between springs M M′. When the key is turned to either side out of the notches in the cam, the collar, by the force of the spring K, is thrown suddenly upward, breaking the circuit between springs C C′ without appreciable spark, and bringing the flanges L L′ into contact with the springs M M′. Conducting-wires P R are secured to the plates and blocks N N′ D D′, as shown. This instrument or any equivalent to it in that it makes one circuit

on breaking another, I employ in the system invented by me.

Referring to Fig. 4, let T V designate the conductors of any circuit with which a certain number of incandescent lamps or like devices are to be connected in what is commonly designated multiple series. Two of such series are shown, each comprising an equal though arbitrary number of lamps *b b' b''*. In the vicinity of each lamp is arranged a switch similar to that shown in Fig. 1, and designated by *c c' c''*, and an electro-magnetic cut-out device, *t t' t''*, that shown being a common form consisting of an electro-magnet, *d*, an armature, *e*, pivoted to a metal post, *f*, and a metal back-stop, *g*, the whole mounted on an insulating-plate, *h*. There is also near each lamp and cut out a coil, *k k' k''*, of the same resistance as one of the lamps. A conductor is run from wire T and branched, the branch P is connected to the spring M of the switch *c*, the branch R to the spring C of the same switch, and the branch S to the post *f* of the cut-out *t*. The remainder of the circuits thus started, being designated by the letters P R S, is easily traced. The spring M' of the switch *c* is connected to spring M of the next switch *c'*, and so on, the spring M' of the last switch of the series being connected to the conductor V by a wire connected with a cut-out, *m*, similar to those described, but of very high resistance. The spring C' of the first switch *c* is connected to one of the terminals of the lamp *b* by a conductor, R, including the cut-out *t*. From the other terminal of the lamp the wire R leads to spring C of switch *c'*, and so on, the last lamp terminal being connected to the back-stop *g* of the cut-out *m*. One terminal of the resistance-coil K is connected to the back-stop *g* of the contact *t*, the other to the wire R between the lamp *b* and switch *c'*, and also to the post *f* of the second cut-out *t'*, and so on. The terminal of the last coil of the series is joined to wire R between the last lamp and the back-stop *g* of cut-out *m*. The same order and plan of connections is made whatever the number of lamps in series.

The operation of the system is as follows: If all the switches be turned so as to complete the circuit between springs C C' and interrupt that between M M', then all the lamps will be in circuit, all the cut-out magnets energized, and all the resistance-coils cut out. In other words, the path for the current will be through the circuit R alone. This is the condition of things represented by the lower or right-hand series of lamps in Fig. 4. Should one of the lamps, as *b'*, be turned out by its switch, the continuity of circuit R is interrupted but immediately re-established by the armature of the cut-out *t'*, which falls and completes the circuit around the lamp and through the resistance *k'*. By this means no disturbance is caused, as all the other lamps will receive the same amount of current as before. The act of turning the switch *c'* completes the connection between spring M' of switch *c* and spring M of switch *c''*. Circuit P still remains broken at two points, however, in switches *c* and *c''*. One or more of the lamps in the series may be turned off with similar results. When the last lamp of the series is turned off, the circuit P, through the springs M M', of all the switches is completed. The magnet of the cut-out is then energized and the resistance-circuit S interrupted. The circuit P, being of very high resistance, and the only one remaining complete, allows but little current to pass; hence there is no appreciable loss of energy. It will be observed that by turning any one of the switches from their positions shown in the upper or left-hand series of Fig. 4, the lamp corresponding to it will be at once rendered active by the rupture of the circuit P.

I have described this system as adapted for running ordinary incandescent lamps. I may, however, employ other forms of lamp or electrical devices operating in an equivalent manner.

The special features of novelty shown and described herein in connection with the switch mechanism I do not claim herein, as they have been made the subject of other applications filed or to be filed.

Without confining myself to any special form or arrangement of the mechanical elements herein shown in illustration of the principle of my invention, what I now claim is—

1. The combination, with a circuit and a series of electric lamps included therein, of a series of resistance-coils, devices for interposing the resistance-coils in the place of the lamps when extinguished, a supplemental circuit of high resistance, a device included therein for interrupting the lamp-circuit, and means for closing or completing the supplemental circuit, and thereby interrupting the lamp-circuit, when all the lamps are extinguished, substantially as set forth.

2. The combination, with a main circuit, cross or multiple-arc circuits, and series of electric lamps included in the cross-circuits, of a series of resistance-coils, one for each lamp, devices for interposing the resistance-coils in the place of the lamps when extinguished, supplemental cross-circuits of high resistance, devices included therein for interrupting the lamp-circuits, and means for closing or completing the supplemental circuits, and thereby interrupting the corresponding lamp-circuits, when all the lamps of such circuits are extinguished, substantially as set forth.

3. In a multiple-series system, the combination, with the translating devices of resistance-coils in circuits around said devices, supplemental cross-circuits of high resistance, containing devices for interrupting, when the supplemental circuits are closed, the cross-circuits including the translating devices, switch mechanism for cutting out the translating devices and constructed to close at the same time breaks in the supplemental circuits, and elec-

tro-magnetic devices for bringing in the resistance-circuits when the translating devices are cut out, as and for the purpose set forth.

4. A system of electrical distribution, wherein the lamps or similar translating devices are connected with the circuit in multiple series, each series being combined with the following instrumentalities and parts, arranged in the manner specified, to wit: resistance-coils to be inserted in place of lamps withdrawn, electro-magnetic shunting devices in circuit with the lamps and operating to bring in the resistance-coils on the withdrawal of lamps, a supplemental circuit of high resistance, an electro-magnetic device included therein for interrupting the lamp-circuit when energized by the closing of the supplemental circuit, and switches connected with both lamp and supplemental circuits, and constructed to close a break in the latter when operated for cutting out one of the lamps.

In testimony whereof I have hereunto set my hand this 23d day of January, 1884.

EDWARD WESTON.

Witnesses:
W. FRISBY,
W. H. HARTLEY.