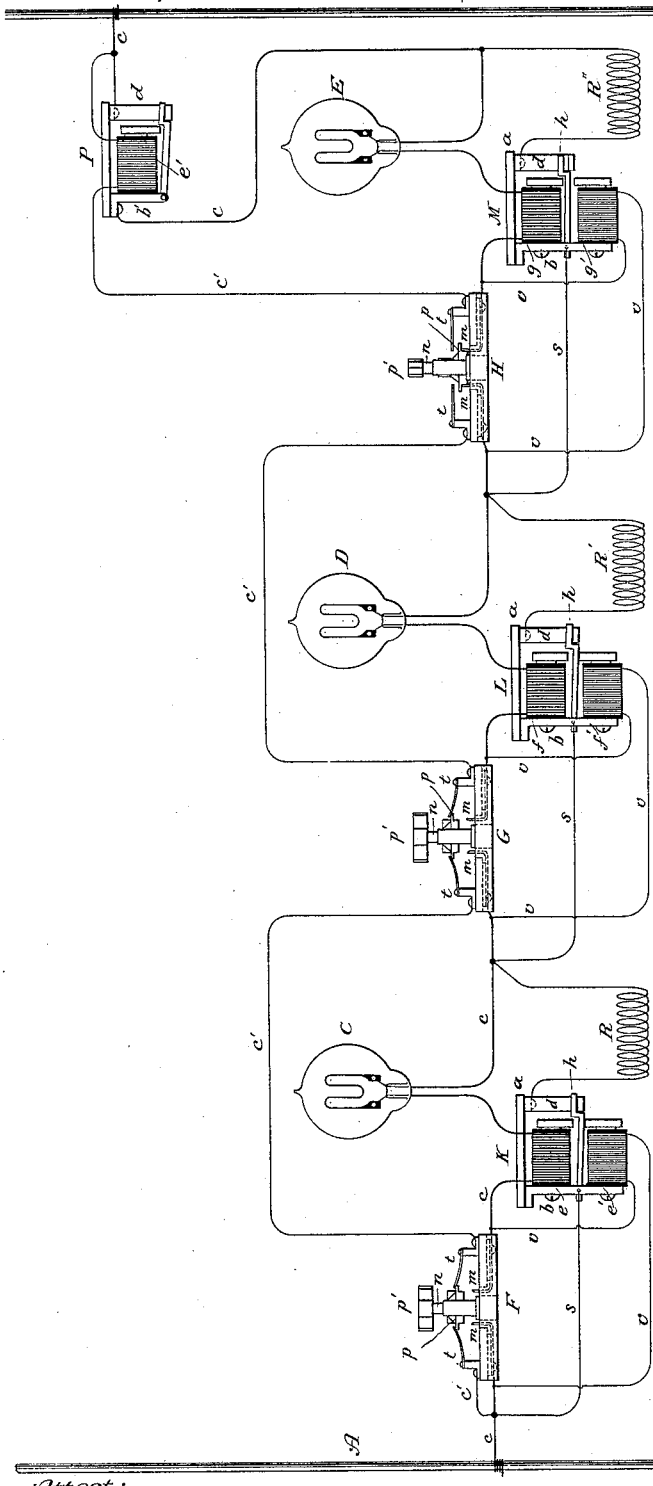
(No Model.)

E. WESTON.

SYSTEM OF ELECTRIC LIGHTING.

No. 304,884. Patented Sept. 9, 1884.



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SYSTEM OF ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 304,884, dated September 9, 1884.

Application filed April 15, 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 drawing accompanying and forming a part of the same.

In an application filed by me February 1, 1884, No. 119,430, I have shown and described a system of electrical distribution in which incandescent lamps are connected up in series in cross or multiple circuits from two main conductors. Each lamp is accompanied by a resistance-coil to take its place when extinguished, and an automatic device to include the resistance in circuit when the lamp is cut out. With each cross-circuit there is combined a supplemental circuit of high resistance, including a device for interrupting the cross or lamp circuit. The supplemental circuit is not closed, however, until all the lamps are extinguished, this being effected by switch mechanisms, each of which closes a break in the supplemental circuit when it is operated for extinguishing a lamp. In systems of this kind an arc is formed between the separating-points of contact of the switch mechanisms, for the reason that this separation precedes the action or operation of the cut-out mechanisms. With the double object of extinguishing this arc or preventing any injurious consequence therefrom, and of securing a more positive action of the cut-out, I have combined with the switches and cut-outs devices which are operated or brought into operation by the action of the switches, and caused thereby to actuate the cut-outs. The special devices which, in illustration of the principle of my invention, I have hereinbefore described consist of electro-magnets of high resistance included in circuits around the switches, and placed so as to operate on the cut-out armatures in opposition to the main magnets. The attractive force of these magnets, under normal conditions, is not sufficient to overcome that of the main magnets. Upon the separation of the contact-points of a switch, however, the amount of current diverted by the resistance of the arc causes the shunt-magnets to instantly draw down the cut-out armature, whereby a circuit equal in resistance to that through the lamp is established around the switch and the arc at once extinguished.

The special character of my invention and the conditions requisite for its successful operation will be understood by reference to the accompanying drawing, which represents diagrammatically one of the cross or multiple circuits in a system of this kind.

A and B designate the conductors of the main line, between which the cross-circuits are formed.

C D E designate an arbitrary number of incandescent lamps included in series in a cross-circuit. In the cross-circuit, which is represented throughout by the letters *c c*, are included switch mechanisms F G H, one for and in the vicinity of each incandescent lamp.

Between the switches and the lamps in the circuit C are electro-magnetic devices K L M, which, for convenience, I term "cut-outs," each consisting of an insulating-base, *a*, metallic standards *b d*, electro-magnets *e e'*, *f f'*, *g g'*, secured to the standards *b*, and armatures *h*, pivoted to the standards *b* between the magnets. The standards *d* are bent at right angles, or provided with back stops, with which the armatures make contact when withdrawn from the magnets *e*, *f*, or *g*.

In circuits formed between the standards *d* and the line *c* are resistance-coils R R' R''.

The switch mechanisms are constructed with two springs or contact-plates, *m m*, set in an insulating-base, and connected with the conductors of the circuit *c*. Between these springs is a vertical spindle, *n*, carrying a metal block or plate, *p*, which, by means of a key, *p'*, is raised or lowered, the special means for effecting this being more fully described in my application above referred to. In its elevated position the block *p* is in contact with two springs, *t t*, secured to posts on the insulating-base and connected with the conductors of a circuit, *c'*, formed between the two wires A and B. The circuit *c'* includes the magnet *e'* of a cut-out, P, similar to those described, but of very much higher resistance. To the stand-

ards b' d' of this device the conductors of circuit c are connected, as shown. Wires s from the circuit c connect with the armatures h, and circuits v are formed from the springs m, and include the magnets e' f' g'. These magnets are of comparatively high resistance, and present to the armatures h poles of the same sign as those of the magnets e f g.

The functions of these devices and their operation are as follows: Assuming that the blocks p are all in contact with the springs m, the circuit c will be closed through the lamps and the circuit c' broken at each switch. If it be desired to cut out one of the lamps, as C, the switch G is turned or operated by raising the block p out of contact with the springs m and into contact with the springs t. This operation is likely to produce an arc between the block p and springs m, which continues until the cut-out L drops and establishes the circuit through wire s and resistance R'. To insure the proper and prompt action of the cut-out the magnet f' is employed. Normally the small amount of current passing in this magnet does not give it sufficient attractive force to draw down the armature from the magnet f. The formation of the arc, however, by creating a greater difference of potential between the springs m, through the circuit v, energizes the magnet f' to such an extent that it neutralizes the effect of the magnet f, so that the armature h drops upon the back stop and the circuit is closed through the resistance R'. This at once extinguishes the arc and prevents the burning of the switch-contacts. A similar action takes place when other lamps are cut out.

It will be noted that when a lamp is cut out by the operation of a switch one of the breaks in the circuit c' is closed. When all the lamps are cut out then the circuit c' will be completed. This is followed by the raising of the armature of the cut-out P and the rupture of the circuit c. By this means a saving of electrical energy is effected.

The number and character of the lamps and switches may obviously be varied without departure from the invention; nor do I confine myself to the specific means for securing a positive action of the cut-out by or through the operation of the switch, but what I have shown I regard as the most practicable plan.

What I claim is—

1. The combination, with an electric circuit and a series of electric lamps included therein, of a series of resistance-coils, switches for extinguishing the lamps, devices for interposing the resistance-coils in place of lamps extinguished, and devices operated or brought into operation by the action of the switches for actuating the devices for interposing the resistance-coils, all substantially as herein set forth.

2. The combination, with a main circuit, cross or multiple circuits, and series of electric lamps included in the cross-circuits, of resistance-coils—one for each lamp—switch mechanisms for extinguishing the lamps, devices for interposing the resistance-coils in place of lamps extinguished, and devices operated or brought into operation by the action of the switches for actuating the devices for interposing the resistance-coils, all substantially as set forth.

3. The combination, with a main circuit, cross or multiple circuits, and series of electric lamps included in the cross-circuits, of resistance-coils—one for each lamp—switch mechanisms for extinguishing the lamps, electro-magnetic cut-outs for interposing the resistance-coils in place of lamps extinguished, and electro-magnets of high resistance in circuits around the switches, arranged to act in opposition to the cut-out magnets, all substantially as herein set forth.

4. In a system of electric lighting, the combination, with a main circuit, cross or multiple circuits, and translating devices included in series in said cross-circuits, of resistances in circuits around the translating devices, supplemental cross-circuits of high resistance, devices contained therein for interrupting, when the supplemental circuits are closed, the cross-circuits containing the translating devices, switch mechanisms for cutting out the translating devices, and constructed to close at the same time breaks in the supplemental circuits, electro-magnetic devices for bringing in the resistances in place of the translating devices cut out, and electro-magnets of high resistance in circuits around the switch mechanisms, and arranged to actuate or operate upon the devices for bringing in the resistances, all substantially as set forth.

In testimony whereof I have hereunto set my hand this 9th day of April, 1884.

EDWARD WESTON.

Witnesses:

HENRY A. BECKMEYER,

HARRY HADFIELD.