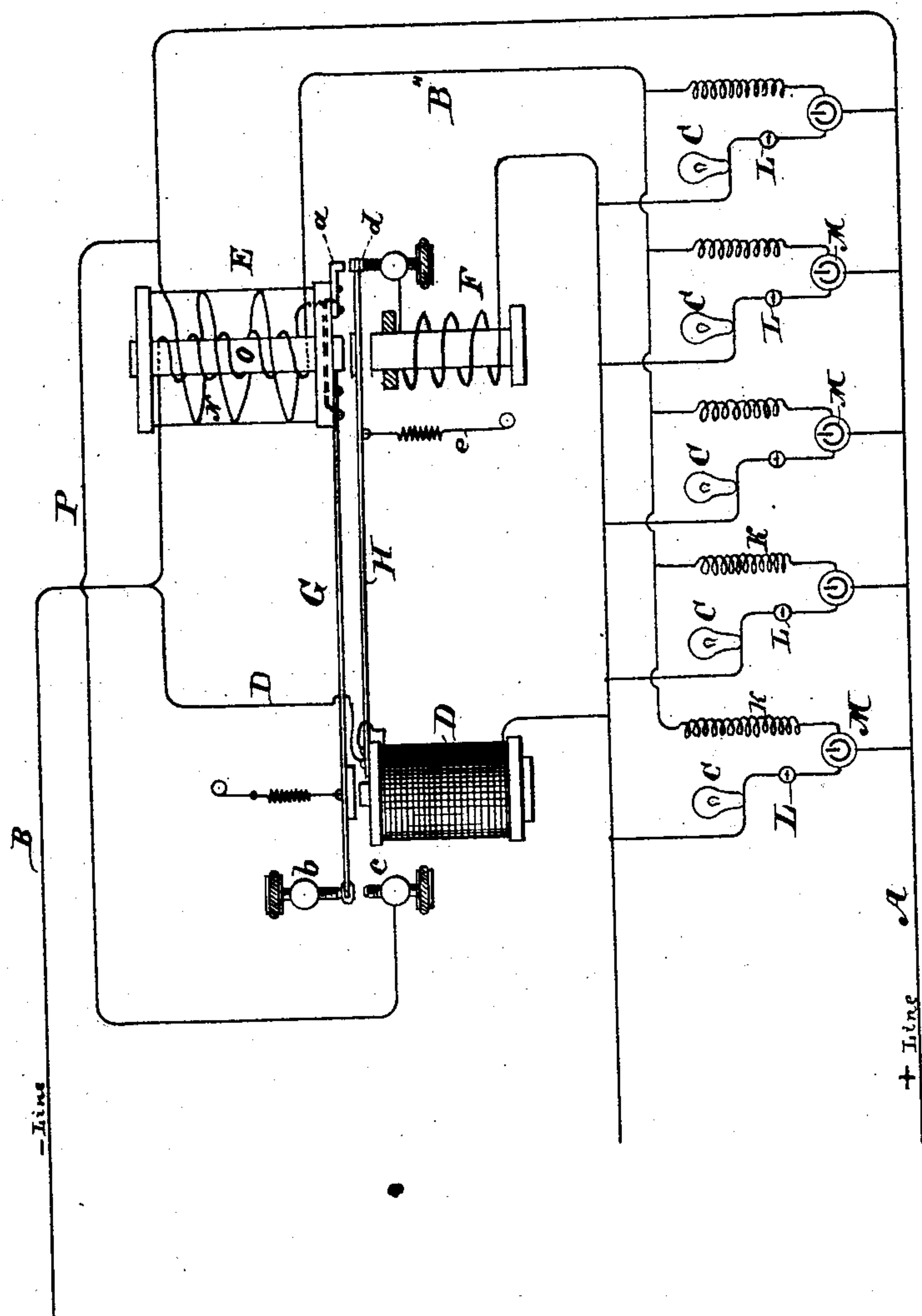


(No Model.)

J. A. POWERS.
ELECTRIC LIGHTING SYSTEM.

No. 360,538.

Patented Apr. 5, 1887.



WITNESSES:

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JOSEPH A. POWERS, OF LANSINGBURG, NEW YORK.

ELECTRIC-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 360,538, dated April 5, 1887.

Application filed January 18, 1887. Serial No. 324,677. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. POWERS, a citizen of the United States, residing at Lansingburg, in the county of Rensselaer, in the State of New York, have invented certain new and useful Improvements in Electric-Lighting Systems, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.
This invention is an improvement in systems of electric lighting by means of incandescent lamps; and it is designed to be applied to a system in which two or more groups of incandescent lamps are run in series with one another in the same circuit.

The purpose or object of the invention will be understood from a brief consideration of the conditions under which I apply it.

I assume the case of a circuit from an ordinary source of current in which are included two or more groups of incandescent lamps, the lamps of each group being in multiple arc, and their number and character being such that when utilizing the total current they all burn with their normal candle-power. Under these conditions each lamp is accompanied by an equivalent resistance, and when any lamp is extinguished, either by accident or design, it is replaced by its appropriate resistance, so that the proper balance and working conditions of the circuit are preserved. In such a system as this there is no economy in the expenditure of energy by turning off one or more lamps of a group, inasmuch as an equivalent resistance is introduced in its place; but when all the lamps of a given group are turned off, as when no longer needed, it is very desirable to cut out or short-circuit the group of resistances until some one or more of the lamps in said group is again brought into use.

My present invention consists of an apparatus for performing automatically these two operations of cutting out or short-circuiting the group when all the lamps therein are extinguished, and of bringing said group back into the circuit simultaneously with the reclosing of the circuit through any one or more of the lamps. The apparatus for effecting this involves various features of novelty, which I shall describe by reference to the drawings,

and subsequently more particularly indicate by the claims.

In the drawings hereto annexed I have illustrated, diagrammatically, a group of lamps and their accessories in conjunction with my improvements.

The various parts of the system are as follows: a main circuit, which may contain two or more groups of lamps similar to that shown, and of which the wires A B form portions on each side of the group of lamps; a given number of incandescent lamps or other translating devices, C; three electro-magnets, D E F, of which the magnets D E only are essential to the operation of the system; a flexible or spring-controlled armature and contact lever, G, arranged to be acted upon by magnet E; a lever, H, of similar character acted upon by either the magnet E alone or by magnets E and F; resistances K, each equivalent to one lamp; manual switches or circuit-breakers L, adapted to interrupt the circuit of a lamp; automatic cut-outs or shunting devices M, of any proper construction, operating to substitute a resistance for a lamp when the circuit through the latter is interrupted. These several devices are arranged in the following manner: That portion A of the main line which may be conveniently designated the "positive" wire is connected to one—preferably the outer—of two coils, N O, which surround the coil of the magnet E. This coil terminates in an insulated contact-stop, *a*, and is connected electrically with the lever G, which vibrates between an insulated back-stop, *b*, and a contact-stop, *c*, to which a branch, P, from the wire A is connected. The negative wire B is divided into the two branches B' B". The branch B' includes the lever H and the magnet F, being completed by the contact of the lever H with the contact-stop *d*. The lamp-circuits are made between this branch and the main wire A. A shunt of high resistance, including the magnet D, is formed around the break at contact *d*. The other branch, B', of the wire B includes the inner coil of the magnet E, and between this branch and the wire A the resistance-circuits corresponding to the lamp-circuits are formed.

The operation of the system is as follows: When all the lamps C are burning, the current

passes through the magnet F, stop *d*, and lever H, and a very small amount through magnet D. The magnet F is used to insure perfect contact between the lever H and stop *d*, and it will be seen that the stronger the current the better this contact will be. This magnet is not indispensable, however, as a simple spring, as *e*, might be used when properly adjusted. If one lamp be now turned off by its switch, the automatic cut-out immediately closes its appropriate parallel path, including a resistance, and transfers its proportion of current to the branch B'. No further change is produced in the apparatus by this act nor by the subsequent removal of lamps and substitution of resistances, except that the magnet E, which, with its appurtenances, may be regarded as the final cut-out energized by its inner coil, increases in attractive force; but the armature-lever is so adjusted by spring H that it is not moved by the magnet E until all the lamps have been removed from circuit. When that is done, however, the lever H is drawn up into contact with the stop *a*, and a new path of low resistance is thus established from wire A through the outer coil, N, of magnet E, the stop *a*, and lever H to line-wire B, which short-circuits the group of lamps and resistances. The current through this path maintains the lever H in contact with stop *a* by energizing the magnet E, while the lever G remains still unaffected by reason of the interruption of the circuit through magnet D. If, under these conditions, a lamp be turned on or brought into circuit, a path is established through magnet D, which may be appropriately termed the "restoring-magnet." The resistance of the circuit through coil N should be such as to divert sufficient current through the magnet D to cause it to draw down the lever G. I have found that a comparatively low resistance will suffice to divert the requisite current, and ordinarily I secure this resistance by making the coil N of about one-half ohm. When the armature G is brought into contact with the stop *c*, the coil N is short-circuited and loses its power, whereupon the armature-lever H is instantly brought down into contact with stop *d*, short-circuiting the magnet D, and in other respects establishing the conditions previously described.

No apparatus other than well-known forms need be constructed for carrying out this invention. The magnets and armatures are of ordinary constructions. I would state, however, that I prefer to use, as a means of controlling the lamps and resistances, an apparatus substantially like that shown and described in United States patent to Little and McDonald, dated April 20, 1886, No. 340,448.

It will now be seen, from the description above given, that this invention involves instrumentalities combined and adapted for effecting substantially the following operations: first, introducing for every lamp extinguished an equivalent resistance; second, short-circuiting the group of lamps and resistances

when all the lamps are extinguished; third, interrupting such short-circuit and re-establishing the proper working conditions when any one or more lamps is again brought into circuit. From the character of the apparatus it will be seen that this is effected at a very small waste of energy, and that the proportion of diverted current required in restoring the said working condition is very small.

I am aware that cut-outs for groups of lamps which short-circuit such groups when all the lamps are out of circuit are not broadly new; but

What I claim is—

1. In a system of electric lighting, the combination, with a given number or group of electric lamps or equivalent resistances in multiple or parallel branches of the circuit, of a cut-out or short-circuiting device adapted to be brought into operation by the removal of all the lamps in said group, and a restoring device adapted to be brought into operation by the closing of one or more of the lamp-circuits when the group is short-circuited, as herein set forth.
2. In a system of electric lighting, the combination, with a group of lamps and equivalent resistances and a final cut-out adapted to short-circuit said group of lamps and resistances when all the lamps are extinguished, of an electro-magnetic circuit-controller adapted to short-circuit the final cut-out and thereby restore the group of lamps to a working condition when circuit is re-established through any one or more of the lamps, as herein set forth.
3. The combination, with a group of electric lamps or similar translating devices accompanied by resistances to be substituted for the lamps when extinguished and included in parallel branches of a circuit, of an electro-magnetic short-circuiting apparatus or final cut-out controlled and operated by the distribution of current through the lamps or the resistances, substantially as set forth.
4. The combination, with a circuit severed and branched, of a group of incandescent lamps and corresponding resistances in multiple arc between one portion of the circuit and the branches of the other portion, respectively, and a short-circuiting apparatus or final cut-out operated by the distribution of current through the lamp and resistance branches, as set forth.
5. The combination, with a circuit severed and branched, of a group of incandescent lamps and corresponding resistances in multiple arc between one portion of the circuit and the branches of the other portion, respectively, an electro-magnetic short-circuiting apparatus or final cut-out included in or connected with both of the said branches, and a short-circuiting or restoring device in a short circuit around the final cut-out and adapted for operation, as herein set forth.
6. The combination, with the lamps C and resistances K in independent multiple circuits

between the branches B' and B'', respectively, of the contact-levers G H, the cut-out magnet E, with one coil in branch B'' and the other connected with the main wire A, and the re-
5 storing-magnet D in a shunt or branch from the branch B', these parts being combined for co-operation in the manner set forth.

7. In an apparatus of the kind described, the combination, with the short-circuiting
10 magnet with a coil in circuit with the resist-

ances, of a magnet, F, in circuit with the lamps and adapted to secure a more intimate contact between the contact-lever H and the stop d, as set forth.

Signed this 15th day of January, 1887.

JOSEPH A. POWERS.

Witnesses:

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