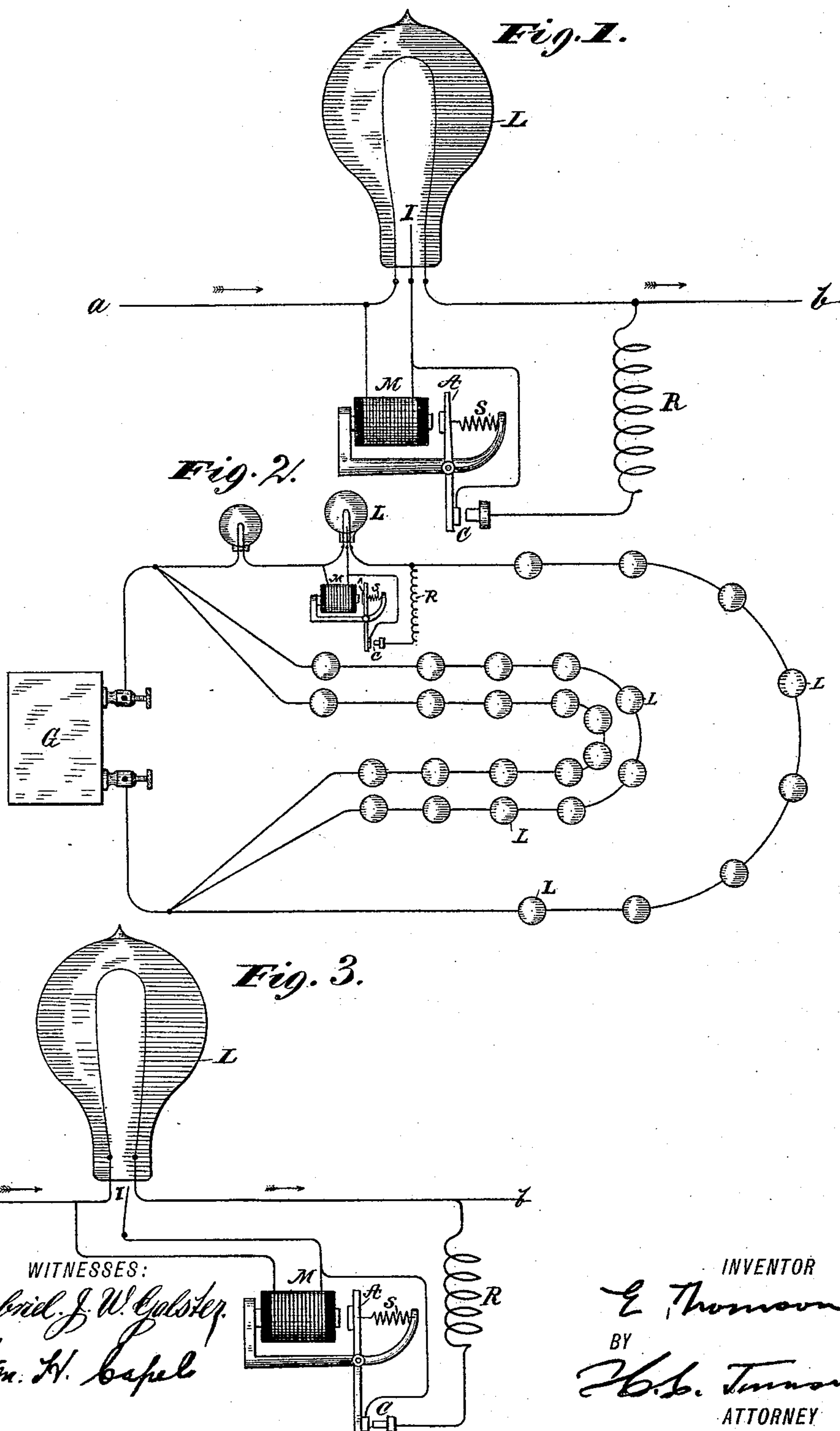


(No Model.)

E. THOMSON.  
LAMP CUT-OUT AND SYSTEM.

No. 454,782.

Patented June 23, 1891.



# UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

## LAMP CUT-OUT AND SYSTEM.

SPECIFICATION forming part of Letters Patent No. 454,782, dated June 23, 1891.

Application filed March 20, 1886. Serial No. 195,881. (No model.)

*To all whom it may concern:*

Be it known that I, ELIHU THOMSON, a citizen of the United States and a resident of Lynn, in the county of Essex, and State of Massachusetts, have invented a certain new and useful Incandescent-Lamp Cut-Out and System, of which the following is a specification.

My invention relates to incandescent electric lamps operated on a series circuit in series with other lamps or other devices; and the object is to provide for an interruption of the series circuit by the rupture of the lamp-filament or incandescing conductor, and in such case to establish a shunt or short circuit around the defective lamp, whereby the continuity of the circuit may be maintained for the lamps or other devices in series with the lamp whose filament may become ruptured. Devices constructed for use with lamps or other devices on series circuits and operating to complete and maintain a branch around a defective apparatus in case of emergency are ordinarily termed in the art "cut-outs," and the term "cut-out," as hereinafter used, is to be understood as applying to a device of this general nature.

My invention consists in the combination, with an incandescent electric lamp of any of the types in which the incandescing-conductor is included in an exhausted or vacuum globe or receiver; of a normally-idle wire or conductor extending between the sides of the incandescing filament, in combination with cut-out devices operated by the passage of an abnormal current in said idle-wire. The said normally-idle wire or conductor, which may be also termed an "auxiliary conductor" for the lamp, preferably extends into the exhausted globe or receptacle which contains the filament of the lamp, but is electrically connected outside said globe with suitable conductors, through which the current which brings the cut-out devices into operation on rupture of said filament may flow. In some cases, however, it may be found desirable to locate this normally-idle wire or auxiliary conductor entirely without the globe or receptacle, but in proper proximity to the two lamp-wires. In the latter case, how-

ever, the arc which forms within the lamp on rupture of the conductor must burn to the outside of the globe before it reaches the normally-idle wire, and for that reason I prefer to employ the arrangement wherein the normally-idle wire extends into the vacuum globe or receptacle and into proper proximity to the incandescing filament, so that it may take up immediately the arc forming in the vacuum space on the rupture of the filament or incandescing conductor.

My invention may be applied to incandescent lamps run in series on any kind of a system; but I have herein illustrated it as applied to a system wherein several series circuits are fed from the same source in multiple with one another.

Figure 1 shows one of the preferable forms of the invention. Fig. 2 shows diagrammatically the application of the invention to the system specified. Fig. 3 illustrates an arrangement of the auxiliary wire or conductor between the lamp wires or conductors outside the vacuum globe or receptacle.

In Fig. 1, L indicates an incandescent lamp of the usual type, having a filament or incandescing conductor mounted within an exhausted globe or receiver upon suitable lamp wires or conductors in any ordinary or proper way.

I is the normally-idle wire or conductor, which is combined with the cut-out devices that are operated by the passage of an abnormal current in said wire upon rupture of the filament. This wire is termed a "normally-idle wire" because under normal conditions of the lamp little or no current passes through it and the cut-out devices can only be called into operation by the rupture of the filament and the passage of an increased amount of current through such wire. The wire or conductor I is connected to the circuit of the lamp, as—for instance, by connection to one of the entering conductors *a*. The contacts of the cut-out switch or lever that completes the branch or shunt circuit around the lamp are indicated at C.

M is an electro-magnet, the coils of which are included in the connection of the normally-idle wire, as indicated, so that the ab-



normal current flowing through said wire on the rupture of the filament will energize the magnet. A is the armature of said magnet, attached to the cut-out lever, and S is a suitable retractor. When the magnet M is sufficiently excited, the contacts of the cut-out are closed at C, thus establishing the cut-out or shunt path from the wire *a* around the lamp to the wire or continuation of the circuit *b*. The cut-out lever is held in position to maintain the circuit by the action of coils upon the magnet M after the manner frequently employed in connection with cut-out devices, such coils being in the present instance the coils which are included in the circuit of the normally-idle wire. When the contacts C are closed by the action of the magnet, the current flows from *a* to *b* through the coils M, and thence through the cut-out contacts C and the wire *b*. The branch or cut-out circuit thus established may be of any desired resistance, but is preferably of a resistance equivalent to that of the lamp, for which purpose an artificial resistance R may be included in the branch or shunt circuit.

In normal operation the current enters at *a*, and is conducted through the filament of the lamp L and out at *b* without affecting the other devices; but should the filament break and burn out and a high potential exist on the line the current traverses the vacuum space as a sort of diffused arc, which will travel downward toward the base of the lamp and exist between the conducting-wires. The third wire I will evidently be immersed in this path or arc, the result of which will be the passage of a small current through the magnet M over the wire I to the wire of the lamp connected to *b*. The magnet M thus energized attracts its armature A and closes the contact at C. The arc in the base of the lamp now ceases, the whole current now passing from *a* through the magnet M, through the contacts at C and resistance R to *b*, the condition of the lines as to resistance being scarcely affected, if at all. The circuit is now complete through the cut-out device, and current may flow without interruption through other devices on the circuit with the lamp whose filament is broken.

My device thus constituted is introduced, as shown in Fig. 2, at any point in the series of lights operated from a generator G. Other

lights may at the same time be fed from the same generating source in multiple arc.

It is not essential that the wire I be placed in the lamp, as the arc formed will follow down into the base of the lamp along the wires and even outside of the lamp. This wire I may therefore be placed between the conductors on the exterior of the lamp, as shown in Fig. 3; but this is not so desirable an arrangement, because, as already stated, the arc must make its way outside the lamp before the cut-out device can be operated by the passage of the current through the auxiliary wire or conductor.

I do not limit myself to using the magnetizing action of the current flowing in the third wire on rupture of the filament to operate the cut-out device, since the current might be made effective in other ways, as well understood by electricians.

What I claim as my invention is—

1. An incandescent electric lamp provided with a normally-idle wire extending between the sides of the looped filament, in combination with cut-out devices operated by the passage of an abnormal current in said idle-wire.

2. An incandescent electric lamp provided with a normally-idle wire extending between the sides of the looped filament and connected outside the lamp to one of the lamp-wires, in combination with cut-out devices operated by the passage of an abnormal current in said idle-wire.

3. The combination, with an incandescent electric lamp, of an auxiliary normally-idle wire or conductor extending into the vacuum or exhausted receiver, which contains the incandescing conductor of the lamp and connected outside of the lamp with the circuit thereof, and a cut-out device for short-circuiting the lamp, operated by the passage of an abnormal current in said idle wire or conductor upon rupture of the filament or incandescing conductor, as and for the purpose described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 16th day of March, A. D. 1886.

ELIHU THOMSON.

Witnesses:

M. L. THOMSON,  
WM. F. NOONAN.