(No Model.)

E. THOMSON.

ELECTRIC ARC LAMP.

No. 489,046. Patented Jan. 3, 1893.

Fig. 1.

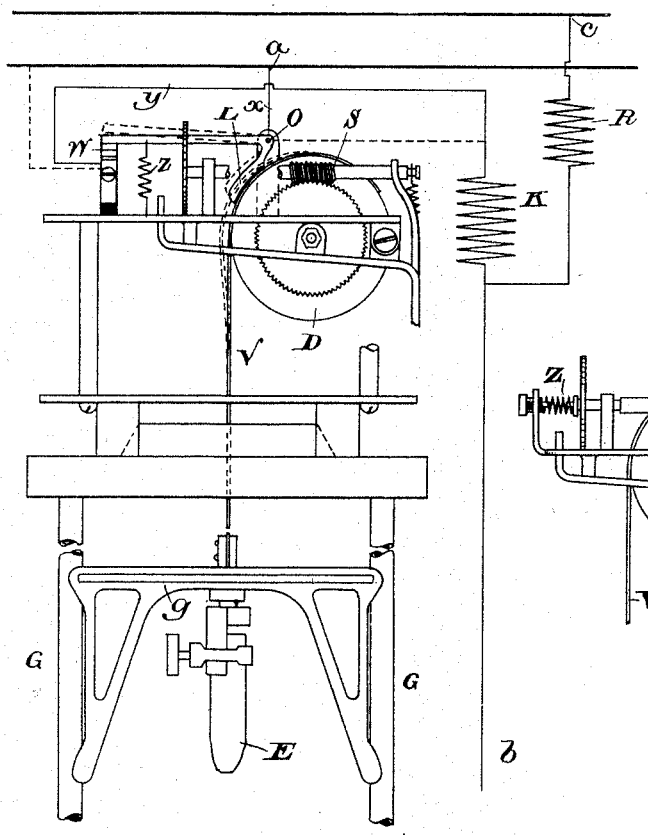


Fig. 2.

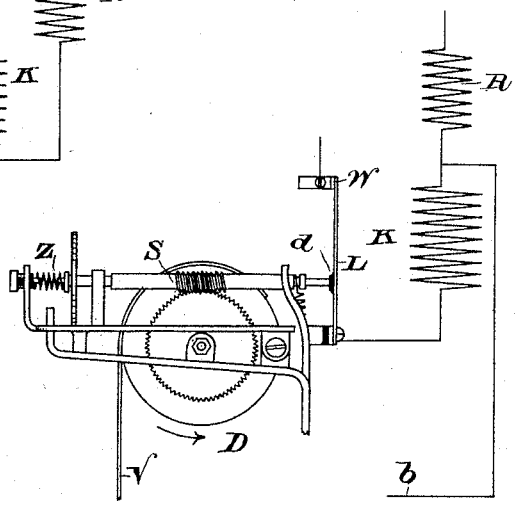


Fig. 3.

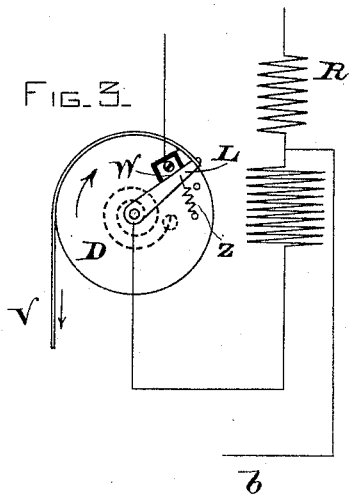
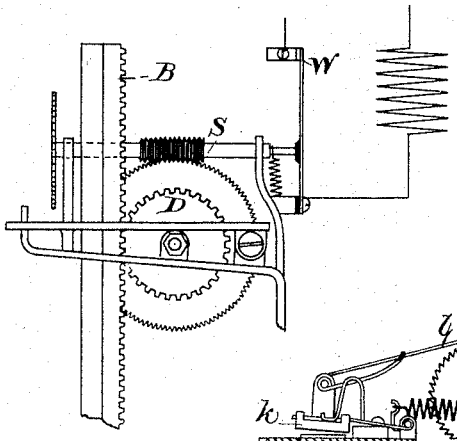


Fig. 4.



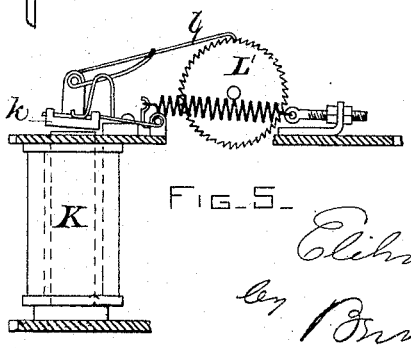


Fig. 5.

Witnesses.

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Attys

UNITED STATES PATENT OFFICE.

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

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 489,046, dated January 3, 1893.

Application filed February 4, 1892. Renewed November 14, 1892. Serial No. 451,907. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Safety Devices for Electric-Arc Lamps, of which the following is a specification.

The present invention relates to safety devices for arc lamps, and its object is to cut out the lamps, or a portion thereof exposed to undue current when for any reason the carbon stops feeding while the current is still on the line. This I accomplish by a circuit controller connected to the feeding mechanism or to the motion transmitting connections between the feed actuator and the carbon holder, and acting to control a safety cut-out, which may serve to cut the entire lamp out of circuit or to simply cut out the feed actuating magnet. It is preferred to cause the cut out to operate on the cessation of feed to render the feeding magnet inoperative. This may be done in various ways. I have shown my lamp as applied to a multiple arc or multiple series system, and in that case the cut-out is preferably made to break a derived circuit including the feed regulating or actuating magnet.

My invention is particularly designed to operate on the stoppage of the feeding of the upper carbon due to its consumption or to its catching or holding up abnormally, to cause the effort of the feeding magnet in attempting to force the feed of the carbon, to open its own circuit finally whether the circuit of the lamp itself opens or not. I thus avoid an extreme potential or current reaching the feeding magnet and the lamp may continue burning with too long an arc without affecting the shunt feeding magnet.

In the accompanying drawings Figure 1 is an elevation of a portion of an electric arc lamp embodying my invention. Figs. 2, 3, and 4 show modifications. Fig. 5 shows the feeding magnet and mechanism.

In Fig. 1 my invention is shown applied to the type of lamp shown in my United States Patent No. 458,025, dated August 18, 1891, in which the support of the upper carbon is on a metallic ribbon carried upon a drum in which the feeding action is caused by the lowering of the ribbon, or the rotation of the drum in the direction to slack the ribbon, such rotation being obtained by the action of the feeding magnet. If such rotation occurs when the ribbon is incapable of descending, as when the upper carbon has reached its limit, then the forces at work are opposed and I utilize the movements obtainable under such condition to operate an open circuiting switch for open circuiting the controlling fine wire magnet controlling the feed.

In Fig. 1 those parts of an arc lamp concerned in the operation of my invention are shown alone, E being the upper carbon mounted on a frame g adapted to move vertically between the rods G, G, in feeding, and suspended by the ribbon V. This ribbon V is wound upon a drum D and is unwound from the same by the rotation of a screw S operated by the derived circuit magnet, as in my former invention, the details of the feeding mechanism being shown in Figs. 2 and 5. The coil K of such magnet is connected in a circuit between the terminals a, c, of the lamp, such circuit including a switch W. This circuit is in derivation with the circuit from a to b to the arc.

R indicates a resistance in the lamp circuit, being a choking coil or sluggishing coil. So long as the carbon E is free to descend the ribbon V remains tight on the drum D but after it has reached its limit of descent, the feeding action continuing, rotates the drum D to slack the ribbon V and by that means raises the shoe L which bears on the ribbon, which shoe is attached to a lever pivoted at O and serves to lift the movable contact of the switch W from the fixed contact under it, the changed position being shown by dotted lines. Should the carbon E be allowed to descend and again tighten the strip or ribbon V the spring Z closes contact at W by pulling down the switching end of the lever and compressing the shoe upon the ribbon again.

As shown in full lines in Fig. 1, the circuit controller W opens only the circuit of the shunt magnet K, so that the arc may continue to burn when the carbon stops feeding. By omitting the connections x, y, and substituting those shown in dotted lines, the opening

of the switch may be caused to cut the entire lamp out of circuit.

The feeding mechanism shown in Figs. 2 and 5, consists of a ratchet wheel L' and pawl *l* driven by the armature *k* of the shunt magnet K, and a worm and worm wheel gear driven by said ratchet wheel and driving the rotating drum or support D for the carbon holder, the ribbon V which supports the carbon holder being carried by and winding on said drum.

In Fig. 2 the action is modified as follows. Instead of relying upon the slacking of the ribbon V to operate the switch which open circuits the magnet coil K or feeding magnet, the shaft on which the screw S exists has a certain freedom of motion endwise, such shaft being turned by the action of the feeding mechanism under the control of the magnet K in obvious manner to drive the drum D in the direction shown by the arrow, that is to slack or lower the ribbon V to which the upper carbon is attached or by which it is carried. So long as there is a downward tension on V due to the weight of the carbon with its holder &c. there is a tendency to carry the screw shaft S to the left in the figure in its bearings and therefore allow the switch contact at W to remain closed, the end of the screw shaft just clearing the lever or spring L at *d*. Should the movement of the ribbon V downward be stopped so as to entirely relieve it of any tension, then the action of the screw in tending to turn the drum D in the direction of the arrow will be met by a moderate counter-action which will carry the screw shaft S to the right. This will cause the end of the shaft to press against the lever L at *d* and open the contact W with which the coil K, which represents the feeding magnet of the lamp or shunt magnet, is attached. The opening of the contact at W consequently opens the circuit of the magnet coil K. The action just mentioned is made the more certain by the fact that in such a lamp structure there is often a spring of limited power tending to rotate the drum in the opposite direction to the arrow and keep the ribbon V tight, the weight of the upper carbon holder and its attachment being sufficient, however, to overcome such spring and turn the drum in the direction indicated, during the feeding. Another device having the same effect, is a compression spring Z, Fig. 2 placed between the end of the shaft S and a fixed point, and tending to force the screw shaft S to the right. This spring should not be powerful enough to overcome the downward tendency of the ribbon or strip V under normal conditions, or in other words, it should remain compressed until for some reason, such as the carbon holder reaching the limit of its descent, or the sticking of the guides of the carbon holder, the ribbon V slacks, when the spring Z being under compression, forces the shaft S to the right and opens the switch contacts W, cutting the shunt or feeding coil out of a circuit, even though at the time the normal length of the arc between the carbons may still exist.

In Fig. 3 the device is modified to work in a slightly different manner involving the same general principles. In this case there is carried a switching lever L to the outer end of which is attached the ribbon V, and which under normal conditions on account of the weight tending to pull the ribbon V downward, keeps a contact W closed, the normal tendency of the ribbon V being downward as indicated by the arrow, and a spring in the drum D tending to turn it in the opposite direction, it is manifest that these two forces will continue to keep the contact W closed. This contact is in circuit with the derived circuit or feeding magnet coil K shown diagrammatically. Now on the release of the downward tendency of the ribbon V and the continuance of the rotation of the drum D in the direction of feed of the carbon by the action of the feeding screw and magnet, the switch W is at once opened and is assisted in opening by a small spring Z.

As shown in Fig. 4, in case of the use of a rack rod B carrying the upper carbon, the device shown in Fig. 2 may be used. Thus, if a downward tendency of the rack rod exists, the feeding screw shaft S is held to the left in its bearings, while if the downward tendency of the rod B is stopped, as by reaching its lowest limit of descent or by sticking, the rotation of the screw shaft S being now unable to move the wheel D so as to depress the rod B results in a slipping or screwing along to the right of said screw shaft S and the opening of the switch W in a manner indicated in Fig. 2.

While I have shown my invention applied to the specific purpose of open circuiting the feed regulating magnet, on the failure of the carbon rod to move, it is obvious that it may be applied to cutting out any part of the lamp which is endangered by the failure to feed, and in fact may be used to cut out the lamp itself, if so desired. In any case, the nature and connections of the cut out would depend on the nature of the lamp and circuit used. Thus, in a multiple arc or multiple series system, the cut out as shown, open circuits a part of the lamp which is in derivation with the arc or open circuits the lamp itself. In a series system, on the other hand, the controller is preferably made to short circuit either the whole lamp, or preferably, the feed regulating magnet only.

What I claim as new and desire to secure by Letters Patent is:—

1. In an electric arc lamp, the combination with the carbon and the feeding mechanism therefor, of a cut-out device connected to one of such parts and responsive to difference in movement between them, due to stoppage of the carbon holder, and operating to cut out a part or the whole of the lamp.

2. In an electric arc lamp, the combination with the carbon and the feeding mechanism of a circuit controller operatively connected to both of such parts, and responsive to a difference in movement between them, and operating to cut out a part or the whole of the lamp.

3. In an electric arc lamp, the combination with the carbon and the feeding actuator, and a mechanism or part between such parts, of a circuit controller operatively connected to such intermediate mechanism or part, and responsive to a difference of movement between them, and operating to cut out a part or a whole of the lamp.

4. In an electric arc lamp, the combination with the carbon, a feed regulating magnet and armature, and connecting mechanism between such parts, of a circuit controller operatively connected to such connecting mechanism, and responsive to a difference in movement between the parts of said connecting mechanism, and operating to cut out the said feed regulating magnet.

5. In an electric arc lamp, the combination of the carbon-holder, a supporting and feeding mechanism therefor having a part movable in a direction to feed the carbon, and also movable in a second direction on stoppage of the carbon holder, a feeding actuator acting on said part and causing both of said movements, and a circuit controller operatively connected with such part and connected to the circuits of the lamp so as to cut out a part or the whole of the lamp, in said movement in the second direction.

6. In an electric arc lamp the combination of the carbon holder, a support therefor having a part connected directly or indirectly to, and movable in a direction to feed the carbon, and also movable in another direction, means for moving it in such second direction, in opposition to the action of the weight of the carbon holder, and a circuit controller operatively connected to such part and responsive to its movement in said second direction to cut out a part or the whole of the lamp.

7. In an electric arc lamp, the combination with the carbon holder, a feed regulating magnet in shunt circuit to the arc, a support for the carbon holder movable under control of said magnet, a circuit controller for said shunt circuit, engaging with a part of said support, and actuating means for moving said part and the circuit controller in a direction to open the shunt circuit when the support is released from the weight of the carbon holder.

8. In an electric arc lamp, the combination with the carbon holder, a part supporting and operating the same, being held in one direction by the weight thereof, but free to move in another direction when released from such weight, actuating means for moving such part in said second direction, and a shunt circuit controller operated by said part, when moved in the second direction.

9. In a multiple arc or multiple series arc lighting system, the combination in each lamp, of a carbon holder, a feeding mechanism therefor, a magnet in shunt circuit with the arc, and a circuit controller in the shunt magnet circuit engaging with a part of the feeding mechanism, and operated by a difference in movement of its parts due to stoppage of the carbons to open said shunt circuit.

10. The combination of the carbon holder, the rotary support, the actuator for the support, the ribbon suspending said holder from the support, and the circuit controller engaging with said ribbon and cutting out a part or the whole of the lamp.

In witness whereof I have hereunto set my hand this 30th day of January, 1892.

ELIHU THOMSON.

Witnesses:
JOHN W. GIBBONEY,
BENJAMIN B. HULL.