(No Model.)

B. B. WARD.

ELECTRIC ARC LAMP.

No. 564,907. Patented July 28, 1896.

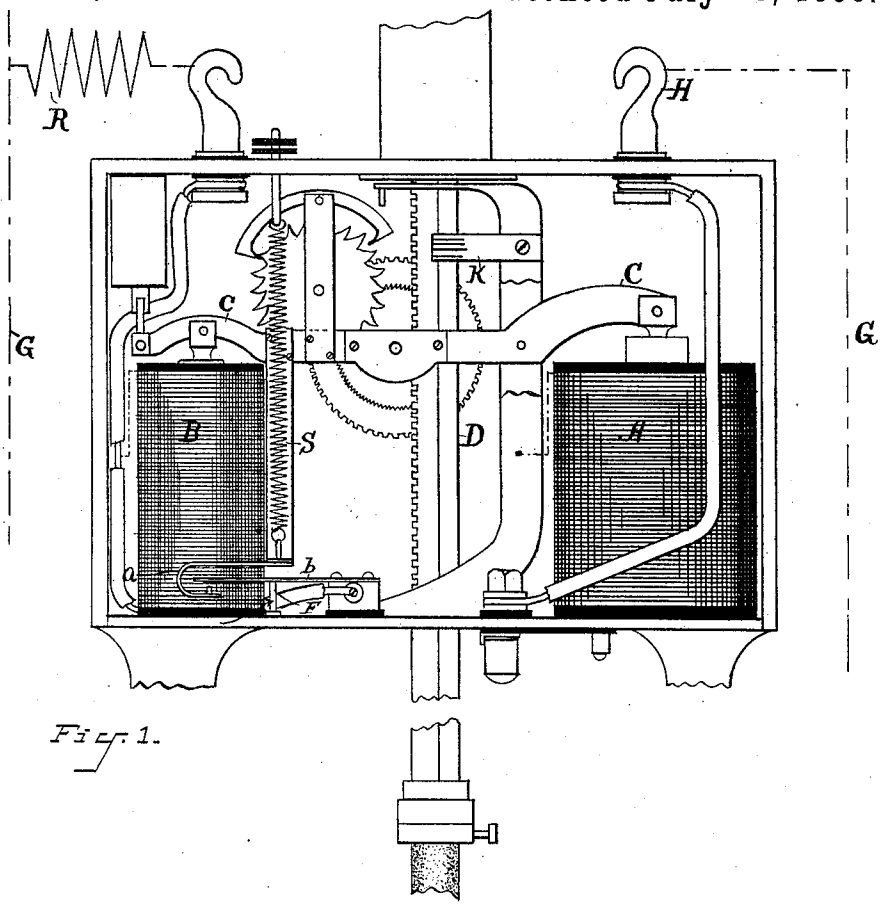
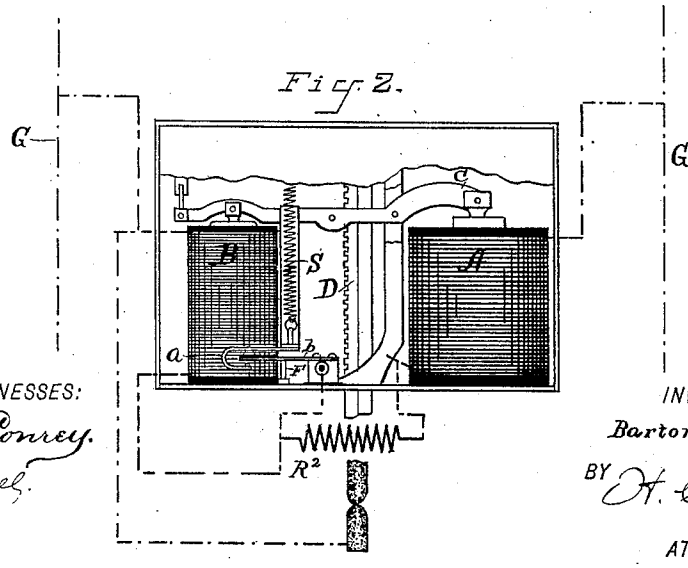


Fig. 1.

Fig. 2.



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UNITED STATES PATENT OFFICE.

BARTON B. WARD, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 564,907, dated July 28, 1896.

Application filed February 15, 1893. Serial No. 462,455. (No model.)

To all whom it may concern:

Be it known that I, BARTON B. WARD, a citizen of the Dominion of Canada, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Electric-Arc Lamp, of which the following is a specification.

My invention relates to safety devices for electric-arc lamps, and is designed more especially for use on arc-lamps run from what are known as "constant-potential" circuits or for arc-lamps which are unprovided with a "cut-out" for closing a safety low-resistance short circuit around the lamp.

The invention provides a simple and effective device for protecting the shunt or derived circuit coil of the lamp from injury; and it consists in the combination, with the lever or other device which is operated upon by said coil for the purpose of regulating or adjusting the arc, of a circuit-breaking device in the circuit of said derived-circuit coil adjusted to open said circuit when the arc becomes abnormally long or the arc breaks and the lamp goes out of action, but to maintain the circuit of the derived-circuit coil through the normal movements of the lever or other device in regulating the feed of the carbon. As will be evident, the circuit opened may be the only one through the coil, or the opened circuit of the coil may be in part a shunt of a resistance, so that the effect of allowing the circuit-breaker to act is to throw a high resistance onto the circuit of the coil and sufficient in amount to protect it from injury. It will be obvious that the operation is to all intents and purposes the same in both cases, the resistance in the circuit in the first case being infinite and in the latter finite, but sufficiently high for the practical purpose of protecting the coil from damage. The invention is in the first form, however, better adapted for lamps in which the lamp-regulating mechanism is operated by a differential magnet or magnet-coil system, one of which coils is in the arc-circuit and assists in starting the lamp and not so well adapted for use with lamps where a derived-circuit coil alone is used for operating on the mechanism to regulate and form the arc. The form in which the opening of the circuit is accompanied by the shunting in of a resistance might be employed with lamps having a regulating-coil consisting of a derived-circuit coil or coils only, since the circuit of the coil is preserved through the resistance which is shunted in, and by proper adjustment the current may be allowed to flow through such resistance in such amount that said coil may, without other accessory devices or appliances, be effective in starting the lamp.

My invention consists, further, in the combination of the lever or similar movable part of the lamp mechanism which is acted upon by the derived-circuit coil, of a "following" circuit closer and breaker adapted by its following contacts to keep the circuit through the coil closed in normal movements of said lever, but on movement beyond to break the circuit.

In the accompanying drawings, Figure 1 is a side elevation of a part of a lamp mechanism in which my invention is embodied. Fig. 2 illustrates a modification wherein the breakage of circuit results in the shunting in of an artificial resistance in the circuit of the coil.

Referring to Fig. 1, B indicates the derived-circuit coil of an electric-arc lamp, said coil operating upon a suitable lever or other support C, which carries the devices for regulating the feed of the carbon. The coil acts upon the lever or other support through a core, armature, or equivalent portion of the coil attached to the lever.

In the form of lamp herein shown the lever or support C supports the regulating mechanism of the lamp, which mechanism may be of any desired character, but as herein indicated consists of a clockwork mechanism to which is connected the upper-carbon carrier D, in such manner that the lever forms the support for both said mechanism and the carbon-carrier. As well understood in the art, the lifting of the lever will separate the carbons to form the arc or lengthen the same if the magnet B decreases in power, while a movement in the opposite direction under the influence of said coil will result in a feed of the carbon downward to compensate for combustion.

The form of lamp herein shown is one that is common in the art and that has a main-circuit coil A operating differentially with coil B through attachment of its armature or

other device to the short arm of lever C at the opposite side of the fulcrum for operating differentially or in any other desired manner. The coil A is included in the circuit of the arc in the ordinary manner.

When the parts are organized as shown, the action of the coil A is assisted by means of a spring or other device, as shown, acting in opposition to magnet B, which tends to pull the support C down in a direction to allow the carbons to come together. The support plays up and down under the varying influence of the coil B in the operation of regulating the feed of the carbon. In the circuit of said coil is a circuit closer and breaker, of any desired description, that is operated by the support C.

In the circuit closer and breaker here shown the two members are supported, respectively, by the lever C and by the base of the lamp, one member being in the form of a hook *a*, which is carried by an arm or hanger depending from lever C, while the other consists of a spring *b*, with which said hook is adapted to engage.

The spring *b* preserves the circuit or connection at the contacts and follows the movement of *a* and lever C in the proper way to keep the circuit closed during the normal movements of the lever C. When, however, the latter moves down by gravity to the abnormal extent which accompanies the abnormal lengthening of the arc or an absolute rupture of the same, the contacts of the circuit-closer separate and the circuit is broken. This point of separation will be determined, of course, by the adjustment of the parts, and the separation may be insured by the placing of a stop in proper position beneath the member B of the circuit-closer, as indicated at F.

G G indicate constant-potential mains, from which the lamp is fed, and R a suitable resistance for cutting down the potential of said mains to that desired for the arc-lamp.

The circuits are established in any preferable way, as follows: The positive hook or terminal of the lamp is indicated at H and is connected to one terminal of the coil A, the other terminal being connected to the post or frame which carries the lever C, from which circuit is taken through the upper carbon and carrier, preferably by a spring K, bearing on the upper-carbon carrier. The derived-circuit connection is from the frame through the lever C, hook *a*, and spring *b* to one terminal of the derived-circuit coil B, the opposite terminal of which is connected to the negative pole of the lamp in the ordinary manner.

When the lamp is out of action, the lever C is depressed under the influence of the weight of the core of C and other parts on the long arm of the lever, which gives the lever or support C a bias, assisting the coil B and opposing the coil A, and by reason of the adjustment of the circuit closer and breaker the circuit of the coil B is broken, so that no current will flow from one main to the other through said coil and it will be effectually protected from damage.

When the lamp starts into operation, the main-circuit coil A lifts the support and immediately establishes the connection of the contacts for said circuit-closer, thus putting the coil B into operation, and as the contacts are following contacts its circuit will be preserved during the normal up-and-down movements of the lever or support C, under the varying influence of coil B, attendant upon fluctuations of the length of arc and the regulation of the feed of the carbon. It will be seen that this device affords a very simple and effective protection for the coil B when the lamp is run from constant-potential circuits or under conditions where the coil B will be subject to damage when the lamp is out of action from the flow of current through it.

The spring *b* of the circuit closer or breaker is mounted on a suitable insulated post, as indicated, and connection with said post is made, as shown, to one terminal of the coil B.

The details of construction of the lamp mechanism and the form of regulating apparatus employed in connection with the derived-circuit coils for producing a feed of the lamp-carbon form no special part of my invention.

The feature hereinbefore referred to, which consists in shunting a resistance into the circuit of the coil B when the circuit-breaker opens the normal circuit thereof, is indicated in Fig. 2.

R^2 indicates such artificial resistance, which, being connected, as indicated, to the circuits, will obviously be normally shunted during the normal movements of the lever C in the operation of the lamp, but will be thrown into circuit by the opening of the contacts of the circuit closer and breaker when the lever C or its other support is abnormally depressed through abnormal increase of arc or the lamp going out of action. In such case the resistance R^2 forms a finite resistance, which will permit some current to flow in the coil B; but the resistance R^2 is so adjusted that the amount of current flowing cannot under any circumstances damage the coil B.

What I claim as my invention is—

1. In an arc-lamp, the combination with the feeding mechanism of a circuit breaker and closer actuated mechanically thereby and placed in the circuit of the feed-regulating derived-circuit coil, said circuit breaker and closer being adjusted to normally maintain the circuit but to break it when the arc lengthens or the lamp goes out of action.

2. In an electric-arc lamp, the combination with the support for the feed-regulating mechanism of the circuit breaker and closer placed in the circuit of the feed-regulating derived-circuit coil and directly or indirectly controlled by said support, said circuit closer and breaker being adjusted to normally maintain the circuit but to break the circuit when the arc lengthens.

3. In an electric-arc lamp, the combination with the feed-regulating derived-circuit coil, of a lever or support actuated thereby for the regulation of the length of arc, and a circuit closer and breaker placed in the circuit of said coil and actuated by said lever, said circuit closer and breaker being adjusted as described, to maintain the circuit of the core under normal movement of the same but to break the circuit when the lamp goes out of action, as and for the purpose described.

4. The combination in an electric-arc lamp, of a lever supporting the feed-regulating devices and the carbon, main and derived circuit magnets acting against one another on said lever, said lever being biased as described in favor of the derived-circuit coil, and a circuit closer and breaker in the circuit of said derived-circuit coil adjusted as described to open the circuit of the coil when the said lever moves to a predetermined point through abnormal increase of the arc or rupture of the same but to maintain the circuit of said coil during normal movements of the lever in adjusting the arc.

5. In an electric-arc lamp, the combination, substantially as described, with the lever or support carrying the carbon-adjusting mechanism, of a circuit closer and breaker in the circuit of the derived-circuit coil which operates on said lever, said circuit closer and breaker being provided with a following contact adapted to preserve the circuit during normal movements of the lever but to separate and disconnect the coil from the supply-wire when the arc increases abnormally or the lamp goes out of action.

6. The combination in an electric-arc lamp, of a main-circuit coil and a derived-circuit coil, a lever supporting a carbon carrier and regulating mechanism and connected at opposite sides of its fulcrum to the armature or equivalent portions of the said coil, and a circuit-breaker in the circuit of the derived-circuit coil, said circuit-breaker having two members one of which is mechanically connected with the lever while the other is mounted on a fixed support, one of said members being formed of a spring through which the circuit of the said coil is maintained during normal movements of the lever.

7. In an electric-arc lamp, the combination substantially as described, of an arc-regulating mechanism mounted on a suitable support, a differential-magnet system governing the position of said support, and a circuit closer and breaker actuated by said support and provided with a following contact in the circuit of the derived-circuit member for the system, the circuit closer and breaker being adjusted as described to preserve the circuit of the derived-circuit coil in normal movements of the lever or support while the lamp is in operation but to break the circuit of said coil when the said support is carried to an abnormal extent in the direction required for producing a feed.

8. In an electric-arc lamp, the combination with a lever C, supporting the feed-regulating mechanism, of a derived-circuit coil B, and a circuit closer and breaker in the circuit of said coil adjusted, as described, to preserve the circuit of the coil during normal movements of the lever C, but to open said circuit when the lamp goes out of action.

Signed at New York, in the county of New York and State of New York, this 13th day of February, A. D. 1893.

BARTON B. WARD.

Witnesses:
WM. H. CAPEL,
T. F. CONREY.