(No Model.)

H. A. SEYMOUR.

ELECTRIC ARC LAMP.

No. 570,823. Patented Nov. 3, 1896.

Fig. 2.

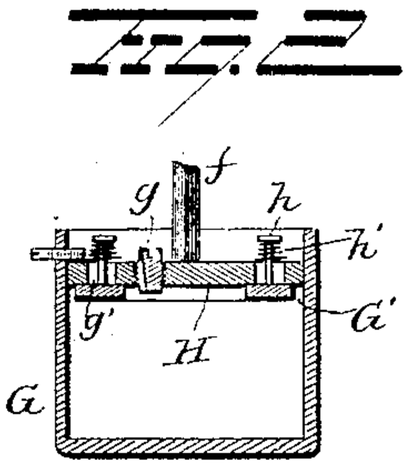

Fig. 1.

Fig. 3.

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UNITED STATES PATENT OFFICE.

HENRY A. SEYMOUR, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 570,823, dated November 3, 1896.

Application filed July 1, 1896. Serial No. 597,752. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. SEYMOUR, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Arc-Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in arc-lamps, and has special relation to that type of lamps which are operated by alternating currents.

Heretofore many attempts have been made to produce arc-lamps capable of being operated by an alternating current, and while lamps of this character have been constructed which would operate with indifferent success when burning a short arc, no one has yet succeeded in producing a practically efficient and satisfactory alternating arc-lamp capable of establishing and maintaining a long arc within an arc-inclosing globe.

The establishment of an arc between the carbons of an alternating-current arc-lamp necessitates the heating of the adjacent ends of the carbons to such a degree as will result in the formation of a bridge of conducting vapor or gas across the gap or space between them when separated to preserve intact the circuit and insure the continued flow of current from one carbon to the other. Excepting some provision be made for heating the adjacent ends of the carbons, when current is first passed through such a lamp the carbons and regulating mechanism will violently chatter for a considerable length of time before it is possible to establish and maintain even a short arc. This action is due to the fact that when a rapidly-alternating current is passed through the cold carbons the current falls to zero so rapidly that the carbons will not be maintained separated for a sufficient length of time to insure their being heated to such a degree as will result in the formation of a bridge of conducting vapor across the gap between them, which, as has been stated, is essential to the maintenance of a persisting arc. Hence the minute arc that is formed between the cold carbons is established and broken in rapid succession, with the result that the electromagnet of the regulating mechanism is rapidly energized and deënergized, thereby causing a rapid and violent chattering of the carbons and regulating mechanism, which continues until the ends of the carbons have finally become sufficiently heated to insure the formation of a conducting-bridge of carbon vapor or gas across the space or gap between them, and then and not until then is a persisting arc established.

The operation of alternating arc-lamps as heretofore constructed has been attended by a constant hissing of the arc and buzzing of the regulating mechanism, which has proved so annoying and objectionable that such lamps have gone into very limited use.

Attempts have been made to obviate the difficulties above set forth by so constructing the regulating mechanism that it would operate to separate the feeding carbon from the non-feeding carbon very slowly and gradually, and thereby insure the establishment of a persistent arc between them without the accompanying chattering of the carbons and of the regulating mechanism; but lamps so constructed proved inefficient and defective in their operation, even when burning a short arc, for two reasons: First, in providing the regulating mechanism with means for retarding the initial separating movement of the feeding carbon from the non-feeding carbon, it rendered the action of the regulating mechanism in adjusting and feeding the carbon so slow and sluggish as to render it incapable of adjusting and feeding the carbon with that delicacy and sensitiveness which are necessary to the maintenance of a steady and reliable persisting arc, and, second, by imposing upon the regulating mechanism associated with the feeding carbon the duty of separating it from the non-feeding carbon and of drawing a long arc the relation between the helix and core of the solenoid was so varied as rendered it impossible to insure the prompt and sensitive adjustment and feed of the feeding carbon.

The object of my invention is to provide an arc-lamp of such construction that the function of slowly separating the carbons and gradually drawing a long arc shall be performed by mechanism associated with and acting upon the lower and non-feeding carbon, while all the functions necessary to the

regulation and feeding of the carbons shall be performed by mechanism associated with and acting upon the feeding carbon.

With this end in view my invention consists in an arc-lamp comprising certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view, partly in vertical section and partly in side elevation, of an arc-lamp embodying my invention; and Figs. 2 and 3 are detailed views of the dash-pot.

A is the lamp-floor, from which the bracket B is suspended and insulated. The bracket is composed of the long arm *a*, short arm *a'*, and connecting-ring a^2, the latter serving the double purpose of strengthening the bracket-frame and guiding the upper end of the arc-inclosing globe N. This bracket may be cast in a single piece or may be made in separate pieces fastened together in any desired manner.

D is a solenoid secured to the lower end of the bracket. The core *d* of the solenoid has mounted thereon a carbon-holding socket *d'*, which is insulated from the core by the insulating-piece d^2. Spiral spring D' serves to uphold the core and carbon F'. Helix E is composed of comparatively thick wire, one of its ends being attached to socket *d'* by the flexible conductor *e*, while its opposite end is electrically connected at *e'* with the bracket-arm *a*. To the under side of the solenoid is secured a dash-pot G, which is shown in detail in Figs. 2 and 3. Piston-rod *f* of the dash-pot is connected at one end to the core and at its opposite end to the piston H, which latter is provided with an adjustable screw-valve *g*, by means of which the speed of the piston throughout its downward stroke may be retarded and checked to any desired extent. A number of holes *g'* are formed through the piston, and these holes are closed by an annular valve G', which seats against the under side of the piston and is held against its seat by means of the stems *h* and spiral springs *h'*. By means of this construction of piston the lower carbon may be retarded in its downward movement and be permitted a quick and prompt upward movement.

I is a coarse-wire solenoid supported upon brackets *i* or in any other desired manner. I' is a hollow core provided at its lower ends with outwardly-projecting arms *i'*, which are perforated at their outer ends for the reception of the vertical guide-rods i^2. Spiral springs i^3 encircle guide-rods i^2 and thereby uphold the hollow core and parts connected therewith. The tension of the spiral springs may be regulated by the set-nuts i^4. Within the hollow core is located the tubular carbon rod or holder J, which passes through an annular valve *j*, which rests upon the lamp-floor and is free to move laterally thereon. The valve serves to prevent the passage of gases from the globe into the casing containing the regulating mechanism. K is a ring-clamp which encircles the carbon-holder and is provided with an annular groove *k*, in which engages the finger of the lifter *k'*, the latter being attached to the hollow core. A piston L is placed within the tubular carbon-holder and is supported by the rod L', which is secured at its upper end to the lamp-casing M.

N is an arc-inclosing globe supported at its lower end in the socket N' and held in place by the set-screws N^2. Suitable packing *n* may be employed to insure a tight joint around the bottom of the globe. The floor of the globe-socket is provided with an opening in which the core *d* snugly fits and through which it is free to move. The upper end of the arc-inclosing globe extends through the ring a^2 of the bracket and is thereby held in place. A cover O is applied to the top of the globe and is provided with an opening through which the upper carbon is fed.

The outer globe is furnished with a metal binding at its upper end, with which is connected a strip P, which engages and slides upon the bracket when the globe is lowered, thereby permitting the latter to be suspended, as indicated by dotted lines, when the lamp is being trimmed.

The operation of the lamp is as follows: Current enters the lamp through binding-post Q and from thence flows through the helix of the coarse-wire solenoid to the lamp-floor, from which it passes through the carbons F F', helix of solenoid D to bracket-arm *a*, and upwardly to binding-post Q' and from thence to line. On the passage of current through the lamp both solenoids I and D will be energized, but owing to the fact that an adjustable stop *q* is provided for restricting the upward movement of the ring-clamp solenoid I will serve to tilt the ring-clamp and cause it to clutch the carbon-holder, and possibly lift it an almost inappreciable distance, while at the same time solenoid D will pull down the lower carbon. The downward movement of the lower carbon is rendered so slow and gradual by the retarding effect of the dash-pot that the arc is slowly drawn to any desired length without danger of its extinction. In short, the separation of the two carbons is rendered so slow and gradual that their adjacent ends will be heated to a sufficient degree to insure the formation of a conducting-bridge of carbon vapor across the gap between them, which will serve to maintain the integrity of the circuit through the lamp and hence prevent the extinguishment of the arc. As the carbons continue to burn, the arc grows longer and its resistance increases, with the result that the solenoid I becomes weaker and allows its core to descend and feed the carbon through the ring-clamp until by the shortening of the arc and the consequent decrease of its resistance the solenoid is rendered sufficiently strong to again lift the core and cause the ring-clamp to grip and raise the carbon-holder and feeding carbon.

In this manner the feeding carbon is adjusted and fed until both carbons have been consumed.

Each one of the solenoids is provided with a closed diamagnetic conductor *s*, consisting of a closed tube of copper or brass, which may be located either inside or outside of the helix, and which serves to suppress the extra current generated in the helices when an alternating current is employed in operating the lamp and thus prevent the very slight but annoying vibrations of the regulating mechanism and also the hissing of the arc when the lamp is burning.

In the event the arc should be extinguished the lower carbon will rise quickly and insure its prompt reëstablishment.

While I have described the lamp as being specially adapted for use with an alternating current, it is evident that it is well adapted to be operated by a straight current, and in the event that it is desired to embody the invention in a series lamp a shunt-solenoid might be associated with the coarse-wire solenoid and form therewith a differential regulator.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an arc-lamp the combination with its upper and feeding carbon, and regulating mechanism comprising a coarse-wire magnet included in series with the arc, for raising and lowering and feeding the upper carbon, of the lower and non-feeding carbon and a magnet and dash-pot associated therewith and constructed and adapted to slowly and gradually separate the lower carbon from the upper carbon when the lamp is switched into circuit and thereby draw the arc to any desired length, and to maintain the lower carbon at the limit of its downward movement throughout the normal operation of the lamp in burning its carbons, substantially as set forth.

2. In an arc-lamp the combination with its upper and feeding carbon and regulating mechanism comprising a magnet in series with the arc, and a friction-clutch, said parts being constructed to grip and uphold the carbon-holder when the lamp is switched into circuit, of the lower and non-feeding carbon and a magnet and dash-pot associated therewith and constructed and adapted to slowly and gradually separate the lower carbon from the upper carbon and thereby slowly draw the arc to any desired length and to maintain the lower carbon at the limit of its downward movement throughout the normal operation of the lamp in burning its carbons.

3. In an arc-lamp the combination with its carbons, a solenoid and a dash-pot for gradually and slowly separating the non-feeding carbon from the feeding carbon, of an arc-inclosing globe mounted on a support provided with an opening in which the core of said solenoid snugly fits and through which it is free to move, substantially as set forth.

4. In an arc-lamp, the combination with a depending frame comprising a long arm and a short arm, and a guide-ring connecting them, of an arc-inclosing globe supported at its lower end in a socket, and having its upper end maintained against lateral displacement by said guide-ring, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HENRY A. SEYMOUR.

Witnesses:
S. G. NOTTINGHAM,
G. F. DOWNING.