

C. D. HASKINS.
ARC LAMP.
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935,908.

Patented Oct. 5, 1909.

Fig. 1.

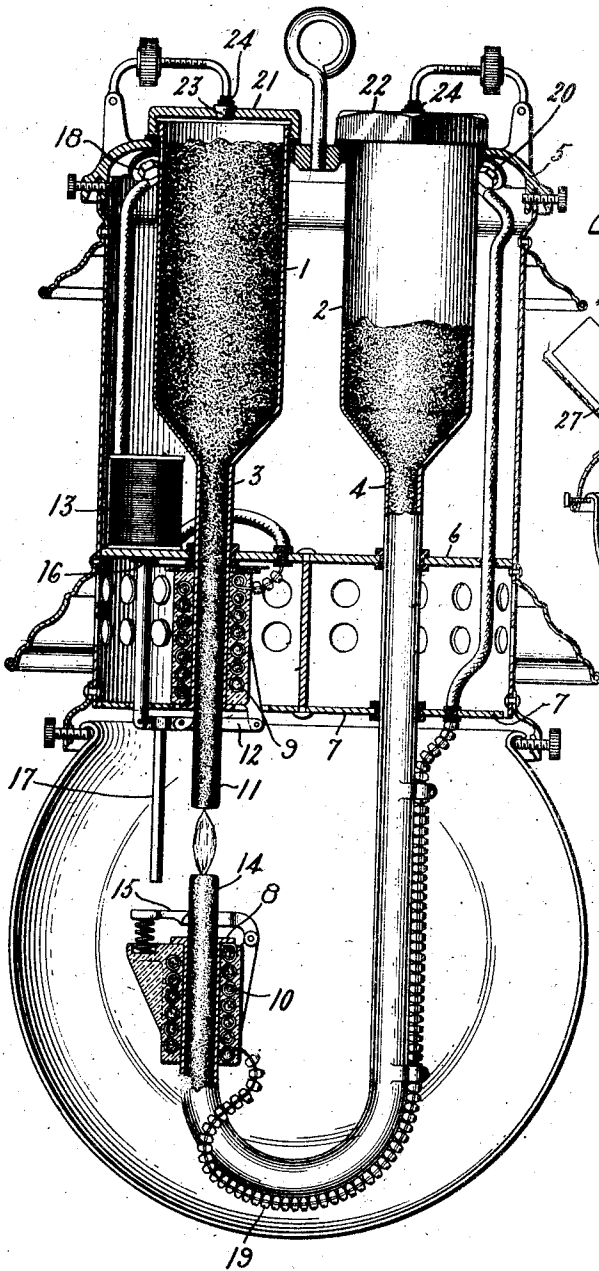
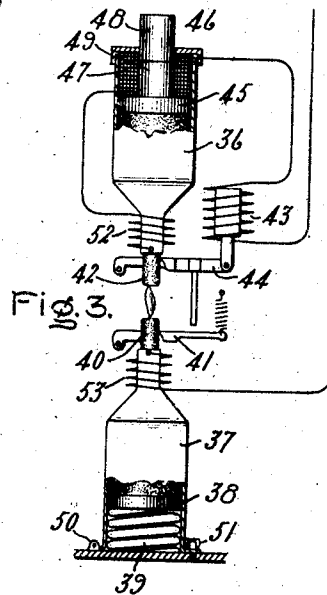
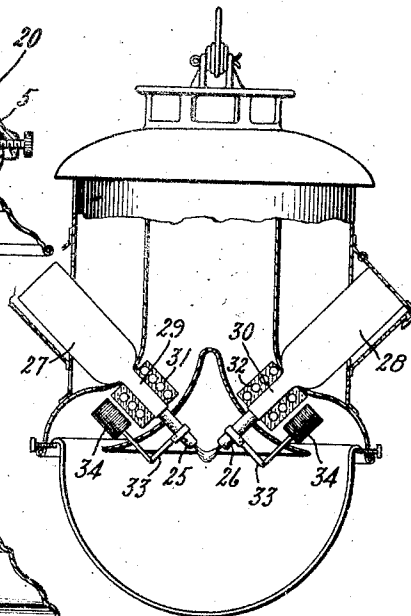


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

CARYL D. HASKINS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LAMP.

935,908.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CARYL D. HASKINS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

My invention relates to means for producing light by forming and maintaining an arc between two electrodes.

In all arc lamps (wherein the arc is formed in the air), it is necessary to have at least one electrode which consumes or wastes away during the operation of the lamp, making it necessary to frequently re-trim the lamp, that is, renew the electrode which consumes. In most lamps both electrodes consume and therefore the expense of renewal is quite great. This item of renewal of the electrodes is an important factor in commercial lighting and many efforts have been made to decrease the frequency with which renewals must be made.

The object of my invention is to make it possible to maintain an arc for any desired period of time before renewal of the electrodes becomes necessary, and further to make the renewal of the electrode material a matter of simple and easy accomplishment.

To the above ends I propose to introduce the electrode material into the lamp in a plastic state instead of in the form of solid sticks as heretofore; and I provide means whereby this plastic material may be fed and progressively formed into an electrode in such a manner that while the electrode is being consumed at one end it is continuously being built up at the other end. Either or both of the electrodes of a lamp may be supplied in this way, or if more than two electrodes are employed, all of them may be of the progressively-formed kind. In lamps of this character the frequency of re-trimming is dependent solely upon the size of the reservoirs within which the plastic material is contained, and by properly designing these reservoirs any desired interval between consecutive renewals may be obtained. Furthermore, the matter of renewing the electrode material is in itself a simple one, since it is only necessary to pour a charge of material into the reservoir or reservoirs without disturbing the other parts of the lamp.

The various novel features which char-

acterize my invention will be hereinafter 55 particularly pointed out in the claims, but for a full understanding of the invention and of its various objects and advantages, reference may be had to the following detailed description taken in connection with 60 the accompanying drawing, wherein—

Figure 1 is a longitudinal central cross-section taken of a lamp arranged in accordance with one form of the invention; Fig. 2 is a longitudinal section taken through a 65 different form of lamp; and Fig. 3 shows conventionally a still further modification.

Referring to Fig. 1, 1 and 2 are receptacles having downwardly-extending tubular portions 3 and 4. Secured to the upper ends 70 of these receptacles, but insulated therefrom, is the lamp hood 5. 6 is a platform which is secured to and insulated from the tubular members 3 and 4. Thus the receptacles and their extensions form the backbone of the lamp and all of the parts are supported 75 therefrom. 7 is an auxiliary platform also supported on the tubes 3 and 4, but at some distance below the platform 6. The tubular member 3 ends at the platform 7, but the member 4 extends downward some distance 80 below this platform and then curves upward so as to bring its end 8 beneath and in alignment with the tube 3. The receptacles 1 and 2 are adapted to receive electrode material in a plastic state. Thus, this material may conveniently be the "mud" from which 85 ordinary electrodes are made by molding and subsequently baking the molded form. This material is ordinarily composed of one 90 or more powdered solid substances, such as gas coke, lamp black, anthracite and bituminous coal, and a suitable agglutinant, such as tar which has previously been deprived of water and of its more volatile constitu- 95 ents, in such proportion as to render the mass sluggishly fluid, so that it readily runs down through the tubes, but before it reaches the ends thereof intense heat is applied which hardens the material. These 100 hardened portions form the electrodes of the lamp, and as they are consumed at their arcing ends, they are automatically built up at the opposite ends. Thus the process of making the electrodes is performed wholly 105 in the lamp, and the tubes leading from the reservoirs or receptacles serve as forming molds, as heating molds, and as the electrode

guides of the lamp. Moreover, the electrode forming process is automatic and continuous, each electrode section being completed as it is required. The heaters are indicated in the drawings at 9 and 10; the heater 9 being arranged between the two platforms and surrounding the lower end of the tube 3, and the heater 10 being arranged about the up-turned end 8 of the tube 4. The heaters may conveniently and economically be made to act as the steadying resistance of the lamp; whereby the energy which is ordinarily wasted, in so far that it does not produce light, is made useful in baking the electrodes.

As the electrodes are formed and consumed they may be controlled in exactly the same way as the electrodes in an ordinary arc lamp. Thus, for example, the upper electrode 11 may be controlled by a clutch 12 of any suitable construction operated by means of a magnet 13. Assuming that the electrodes are in contact and that current has begun to flow, the electromagnet, acting through the clutch, lifts the electrode 11 and forces a portion of the material above it back into the receptacle 1 until the lower end of the electrode has been moved far enough away from the companion electrode to give the required arc length. With this arrangement of controlling means for the upper electrode, the lower electrode 14 may conveniently be regulated by means of a clutch 15 so constructed that it normally holds the lower electrode from being fed upward. Therefore, when the arc is struck, the lower electrode is held stationary and the arc length is determined wholly by the movement of the upper electrode. When the current is turned off the lamp the electromagnet is deenergized and the core 16 thereof, together with the clutch 12, drops. There is a stem or finger 17 connected with the armature and the upper clutch and this stem or finger is so proportioned that when the magnet is deenergized, it drops upon the clutch 15 and disengages it from the lower electrode. Both electrodes are, therefore, unrestrained and the weight of the material in the reservoirs, with or without an auxiliary pressure, as may be desired, forces the electrodes outward from the ends of their respective tubes until they come into engagement with each other. When this happens equilibrium is established between the two reservoirs and the feeding action ceases. When current is again turned on the lamp, the upper electrode is raised in the manner described and the lower electrode is held stationary at the point to which it was previously fed. As the electrodes waste away during the operation of the lamp, the arc between them lengthens until it becomes abnormally long and breaks, whereupon the electrodes are again fed toward each other

in the manner described: when they again engage, the magnet is energized and the arc struck.

The circuit in the lamp may be traced from a positive terminal 18 through the coil of magnet 13, thence through the heater 9, to the tube 3 and electrodes 11, to the electrode 14 and tube 8, thence through the heater 10 and by way of an insulated conductor 19 to the negative terminal of the lamp, 20.

Instead of depending solely upon the weight of the electrode material for causing the feeding of the electrodes, auxiliary pressure devices may be employed, as for example, the tops of the reservoirs may be securely closed by screw-threaded caps 21 and 22, respectively; each of these caps having an opening 23 which is normally closed by a valve 24 of the safety valve type. As the electrodes are baked, gases and vapors are given off and find their way into the tops of the receptacles, where they collect between the caps and the upper surfaces of the masses of electrode material and exert a downward pressure on this material. This pressure is controlled by the valves 24, which open when the pressure rises above a predetermined value and allow the gases to escape. As soon as the pressure has again fallen somewhat, the valves again close and remain closed until the pressure rises above the maximum.

It will be seen that when the supply of electrode-material becomes low it is merely necessary to unscrew the caps on the reservoir and dump in a new supply.

In Fig. 2 is shown a lamp having converging electrodes 25 and 26. The supply of electrode material is contained within reservoirs 27 and 28, having tubular extensions 29 and 30, respectively, surrounded by heaters 31 and 32. In this instance each electrode is provided with a clutch 33 similar to the clutch 12, and each of these clutches may conveniently be operated by a separate electromagnet 34. When no current is flowing, the clutches 33 are idle and the electrodes are fed toward each other until they engage and further feeding is prevented. When current is turned on, the electromagnets are energized and both of the electrodes are moved axially until the proper distance between their ends is attained.

In Fig. 3 a further modification is shown, wherein the reservoirs, instead of being placed side by side, are arranged in alignment one above the other. The upper reservoir 36 may be similar in all respects to the reservoir 1, while the lower reservoir 37 is provided with a false bottom 38 which is pressed upwardly by means of a spring 39. Normally the lower electrode 40 is held stationary in the same manner as electrode 14 in Fig. 1, by means of a clutch 41. When

this clutch is released the spring 39 presses the false bottom of the lower reservoir upward and produces a feeding of the electrode material. Electrode 42 is controlled by an electromagnet 43 and clutch 44 similar in all respects with the clutch 12 and the electrode 13 in Fig. 1. The reservoir 36 is illustrated as being provided with means for producing electromagnetically a pressure upon the electrode material. Thus, in the upper end of this reservoir there is placed a piston 45 having a stem 46 which is surrounded by a coil 47. The stem is made in two parts, the part 48 being of magnetic material, and the part 49 of non-magnetic material. When the current is turned on, the part 48 is attracted by the coil 47 and the piston 45 is forced downward against the top of the electrode material in the reservoir. Any desired feeding pressure may then be obtained.

A convenient means for permitting the lower reservoir to be filled consists in pivoting it to a support at the point 50 and normally locking it against pivotal movement by means of a catch 51. When it is desired to replenish the supply of electrode material, the catch is released and the reservoir swung about its pivot, thereby permitting the false bottom and spring to be removed. After the requisite amount of electrode material has been introduced, the bottom and spring may be replaced and the reservoir brought into the position shown.

The heaters in Fig. 3 are indicated by the coils 52 and 53, which, as in Fig. 1, act as the steadying resistance of the lamp.

While I have described but a few mechanical arrangements for carrying out my invention, I do not desire to be limited to the mechanical details shown, since in its broadest aspect, my invention contemplates the use of any means whereby an arc is produced between two or more electrodes any or all of which are progressively formed as required for maintaining the arc, and my invention also covers broadly the method of producing light by forming an arc between two or more electrodes any or all of which are progressively built up as wasting at the arcing end occurs.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In an arc lamp, an electrode, and means for automatically building it up at one end as the other end wastes away during the operation of the lamp.

2. The method of compensating for the wasting away of an arc lamp electrode at the arc which consists in progressively building up the electrode at one end as it wastes away at the other end.

3. In an arc lamp, a supply of electrode-material, means for progressively feeding said material toward the arc, and means for forming it into an electrode as it approaches the arc.

4. In an arc lamp, a supply of electrode-material in a plastic state, means for progressively feeding said material toward the arc, and means for converting it into a self-sustaining electrode as it approaches the arc.

5. In an arc lamp, a supply of electrode material in a plastic state, a formed electrode, means for feeding said material progressively toward and against said formed electrode, and means for converting it into a formed electrode body as it approaches said electrode.

6. In an arc lamp, a supply of electrode-material in a plastic state, means for forming a portion of said material into an electrode, and means for then progressively building up one end of said electrode as it is consumed at the other end.

7. In an arc lamp, a supply of electrode-material in a plastic state, means for progressively feeding said material toward the arc, and means for baking it into the form of an electrode as it approaches the arc.

8. In an arc lamp, a reservoir for plastic electrode material, a tube leading from said reservoir, and means for hardening the material in said tube.

9. In an arc lamp, a reservoir adapted to contain electrode-material in a plastic state, an electrode mold connected to said reservoir, and means for hardening the material in said mold.

10. In an arc lamp, a reservoir adapted to contain electrode-material in a plastic state, an electrode mold connected to said reservoir, means for heating said mold, and an electrode in said mold adjacent the free end thereof, whereby the electrode-material is progressively fed from the reservoir into the mold against the electrode therein.

In witness whereof, I have hereunto set my hand this 15th day of February, 1907.

CARYL D. HASKINS.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.