R. FLEMING & E. J. GUAY.

ARC LAMP.

APPLICATION FILED FEB. 15, 1907.

1,022,541.

Patented Apr. 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

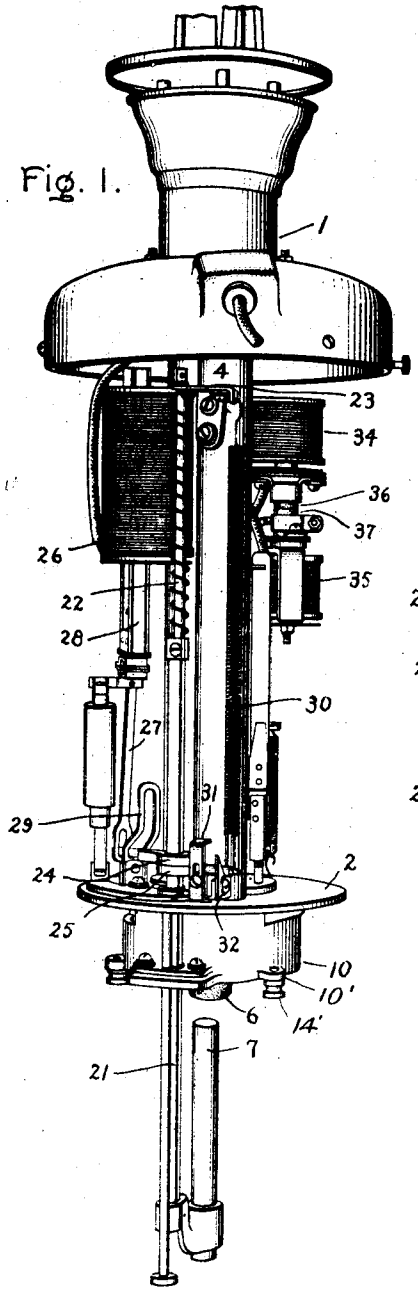
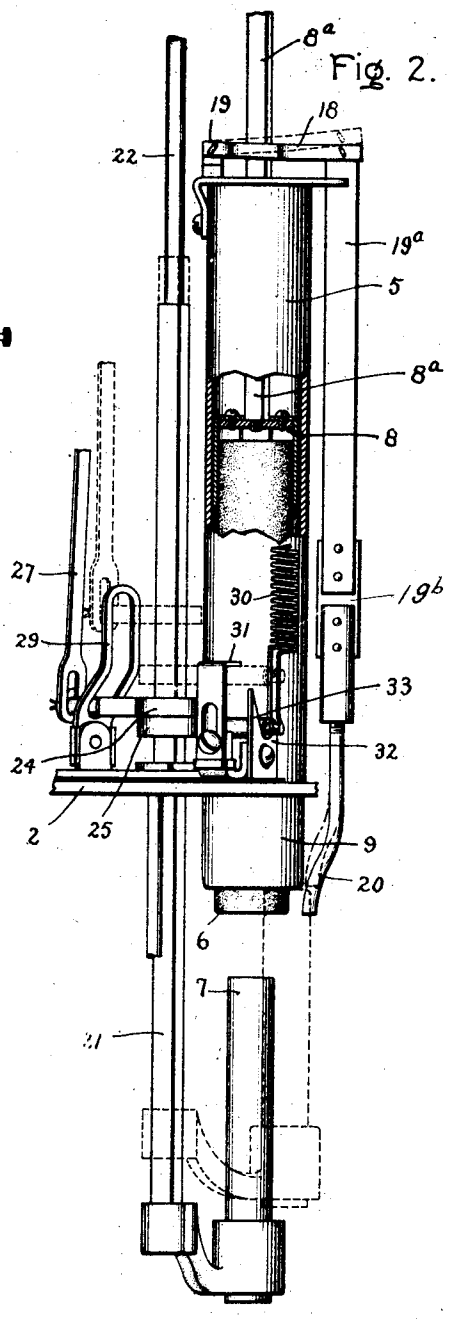


Fig. 2.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

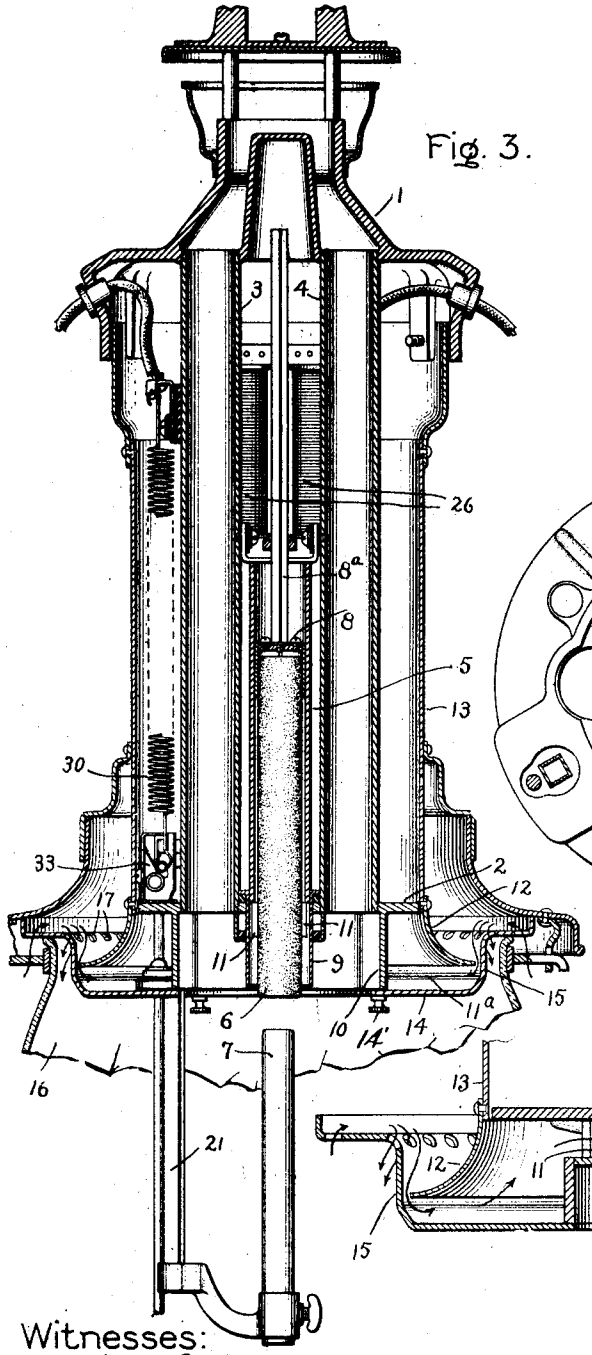


Fig. 6.

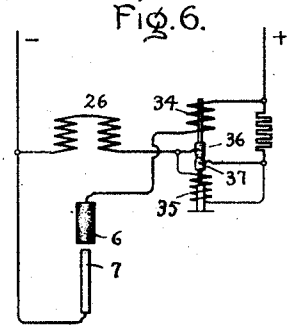


Fig. 4.

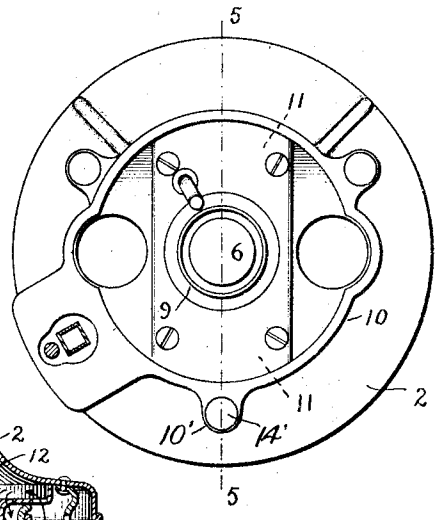
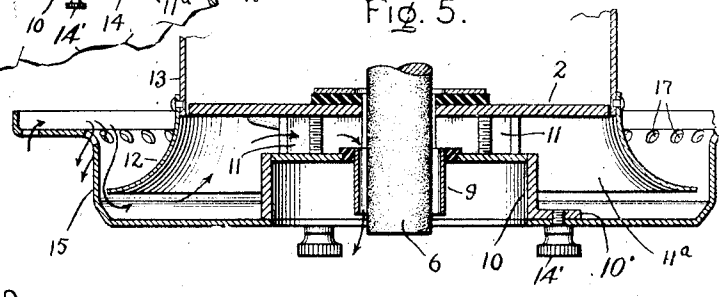


Fig. 5.



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UNITED STATES PATENT OFFICE.

RICHARD FLEMING, OF SWAMPSCOTT, AND EMILE J. GUAY, OF LYNN, MASSACHUSETTS, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LAMP.

1,022,541. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed February 15, 1907. Serial No. 357,460.

To all whom it may concern:

Be it known that we, RICHARD FLEMING, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, and EMILE J. GUAY, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

The present invention relates to electric arc lamps and particularly to lamps having a luminous or flaming arc, and its object is to improve the construction and operation of the same. In lamps of this type it is necessary to provide chimney and draft devices of some sort. Thus, it is common to have a chimney arranged above the arc for carrying away the fumes, together with a horizental air duct for maintaining the oxygen supply within the globe and creating a down-draft about the arc for steadying it. It sometimes happens that the air duct tends to act as a chimney for carrying away fumes instead of serving to create the desired down-draft.

One of the features of the present invention consists in a novel arrangement of air ducts whereby the air or gas in the air duct is given an impetus in the direction of the arc when the lamp starts, thereby obviating the danger of currents being set up therein in the opposite direction.

Notwithstanding that extreme care may be exercised in providing for the removal of the fumes in flaming or luminous arc lamps, there is always danger that a portion, at least of the fumes will condense on the interior of the globe and thereby cut off part of the light.

Another feature of our invention consists in means for automatically keeping the interior of the globe clean during the operation of the lamp.

The control of the air supply and the disposition of the fumes require such careful regulation that it is necessary to maintain the arc focused at a given point in the globe in order that the relation between the arc and the air and fume controlling devices may remain constant.

A further feature of the present invention relates to a novel feeding arrangement for the electrodes whereby the arc is always maintained in an approximately fixed position.

The various features of novelty constituting our invention will be hereinafter particularly pointed out in the claims, but for a full understanding of the invention in its various aspects, reference is to be had to the following detailed description taken in connection with the accompanying drawings, wherein—

Figure 1 is a perspective view of a lamp arranged in accordance with a preferred form of our invention, the globe, casing, and reflector being removed to more clearly show the working parts; Fig. 2 is an enlarged view showing a fragment of the lamp, particularly the electrodes and the clutch mechanism; Fig. 3 is a longitudinal section taken through the center of the lamp; Fig. 4 is an inverted plan view of the platform of the lamp; Fig. 5 is a cross-section taken on line 5—5 of Fig. 4 and at right angles to the plane of Fig. 3; and Fig. 6 is a diagram of connections.

Referring to the drawings, 1 represents a hood and 2 a platform which are connected together by means of two elongated tubes 3 and 4. The tubes may be screw-threaded to the hood and platform at their opposite ends. These tubes constitute twin chimneys as well as the backbone of the lamp. They, in themselves, form no part of the present invention, however, but are described and claimed in an application filed by C. A. B. Halvorson, Jr., on the 2nd day of April, 1907, Serial No. 365,904. Between the chimneys is an electrode-receiving tube 5 which may also be screw-threaded into or otherwise secured to the platform at its lower end.

6 and 7 are the electrodes, the electrode 6 being arranged within the tube 5 and preferably carried by a holder 8, which has an elongated stem 8^a projecting through the top of the tube. The electrode 6, which is shown as being of the carbon type, is fed intermittently, as will be hereinafter described, so as to maintain its arcing end slightly below the lower end of the tubular member 9, which projects downward from the platform and forms a continuation of the electrode-receiving tube. An annular flange or wall 10

projects downward from the lower face of the platform to a point near the plane of the arcing end of the upper electrode. This flange is far enough removed from the axis of the lamp to surround the lower ends of the chimneys, thus forming with the member 9 a fume box or chamber into which the vapors given off by the electrodes ascend and from which they are then carried out of the lamp through the twin chimneys.

A down-draft is produced about the arc by means of currents of air which enter the top of the electrode-opening in the member 9 through lateral ducts 11, formed in the platform member in any suitable way at a point above the fume chamber. These ducts, in conjunction with a heating chamber 11^a, to be hereinafter described, form continuous channels, each opening at one end into the atmosphere and at the other end into the top of the tubular member 9. The air which flows inward through these channels is thus discharged downward through the electrode-opening in the axial direction of and about the arc. It will be seen that when the lamp is started there is a tendency toward an upward flow of the hot gases from the arc through the electrode-opening, thereby causing the air channels to act as chimneys. This danger is avoided in the present lamp by causing an inward flow to be positively set up in the air channels at the time of starting. To this end, the parts are so arranged that the opening from the air channels into the atmosphere is from the bottom of the chamber 11^a wherein the temperature of the gases is raised slightly in starting the lamp, while the ducts 11 open out of the top of this chamber, so that the tendency of the gases between the lower end of the electrode-opening and the heating chamber to flow outward is overcome by the inward tendency set up in the heating chamber. The heating chamber may conveniently be formed by extending the lower end 12 of the lamp casing 13 past the platform and into proximity to a reflector 14 which is secured to lugs 10′ projecting from the lower end of the wall of the fume box by thumb screws 14′, and passes outwardly and upwardly so as to leave but a narrow opening between the vertical portion 15 thereof and the edge of the casing. Thus the heating chamber wholly surrounds the fume box and the heated gases therein rise into the air ducts 11 leading from the top thereof and cause air to flow in at the bottom about the lower edge of the casing. The only outlet for the gases entering the ducts 11 from the heating chamber is down through the tube 9 around the edge of the same and up into the chimneys, and therefore a downdraft is positively started past the lower end of the upper electrode, and the air inlet made to serve its intended function in a reliable manner.

The reflector is made to close the upper end of the lamp globe 16 and is provided with a series of openings 17 arranged about the edge thereof. All of the air required by the lamp is not fed through the air channels described, but a portion passes downward through the openings 17 in the reflector and along the interior face of the globe toward the bottom thereof. In this way it will be seen that the fumes which might otherwise collect on the globe are blown away, and such matter as is actually condensed is carried to the bottom of the globe. Therefore, as long as the lamp burns, the interior of the globe is automatically kept clean.

In order that the down-draft may properly serve its function as a means for steadying the arc, it is necessary that the electrodes be so fed that the arc remains in a practically fixed relation to the lower end of the outlet for the down-draft. Where both of the electrodes are consuming, as illustrated, the feeding may conveniently be accomplished by moving the lower electrode at each feeding operation until its arcing end reaches a predetermined point, and then permitting the upper electrode to drop by gravity into engagement with the lower electrode and to be then held while the lower electrode drops to strike the arc. To this end the upper electrode is controlled by means of a simple clutch 18 which acts upon the stem of the electrode holder. The clutch may conveniently be pivoted at one end, as at 19, at the upper end of the electrode-receiving tube 5, and be controlled by means of a downwardly projecting stem 19^a having at its lower end a finger 20 which is insulated from the clutch 18 by a member 19^b, interposed in the stem 19^a and which is arranged adjacent to and projects slightly beneath the lower end of the tube 9. The parts are so arranged that normally the clutch acts upon the stem of the upper electrode-holder to sustain the upper electrode. When the tripping finger is pressed upward, however, the clutch is released and permits the upper electrode to drop. The tripping is preferably effected by means of the lower electrode which, when it is moved upward, is also given a lateral movement; so that when it is in its extreme upper position it engages not only the upper electrode but also the lower edge of the tube 9 and the end of the tripping finger. Thus the tube acts as a stop to limit the upward movement of the lower electrode when the clutch is released, and therefore, the upper electrode always drops until its arcing end reaches a predetermined point.

The means for operating the lower electrode may take any suitable form. In the arrangement shown the lower electrode is supported upon a hollow rod 21 which projects upwardly through the platform and

is guided by a rod 22 suspended at its upper end from the lamp chimney 4 by means of a bracket 23. Engaging with the member 21 are two clutches 24 and 25, the first being the lifting clutch and the second the holding clutch. The lifting clutch is controlled by the feeding magnet 26 in the usual way: as by means of a stem 27 which is connected at one end to the clutch and at the other end to the armature 28 of the magnet. The stem of the lifting clutch passes through a curved guide 29, so arranged that, when the feeding magnet is energized and attracts its armature, raising the clutch and with it the holder for the lower electrode, the clutch and holder are also given a turning movement, whereby, as the lower electrode is lifted, it is also swung laterally about its supporting rod as an axis. This operation is clearly shown in Fig. 2, wherein the full lines show the parts in the positions which they occupy just before feeding occurs. In the dotted lines the parts are shown in the positions which they occupy after the lower electrode has been lifted into engagement with the lower end of the tube 9. At this time the clutch 18 has been released and the upper electrode has been forced upward until its arcing end is level with the lower end of the tube,—assuming that it previously extended below the end of this tube. Similarly, if the upper electrode had been burned away so far as to have brought its arcing end above the lower end of the tube, upon the release of the clutch 18, it would have dropped into engagement with the lower electrode, so as to bring its arcing end, as before, in the plane of the lower end of the tube 9. The arrangement of parts is such that when the electrodes are brought together, the feeding magnet is deënergized and the lower electrode is permitted to drop. As the arcing end of the lower electrode gradually recedes from the lower end of the tube 9, the upper electrode and the tripping finger of the clutch follow until such a point is reached that the holding clutch on the upper electrode resumes its grip and prevents further downward movement of that electrode. The lower electrode continues its downward movement until the proper arc length is obtained. The downward movement of the lower electrode is controlled through the holding clutch 25 which is of the usual floating form, surrounding the rod 21 at one end and having its other end carried by an elongated spring 30 which is suspended from the bracket 23. This spring normally holds the clutch locked upon the rod; but, as the feeding magnet lifts the lower electrode holder, and carries with it the holding clutch, this clutch is brought into engagement with a stop 31 which arrests its movement and allows rod 21 to slip through the clutch so that the electrode holder may continue its upward movement. When the electromagnet is deenergized, however, and the lower electrode begins to fall, the holding clutch is again carried downward, away from the stop 31, until it is brought to rest upon the second stop 32. Since the clutch is now gripping the electrode-supporting rod, the lower electrode is also brought to rest when the holding clutch reaches the lower stop 32. An inclined or curved guide 33 is provided for the holding clutch so that, as the lower electrode descends, it is positively rotated into alinement with the upper electrode by reason of the coöperation between the guide and the holding clutch.

The electrical connections may be the same as those in an application filed in the name of Richard Fleming and Cromwell A. B. Halvorson, Jr., May 1, 1905, Serial No. 258,214, and these connections will, therefore, be only briefly described. In addition to the main electromagnet 26, there are two other auxiliary magnets: a magnet 34 having a series coil, and a second magnet 35 having a shunt coil. Magnet 34 controls one of coöperating contacts 36 and 37, and the magnet 35 controls the other of these contacts. The coils of the magnets 26 and 35 are connected in series with each other directly across the line. (See Fig. 6.) The contacts 36 and 37 control a shunt about the coil of magnet 35, so that when these contacts are in engagement the main magnet is connected directly across the line. When no current is flowing and both coils 34 and 35 are deënergized, the contacts 36 and 37 are in engagement with each other. Then, when current is turned on the lamp, magnet 26 is energized and lifts the lower electrode into engagement with the upper electrode. Current thereupon flows through the electrode in series with the coil of magnet 34. This latter magnet, being now energized, lifts contact 36 out of engagement with contact 37 and, by reason of the high resistance of coil 35, which is now the only path through which current can flow to the magnet 26, this latter magnet no longer remains operatively energized, and allows the lower electrode to drop in the manner described. As the lamp continues to burn, the current flowing through the coils of magnets 26 and 35 increases until the latter is energized sufficiently to lift the contact 37 into engagement with the contact 36, whereupon magnet 26 is again operatively energized and effects another feeding operation.

While we have described in detail only one preferred form of our invention embodied in but a single type of lamp, we wish it to be understood that the several features of our invention may take various forms and be embodied in various types of lamps,

as will be evident from the following definition constituting the several claims.

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

1. In an arc lamp, a pair of electrodes, a controlling device for one of the electrodes arranged at one side thereof, and means for moving the other electrode toward the first electrode and laterally therefrom into engagement with said controlling device.

2. In an arc lamp, a pair of electrodes, a stop adjacent the end of one of said electrodes, a controlling device for the latter electrode arranged adjacent to the stop, and means for moving the other electrode into engagement with said stop and with said controlling device.

3. In an arc lamp, a pair of electrodes, a controlling device for one of the electrodes and a stop arranged in proximity to the lower end of the latter electrode, and means for operating the other electrode in the path of the first electrode so as to bring its arcing end into engagement with the stop and said controlling device.

4. In an arc lamp, a pair of electrodes, a clutch for one of said electrodes, a tripping finger for the clutch arranged beside the latter electrode, and means for moving the other electrode toward the first electrode and laterally to bring its arcing end into engagement with said tripping finger.

5. In an arc lamp, a gravity-actuated electrode, a second electrode, a controlling device for said gravity-actuated electrode extending adjacent the arcing end thereof, and means for moving said second electrode toward the other electrode and laterally so as to bring its arcing end into engagement with said controlling device.

6. In an arc lamp, a gravity-actuated electrode, a second electrode, a controlling device for said gravity-actuated electrode extending adjacent the arcing end thereof, a stop adjacent the controlling device, and means for moving the said second electrode toward the other electrode and laterally so as to bring its arcing end into engagement with said stop and said controlling device.

7. In an arc lamp, a pair of electrodes arranged in alinement with each other, a controlling device for one of said electrodes arranged at one side thereof and near its arcing end, and means for moving the other electrode toward the first electrode and laterally so as to bring its arcing end into engagement with said controlling device.

8. In an arc lamp, a pair of electrodes arranged in alinement with each other, a controlling device arranged at one side of and close to the arcing end of one of the electrodes, and means for moving the other electrode toward the first electrode and also laterally a distance sufficient to bring its arcing end into engagement with said controlling device but not sufficient to remove it from the path of the first electrode.

9. In an arc lamp, a platform, an electrode-receiving tube above said platform, an electrode and electrode-holder arranged within said tube, a clutch controlling the movement of said holder, a tripping finger extending from said clutch through the platform, a second electrode beneath said platform, and means for moving said second electrode toward the other electrode and laterally so as to bring its arcing end into engagement with said tripping finger.

10. In an arc lamp, a gravity actuated electrode, a holding clutch therefor, a tripping member for said clutch insulated from the clutch and electrode, a second electrode, and means arranged to lift the latter and move it into engagement with the tripping member and the first electrode and then permit it to drop a predetermined distance.

11. In an arc lamp, electrodes, a chimney arranged above the arcing ends of the electrodes to carry away the arc fumes, and an air channel leading from the exterior of the lamp to a point adjacent the arcing ends of the electrodes, said channel having a heating chamber intermediate its outer ends.

12. In an arc lamp, electrodes, a chimney arranged above the arcing ends of the electrodes to carry away the arc fumes, and an air channel leading from the exterior of the lamp to a point adjacent the arcing ends of the electrodes and having an enlarged intermediate portion forming a heating chamber.

13. In an arc lamp, an electrode, a member having an enlarged electrode-opening surrounding the lower end of said electrode, a fume box surrounding said member, a chimney leading from said fume box, an air channel arranged above said fume box and opening into said electrode-opening at one end, said channel having a heating chamber intermediate its ends and opening into the atmosphere from the bottom of said chamber.

14. In an arc lamp, electrodes, a chimney arranged above the arcing ends of said electrodes to carry away the arc fumes, a heating chamber having an opening into the atmosphere near its lower end, and an air duct leading from said heating chamber to a point adjacent the arcing ends of the electrodes.

15. In an arc lamp, an electrode, a member having an enlarged electrode-opening which surrounds the electrode near its lower end, a fume box surrounding said member, a chimney leading upward from said fume box, an air duct arranged above said fume box and opening into the top of said electrode opening, and a heating chamber surrounding said fume box and connected to

said duct, said heating chamber having an opening leading into the atmosphere from its lower end.

16. In an arc lamp, an electrode, a member having an enlarged electrode-opening surrounding the electrode near its lower end, a fume box surrounding said member, a chimney leading from said fume box, a heating chamber surrounding said fume box, said heating chamber opening into the atmosphere near its lower end and having a connection from its upper end with the top of said electrode-opening.

In witness whereof, we have hereunto set our hands this twelfth day of February, 1907.

RICHARD FLEMING.
EMILE J. GUAY.

Witnesses:
JOHN A. MCMANUS, Jr.,
HENRY O. WESTENDARP.