R. FLEMING & C. A. B. HALVORSON, Jr.

ARC LAMP.

APPLICATION FILED JAN. 16, 1906.

928,189.

Patented July 13, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

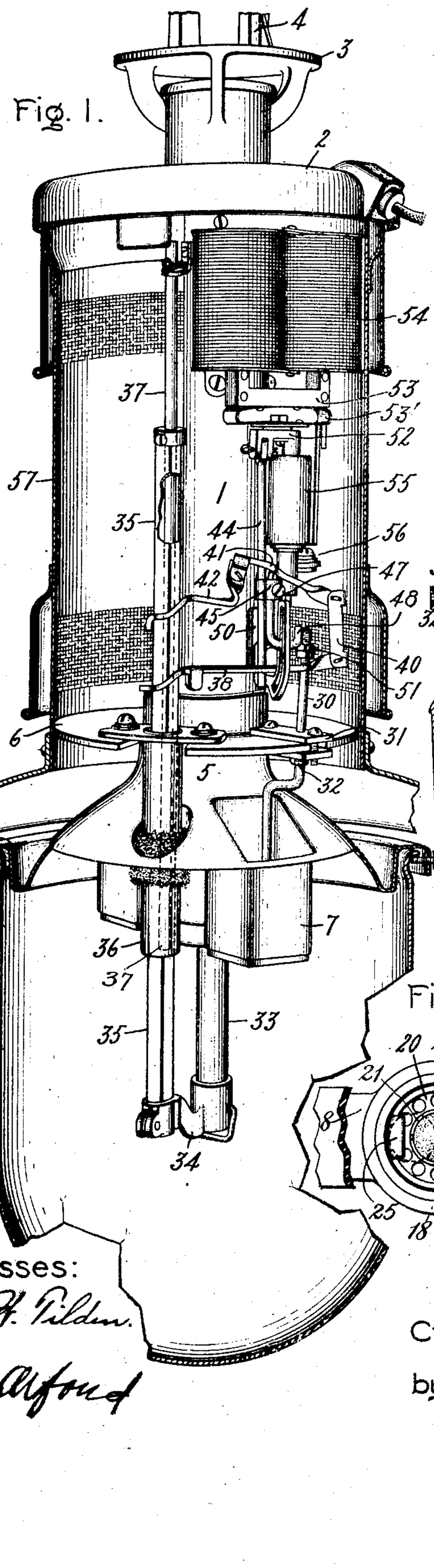


Fig. 2

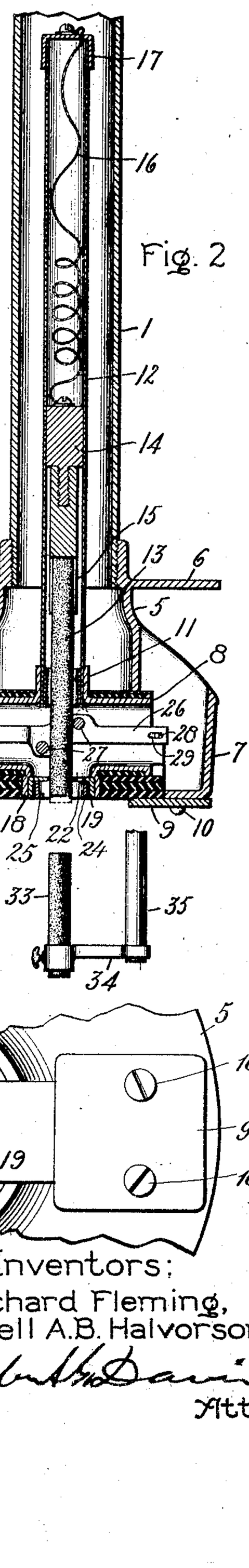
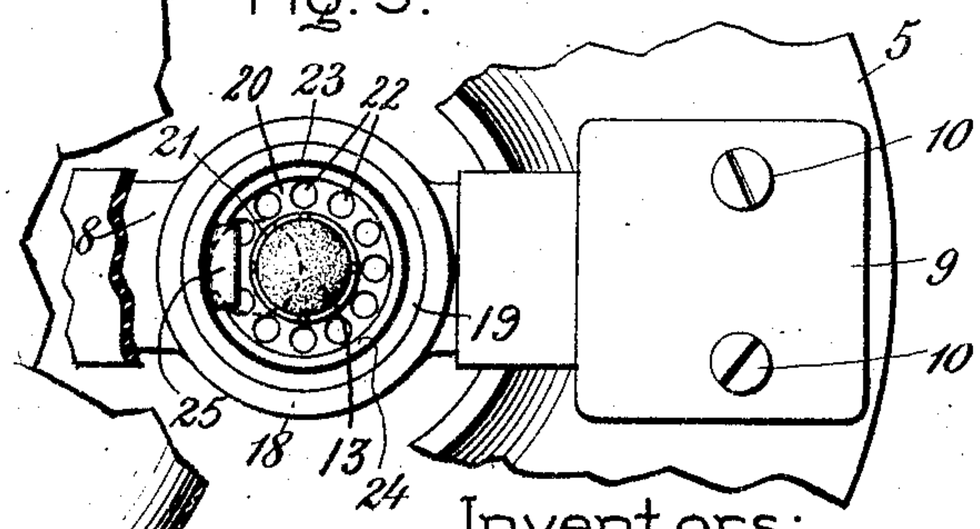


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 5.

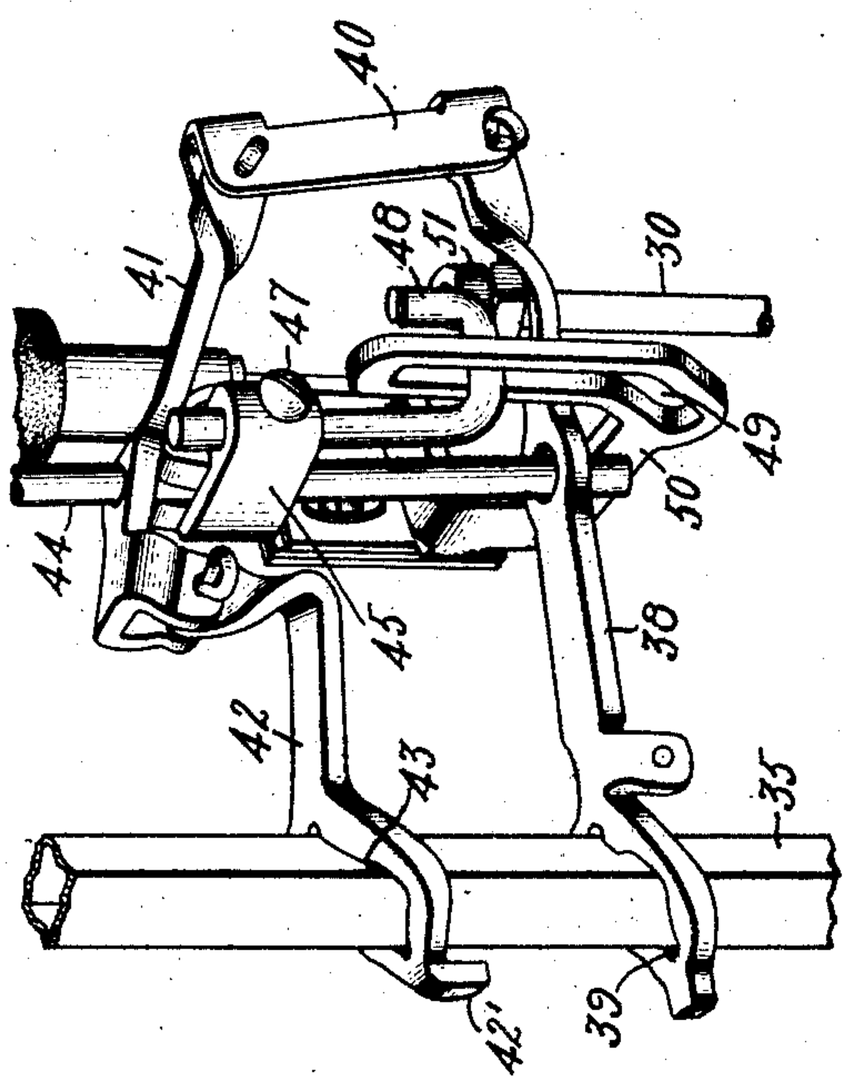
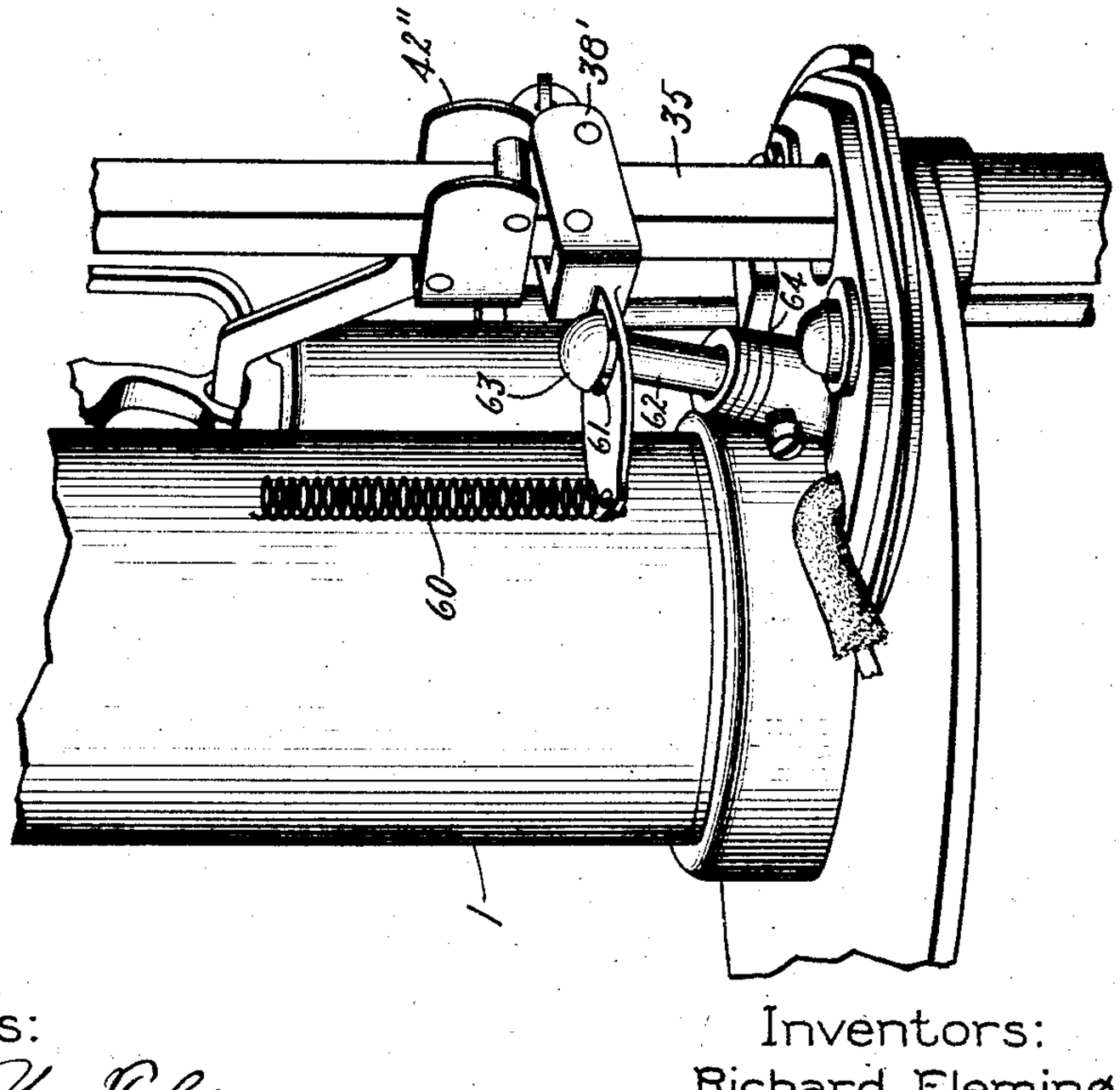


Fig. 4.



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UNITED STATES PATENT OFFICE.

RICHARD FLEMING AND CROMWELL A. B. HALVORSON, JR., OF LYNN, MASSACHUSETTS, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LAMP.

No. 928,189. Specification of Letters Patent. Patented July 13, 1909.

Application filed January 16, 1906. Serial No. 296,303.

To all whom it may concern:

Be it known that we, RICHARD FLEMING and CROMWELL A. B. HALVORSON, Jr., citizens 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.

Our present invention relates to arc lamps and comprises certain improvements in the electrode feeding mechanism of such lamps. These improvements are intended to produce an arc of constant length and in fixed relation to the arc lamp structure at each feeding operation in the particular embodiment of our invention disclosed.

Our invention also comprises features of construction and arrangement particularly adapted for use in arc lamps of the luminous or flaming arc type in which the electrodes employed are such that a relatively long arc is obtained and the arc products contain fumes which require special provision for their disposal.

The various features of novelty which characterize our invention are pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of our invention and for the advantages possessed by it reference may be had to the accompanying drawings and descriptive matter in which we have illustrated and described some of the forms in which our invention may be embodied.

Of the drawings, Figure 1 is a perspective view of an arc lamp with casing and globe broken away and in section; Fig. 2 is a sectional elevation illustrating the lamp ventilation and the arrangement of the upper electrode; Fig. 3 is an inverted plan showing the lower end of the lower electrode and nozzle surrounding mechanism; Fig. 4 is a perspective view of a portion of an arc lamp illustrating a modified electrode feeding mechanism; and Fig. 5 is a perspective view illustrating the clutch mechanism used in the lamp shown in Fig. 1.

In the construction disclosed in Figs. 1 and 2 an arc lamp is shown in which the backbone of the arc lamp frame-work is formed by a draft tube or chimney member 1. To the member 1 at a short distance below its upper end is secured a hood 2. To the extreme upper end of the chimney member 1 or an extension thereof, is secured a carrier member 3 from the upper side of which may extend members 4 through which the lamp is suspended. In the construction shown, the lower end of the chimney member 1 is in threaded engagement with a bell-shaped fume box or hood member 5. The member 5 is provided with an annular flange portion 6 which forms the lower platform of the arc lamp. From the conical portion of the member 5 below the platform 6 extend two box-like chambered portions or pockets 7 open at their upper ends diametrically opposed to each other with respect to the axis of the member 5.

Openings are formed in the adjacent inner walls of the member 7 into which project the ends of a hollow member 8. As shown, the member 8 is separated from the portion 7 by insulation and is held in place by means of plates 9 secured to the lower ends of the portion 7 by screws 10. The member 8 is formed with a tubular boss 11 projecting from its upper side and coaxial with the chimney member 1. The lower end of a tube-like member 12 is secured in the boss 11. The lower end of the upper electrode 13 of the lamp projects from the lower end of the member 12 which serves as a shield or receptacle for the electrode. The upper end of the electrode 14 is secured to a suitable follower, the lower end of which may be provided with the usual spring clips 15 for engaging the electrode. A flexible conductor 16 connects the follower 14 to the cap member 17 which closes the upper end of the member 11. A tubular boss 18 extends downward from the under side of the member 8. A cap-like member comprising a cylindrical portion 19, to the upper end of which is connected a horizontal portion or diaphragm 20, is suitably secured in the boss 18. A central aperture 21 is formed in the portion 20 through which the lower end of the electrode 13 projects. A series of apertures 22 are also formed in the portion 20 surrounding the aperture 21. Within the cap-like member and preferably separated from it by insulation 23 is secured an annular member 24 which is provided with an inwardly extending projection 25 forming a stop for limiting the upward movement of the lower electrode in a manner hereinafter described.

A clutch member for the upper electrode comprising a lever or bar 26 provided with projections 27 between which the electrode 13 passes, is connected to the member 8 by means of a pin 28 secured to the latter which passes through a slot 29 formed in one end of the member 26. The other end of the member 26 is connected to a partially threaded operating rod 30 which projects up through the upper open end of one of the pockets 7 and through an insulating guide 31 secured for the purpose in an opening in the platform 6. When the member 30 does not hold up the end of the member 26 to which it is connected the electrode is gripped between the projections 27. When, however, an upward pull is exerted upon the member 30 the lever 26 is tilted so that the upper electrode is released and is free to move downward under the action of gravity. Nut 32 threaded on the rod 30 engages the under side of the guide 31 to limit the upward movement of the member 30.

The lower electrode 33 which in the working position of the lamp shown in Fig. 2 is in axial alinement with the electrode 13, is supported in a socket formed in a bracket arm 34 carried at the lower end of a hollow bar-like member 35 which is rectangular in cross-sectional outline. The member 35 slides through a tubular member 36 secured to the platform 6 extending down through an opening formed for the purpose in the conical portion of the member 5, and slides upon a member 37 secured to the framework of the lamp in any suitable manner. The member 35 is engaged by two clutches located between the platform 6 and the hood 2. The lower clutch in the form shown in Figs. 1 and 5 of the drawings comprises a bar-like member 38 provided with an aperture 39 at one end through which the member 35 extends. The member 38 is so arranged that when its end opposite to that containing the aperture 39 is raised, the member 35 is cramped in the opening 39 to lock the members 35 and 38 together. The end of the member 38 remote from the member 35 is pivoted to the lower end of a link-like member 40. The upper end of the member 40 is pivotally connected to a link-like member 41 to the other end of which is pivotally connected a member 42 provided with an aperture 43 through which the member 35 passes. The member 41 is formed with an aperture between its ends and adjacent the member 42 through which loosely passes a rod 44. The rod 44 has secured to it a fulcrum member 45 which engages the under side of the member 41. When the rod 44 is pulled upward and the adjacent end of the member 42 correspondingly raised the member 35 is cramped in the opening 43, thus locking the members 35 and 42 together.

The member 44 is extended to pass through an opening formed for the purpose in the member 38. Adjustably secured to the member 45 by means of screws 47 is a hook shaped member 48. The hook portion of the member 48 extends through a slot 49 in a slotted member 50 secured to the chimney member 1. As shown, the slot 49 comprises an upper vertical portion and a lower inclined portion. The member 38 is provided with an aperture through which the upper end of the clutch operating member 30 extends. A pair of nuts 51 secured to the upper end of the member 30 serve as a means by which the amount of upward movement of the member 38 necessary to cause the member 30 to be elevated to release the upper electrode can be adjusted. The upper end of the rod-like member 44 is pivotally connected to a member 52 connected to the under side of the U-shaped armature 53 by springs 53′. The legs of the armature 53 extend into solenoid coils 54. The movable shell member 55 of a dash-pot is secured to the member 52. The stationary piston member 56 of the dash-pot is secured to an extension of the member 50.

When the lamp is in the out-of-service position the electrodes are in the position shown in Fig. 2, the lower electrode being supported by the member 38 which in turn is supported by the plate 50. In this condition of the lamp the upper electrode is gripped between the pins 27. As soon as the lamp is connected into the operating circuit the coils 54 are energized. This causes the armature 53 to be attracted, thus elevating the member 44. The initial upward movement of the member 44 causes both clutch members 38 and 42 to grip the member 35, after which the member 35 and the entire clutch mechanism moves upward with the member 44 until the upward movement of the member 38 is checked by the member 30. After the upward movement of the member 38 is checked by the member 30 through the nuts 32 and 51 further upward movement of the member 44 causes the member 42 to tilt about the fulcrum block 45 causing a further upward movement of the member 35 which is then moved through the aperture 39. As the member 45 moves upward the hook portion of the member 48 moves out of the lower end of the inclined portion of the slot 49 into the vertical portion of the slot. This movement causes a lateral movement of the member 45 and thereby of the lower end of the member 44 which through the clutch mechanism turns the member 35 about the rod 37 as an axis. This results in throwing the lower electrode from a position in alinement with the upper electrode to the position indicated by the dotted line in Fig. 3. The upward movement of the member 35 is checked by the engagement of the upper end of the electrode 38 with the projection 25.

The position of the clutch mechanism at this instant is shown in Figs. 1 and 5. At or usually slightly before the instant at which the electrode 33 engages the projection 25 the member 30 is raised by the member 38 sufficiently to release the upper electrode which drops into engagement with one side of the upper end of the lower electrode. As soon as current begins to flow through the electrodes, the coils 54 are automatically deenergized in any suitable manner and the member 35 and electrode 33 begin to descend under the action of gravity. The dash-pot members 55 and 56 are arranged to coöperate to retard the downward movement of the electrode 33 without impeding the upward movement of the electrode. The downward movement of the member 35 is checked by the engagement of the lower clutch member 38 with the member 50. As the member 45 descends the coöperating cams formed by the member 48 and the walls of the slot 49 causes the electrode 33 to be swung back into axial alinement with the electrode 15. The clutch mechanism is so arranged that when the coils 54 are deënergized and the lamp is in its normal running or operative condition, as well as in its out-of-service condition, the projection 42′ of the member 42 rests on the member 38.

It will be understood that the movement of the member 35 through the clutch member 38 at each feeding operation is great enough to compensate for the consumption of the lower electrode occurring since the preceding feeding operation. The downward movement of the electrode 33 occurring at each feeding operation is constant and is equal to the movement of the member 38 between the stops limiting its movement, the stop for the downward movement of the member 38 being the elbow recess in plate 50, and the stop for the upward movement is constituted by the nuts 32 and 51 on rod 30. As soon as the member 38 starts to descend the member 30 is released, whereupon the electrode 13 is again gripped between the projections 27 of the member 26. As a result after each feeding operation the lower end of the upper electrode projects through the diaphragm 19 a fixed distance as shown in Fig. 2 by dotted lines.

The lamp mechanism between the hood 2 and platform 6 is inclosed by a casing 57 which may be of any suitable construction. An annular member 58 is secured to the lower end of the member 5 of which it forms an extension. The member 58 in turn supports in any suitable manner a transparent or translucent globe 59.

In operation, the heat of the arc causes a rapid flow of air up through the chimney 1. The air carried out of the chimney 1 in this manner is replaced by air entering through the members 7 and 8. The air entering in this manner passes down through the nozzle formed by the apertures 22 to form a tubular body of air surrounding the upper end of the arc and serving to steady the arc and to keep down the temperature of the upper electrode. Under these conditions an upward current of air is also produced from the bottom and the sides of the globe, which current causes the lower end of the arc to be surrounded by an upwardly moving shell or tubular mass of air. The air circulation thus provided serves to steady the arc as well as to carry out of the arc lamp structure any fumes or smoke which may result from the consumption of the electrodes.

The particular lamp mechanism disclosed is intended for operation in the alternating-current circuit. Under these circumstances we have obtained excellent results by making the upper electrode of the lamp of ordinary carbon and by forming the lower electrode principally or entirely of titanium carbid.

In the modification of our invention shown in Fig. 4 the member 35 is engaged by an upper clutch member 42″ which is connected to the feeding mechanism. The lower clutch member 38′ is normally held in the position in which it is locked to the member 35 by a long helical spring 60. The member 38′ is provided with an aperture 61 through which extends a post 62 adjustably secured to the lamp frame-work. The post 62 is inclined to the line of movement of the member 35. Consequently as the member 35 is moved upward by means of the clutch 42″ it is rotated by reason of the engagement of the member 62 with the aperture 61, thus moving the lower electrode out of alinement with the upper electrode. In this construction, as shown, the upper end of the member 62 is provided with an enlargement 63 which serves as a stop to limit the upward movement of the clutch member 38′. Similarly, washers 64 may serve as stops limiting the downward movement of the clutch 38′. In this form of our invention the length of the arc struck at each feeding operation is the play of the member 38′ between the enlargement 63 and the top washer 64.

While the forms of our invention hereinbefore described have been found to give excellent results in practice it will be readily understood by all those skilled in the art that changes may be made in the forms of our invention without departing from its spirit, and we do not wish the claims hereinafter made to be limited to the particular constructions described and illustrated more than is made necessary by the state of the art.

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

1. In an arc lamp, an electrode, a stop ad-

jacent the arcing end of said electrode but out of line therewith, a second electrode normally in line with the first-mentioned electrode, and means for moving said second electrode toward the first-mentioned electrode and also laterally so as to bring it into engagement with said stop and the first-mentioned electrode.

2. In an arc lamp, the combination of two electrodes normally in axial alinement with each other, and means for moving one of said electrodes toward the other and laterally with respect to the axis of the other electrode.

3. In an arc lamp, the combination of two electrodes normally in axial alinement with each other, and means for moving one of said electrodes simultaneously toward the other and laterally with respect to its own axis.

4. In an arc lamp, an electrode, a support for the same, and means for moving the support parallel to the axis of the electrode and about another axis parallel to that of the electrode.

5. In an arc lamp, a movable electrode, a shield or guard formed with an aperture through which the arcing end of said electrode projects, a stop carried by said shield out of line with said electrode, and insulated therefrom, a second electrode, and means for moving it toward the first-mentioned electrode and laterally into engagement with said stop.

6. In an arc lamp, an upper electrode, a shield or guard surrounding its lower and arcing end and provided with a stop adjacent the arcing end of said electrode but out of contact therewith, means normally holding the upper electrode in fixed relation to said shield, a lower electrode, means for moving said lower electrode toward the upper electrode and laterally into position to engage said stop and to be engaged by the upper electrode, and means for causing said upper electrode to be released at or about the instant at which the lower electrode engages said stop whereby an engagement between the two electrodes occurs while the lower electrode is in engagement with the stop.

7. In an arc lamp, an electrode from which an arc normally axially extends, a movable electrode-carrying member, a clutch engaging said member for moving it parallel to the axis of the electrode, and means for moving said clutch laterally to thereby turn said member rotatively about an axis offset from but parallel to that of the electrode.

8. In an arc lamp, a chimney, a hood carried at the lower end of the chimney, a nozzle carried by the hood in line with the axis of the chimney, an electrode projecting through said nozzle and extending into said chimney, a conduit for conveying air from outside said hood to said nozzle, and means extending through said conduit for controlling the movement of the electrode passing through said nozzle.

9. In an arc lamp, a chimney, a hood supported at the lower end thereof, an annular member supported by the hood with its axis in line with the axis of said chimney, a conduit establishing communication between the space outside of said hood and the interior of said annular member, and a perforated diaphragm located in and insulated from said annular member.

10. In an arc lamp, an electrode, a movable electrode-carrying member whose axis is parallel to but offset from that of the electrode, a clutch for moving the member in a direction parallel to its length, and means comprising a stationary inclined surface and a coöperating cam surface carried by the clutch whereby the upward and downward movement of the clutch is accompanied by a lateral movement of the same and of the electrode.

11. In an arc lamp, a chimney member having a bell-shaped hood member at its lower end, said hood member being formed with pockets or chambered portions opening from the outer surface of the hood member, a chambered member establishing communication between said pockets, an electrode, one end of which extends transversely through said chambered member, a clutch member located in said chambered member, and an operating device therefor extending into one of said pockets.

12. In an arc lamp, a pair of electrodes normally in axial alinement with each other, and means for automatically moving said electrodes simultaneously in the lines of their axes and one of them laterally thereto.

In witness whereof, we have hereunto set our hands this second day of January, 1906.

RICHARD FLEMING.
CROMWELL A. B. HALVORSON, JR.

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