(No Model.) 2 Sheets—Sheet 1.

H. A. SEYMOUR.

ELECTRIC ARC LAMP.

No. 570,824. Patented Nov. 3, 1896.

FIG. 2.

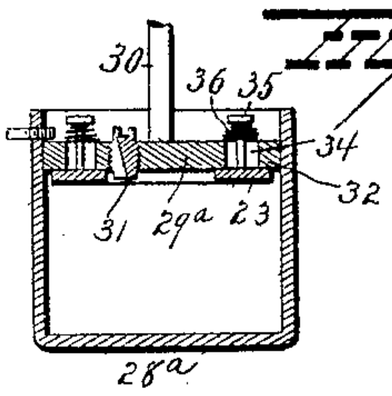


FIG. 1.

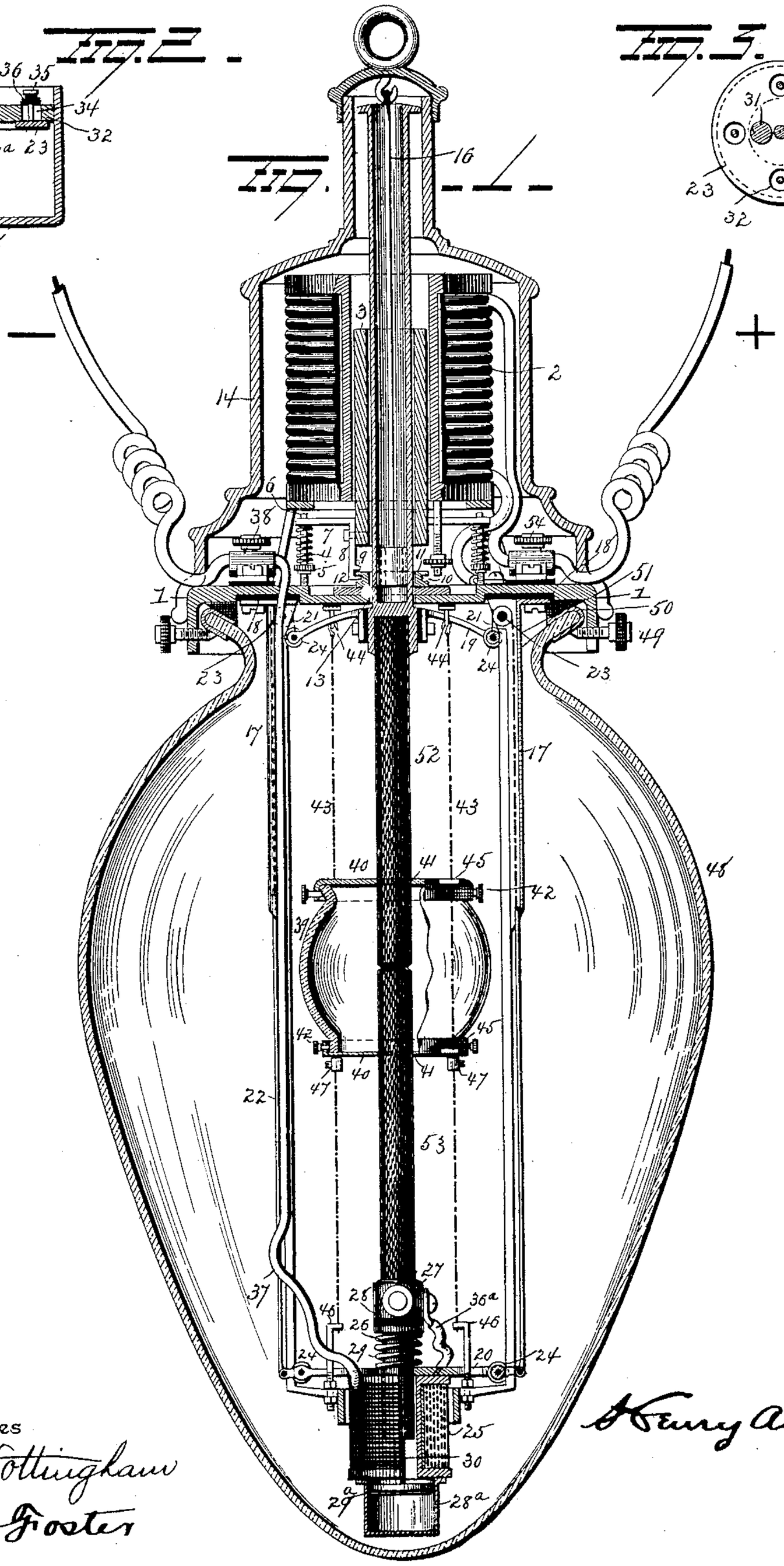
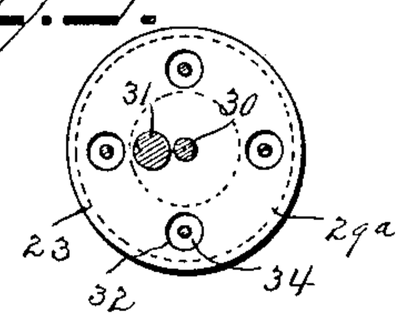


FIG. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

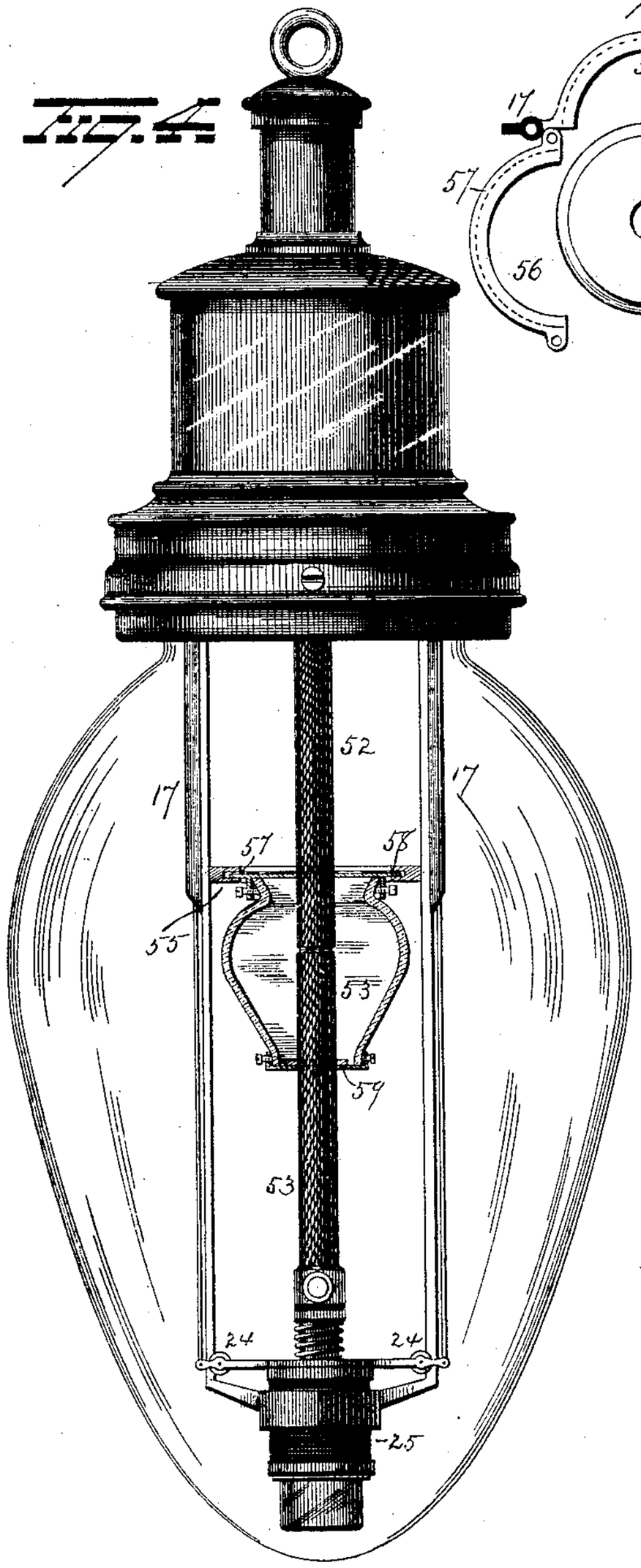
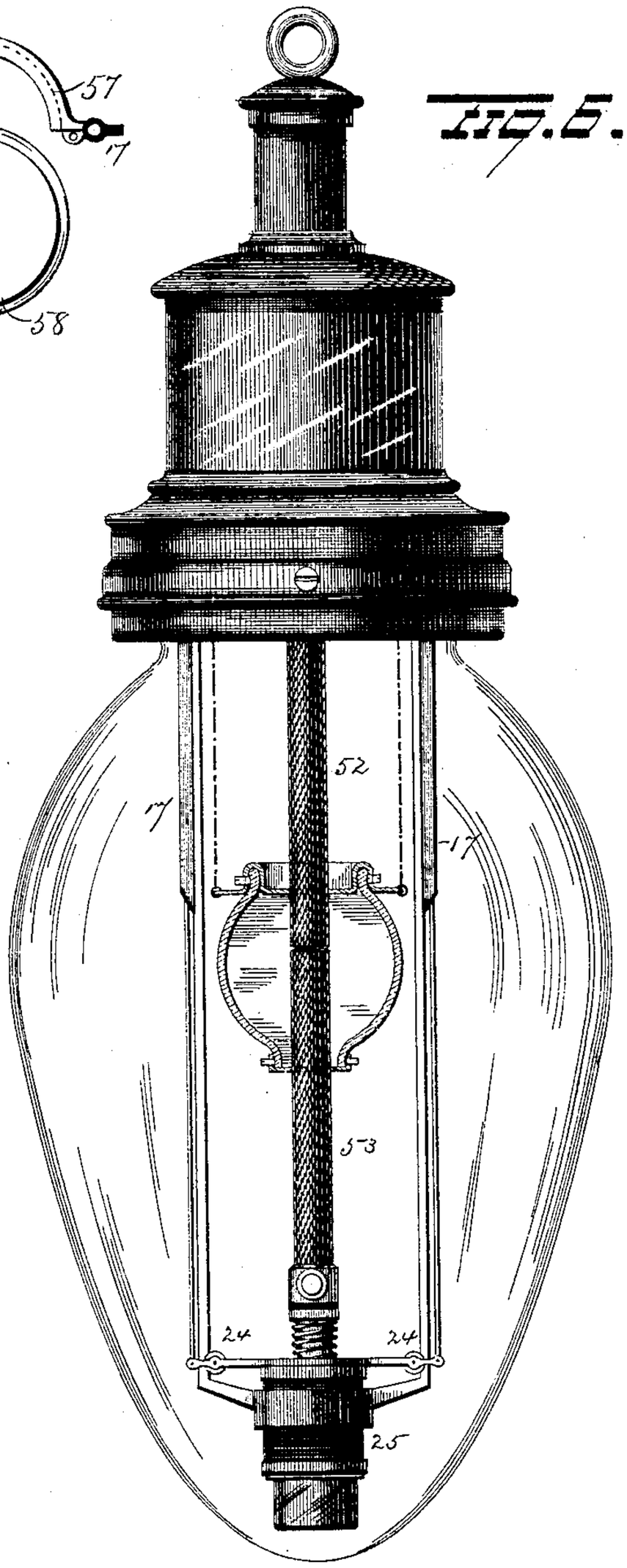


Fig. 5.



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Inventor
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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. 570,824, dated November 3, 1896.

Application filed July 7, 1896. Serial No. 598,323. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. SEYMOUR, of Washington, District of Columbia, have invented certain new and useful Improvements in Focusing 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 focusing arc-lamps, and especially to that type of lamps which are operated by an alternating current.

Alternating-current arc-lamps as heretofore constructed have been faulty and objectionable in their operation by reason of the violent chattering of their carbons and regulating mechanism that attends the establishment of the arc; also because of the buzzing of the regulating mechanism and the hissing of the arc during the burning of the carbons; also because of the frequent extinguishment of the arc, and also because of the impossibility of maintaining a long persisting arc within an arc-inclosing globe.

The object of my invention is to obviate the defects and objectionable features above set forth and to provide an alternating-current focusing arc-lamp of such construction that any desired length of arc may be established and maintained within an arc-inclosing globe without the chattering of the carbons or regulating mechanism when the lamp is first put into operation and without the hissing of the arc and buzzing of the regulating mechanism while the lamp is burning, and thereby insure the production and continued maintenance of a steady and reliable arc for prolonged periods of time without a renewal of the carbons or other manual interference with the lamp.

With these ends in view the 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 one construction of arc-lamp embodying the invention. Figs. 2 and 3 are detached views illustrating the details of construction of the dash-pot, and Figs. 4, 5, and 6 illustrate modifications.

1 represents the lamp-floor, 2 a coarse-wire solenoid, and 3 a hollow core adjustably supported and guided by the spiral springs 4, adjusting-nuts 5, and guides 6, the latter passing through holes formed in arms 7, attached to the core. A lifter 8, attached to and moving with the core, is provided with a finger 9, which engages in an annular groove 10, formed in the periphery of the ring-clamp 11, which encircles the carbon-holder. A ring-valve 12 encircles the carbon-holder below the ring-clamp and is seated on the lamp-floor over the opening 13, formed therein for the passage of the carbon-holder. The ring-valve, while permitting of a slight lateral adjustment of the carbon-holder, serves to prevent gases from flowing through opening 13 into the casing 14. Within the tubular carbon-holder is placed a piston 15, which is suspended from the casing by the rod 16. The piston and tubular carbon holder or rod constitute a dash-pot for retarding and controlling the feed of the carbons. To the under side of the lamp-floor are secured the upper ends of the guides 17 17, which may be, if desired, insulated from the lamp-floor by means of the insulating-strips 18. These guides may be made of any desired form in cross-section. They are shown as being U-shaped in cross-section at their upper ends. Between these guides slide the cross-heads 19 and 20, which are connected together at each end by the chain 21 and rod 22, the chains passing over pulleys 23. The ends of the cross-heads may have rollers 24 journaled therein, which engage and travel upon the inner faces of the guides, and thus minimize the friction and wear of the parts.

In the lower cross-head is mounted a solenoid 25, upon the core 26 of which is secured a carbon-holding socket 27, which is insulated from the core by a strip 28 of insulating material. Spiral spring 29 is interposed between the carbon-socket 27 and the upper end of core 26 and serves to uphold the latter and the carbon supported by it.

28ª is a dash-pot secured to the lower end of the solenoid. The piston 29ª of the dash-pot is connected to the core by means of the rod 30. Figs. 2 and 3 illustrate the details of construction of piston 29ª. It is provided with an adjustable screw-valve 31 for regulating its downward movement and by means of which the entire downward movement of

the piston, core, and lower carbon may be made very slow and gradual. A series of passages 32 extend through the piston, and an annular valve 33 seats against the under side of the piston and serves to cover and close all said holes or passages. Annular valve 33 has secured thereto a series of stems 34, which pass through the holes 32 and are provided at their upper ends with heads 35. Spiral springs 36, encircling the stems and interposed between the heads 35 and the upper side of the piston, serve to retain annular valve 33 against its seat. By means of this construction of piston its movement throughout its downward stroke will be slow and gradual, while, on the other hand, its upward movement will be quick and prompt, owing to the yielding of the annular valve and the passage of the checking fluid through the series of holes in the piston.

Carbon-socket 27 has secured thereto one end of a flexible conductor 36^a, the opposite end of which is electrically connected with one end of the helix of solenoid 25, while the opposite end of the latter is connected with a conductor 37, which extends to the negative binding-post 38 of the lamp.

39 is an arc-inclosing globe, which may be of any desired size, form, and construction, and is provided at its opposite ends with covers 40, each of which is constructed with an opening 41, through which one of the carbons is fed and in which it snugly fits. These covers may be secured to the globe in a practically air-tight manner by means of the set-screws 42, or they may simply rest upon the ends of the globe, so as to be free to move laterally thereon. In the latter case the ends of the globe are formed with a ground-seat to insure a tight joint between the globe and cover. The globe is supported by chains 43, two being shown in the drawings, although three or more chains may be employed. These chains are secured at their upper ends to the hooks 44, fastened to the under side of the lamp-floor, and pass through outwardly-projecting perforated ears 45, formed on the covers, and are fastened at their lower ends to adjustable rods 46, by which their tension may be readily regulated. The perforations in the ears on the covers are of greater diameter than the thickness of the chains, in order to permit of the lateral movement of the covers.

47 are adjustable stops on which the lower cover of the globe rests and by means of which the vertical adjustment of the globe may be regulated. An arc-inclosing globe, when mounted in the manner shown, is free to adjust itself laterally in all directions to provide for any irregularities that may exist in the carbons and which would tend to interfere with their passage through the openings in the covers. The chains serve to support the globe at the desired height, and by reason of their flexibility will yield laterally to a sufficient extent to permit the globe to move bodily in a lateral direction and accommodate itself to any irregularities in the carbons, while the tension of the chains will serve to restore the globe to its normal position.

48 is an outer globe which is detachably secured in place by means of set-screws 49, which serve to force the upper rim 50 of the globe snugly against the inclined bearing 51 on the under side of the lamp-floor and form a practically air-tight joint therewith.

The operation of the lamp is as follows: When no current is passing through the lamp, its carbons 52 and 53 are in contact. When the lamp is switched into circuit, current enters the positive binding-post 54, and from thence flows through solenoid 2, lamp-floor 1, the carbons 52 53, flexible conductor 36^a, solenoid 25, conductor 37 to the negative binding-post 38. On the passage of current through the lamp both the upper and lower solenoids will be instantly energized and will operate to pull the carbons in opposite directions. However, the upper solenoid can separate the carbons only a very slight distance, owing to the engagement of the ring-clamp, as it rises with the adjustable stop 54, which latter is so adjusted that it will prevent the ring-clamp from being raised any higher than will cause it to barely clear the lamp-floor, at which point it will firmly grip and support the carbon-holder on the upper carbon thereto attached. The downward movement of the core of the lower solenoid is so retarded by the dash-pot that the lower carbon is very slowly and gradually separated from the upper carbon. Hence the carbons are initially separated but a very slight distance, with the result that an exceedingly short arc is established between them. This minute arc will offer sufficient resistance to the passage of the current through it to insure the heating of the adjacent ends of the carbons sufficiently to form a conducting-bridge of incandescent carbon vapor across the gap or space between them, which will preserve the integrity of the circuit through the lamp and thereby prevent the carbons and regulating mechanism from chattering when the lamp is first put into operation. The lower solenoid slowly and gradually pulls down the lower carbon and maintains the conducting-bridge of incandescent carbon vapor across the gradually-lengthening gap or space between the carbons, and thus enables the arc to be drawn to any desired length without danger of its extinction and unaccompanied by any appreciable vibration or chattering of the carbons or regulating mechanism. As the carbons continue to burn away the arc increases in length. The resistance of the arc is correspondingly increased, with the result that the upper solenoid will become so weakened as to be unable to uphold its core and parts connected therewith, and hence the core will descend and cause the ring-clamp to engage the lamp-floor and release its grasp on the carbon-holder, which latter will then feed the upper carbon downwardly and cause the

lower carbon to be fed upwardly, and thus insure the maintenance of the arc at a fixed point. The shortening of the arc lessens its resistance, with the result that the upper solenoid is so strengthened that it will again raise its core and cause the ring-clamp to again grip and uphold the carbon-holder. In this manner the two carbons are simultaneously adjusted and fed until they have been consumed or sufficiently consumed. In order to insure the simultaneous adjustment and feed of the two carbons, the combined weight of the core, tubular carbon-holder, and cross-head associated with the upper carbon are made to slightly exceed the weight of the solenoid, cross-head, and other parts associated with the lower carbon, so that when such parts of the lamp are released to the action of gravity the carbons will be fed together. The lower solenoid is preferably so constructed that it will not be effected by variations of current strength, such as will insure the feeding of the carbons. However, in the event that the arc should be extinguished from any cause both solenoids would be instantly deënergized and both carbons would be quickly fed toward each other and brought into contact, causing the arc to be again established between them.

Figs. 4 and 5 illustrate a modified construction in which the guides 17 17 are connected by a two-part clamp composed of the stationary portion 55, which is secured at its ends to the guides, and the hinged portion 56, which is hinged at one end and is detachably secured in place at its opposite end. The halves of this two-part clamp are provided with a groove 57 on their inner and adjacent edges, within which rests the outwardly-projecting flange 58, formed on the cover of the arc-inclosing globe. By means of this construction the globe is restrained against vertical displacement and is permitted to adjust itself laterally in all directions. In this construction of lamp an annular valve 59 encircles the lower carbon and is supported upon the lower cover.

Fig. 5 represents another modification in which the arc-inclosing globe is suspended by chains secured to the upper cover of the globe.

In each one of the constructions shown and described the arc-inclosing globe is permitted to move bodily in a lateral direction and thereby permit of the feeding through either its upper or lower covers of carbons slightly crooked or having slightly-irregular surfaces, and which, without such lateral adjustment of the globe, would interfere with their operation in feeding.

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 carbons and regulating mechanism for feeding the carbons simultaneously and thereby maintaining the arc at a fixed point, of means acting independently of the regulating mechanism and associated with the lower carbon for slowly and gradually separating it from the upper carbon when the lamp is switched into circuit and thereby slowly drawing the arc to any desired length, substantially as set forth.

2. In an arc-lamp the combination with its carbons; regulating mechanism for feeding the carbons simultaneously and thereby maintaining the arc at a fixed point, and an arc-inclosing globe provided with openings at each end through which the carbons pass and within which they snugly fit, of means associated with the lower carbon for slowly and gradually separating it from the upper carbon when the lamp is switched into circuit, and thereby slowly and gradually drawing the arc to any desired length, substantially as set forth.

3. In an arc-lamp, the combination with its carbons and means for feeding them simultaneously and thereby maintaining the arc at a fixed point, of an arc-inclosing globe provided at each of its ends with a cover having an opening through which one of the carbons is fed and within which it snugly fits, the parts being constructed to permit of the lateral adjustment of the openings through which the carbons are fed, substantially as set forth.

4. In an arc-lamp the combination with its carbons and means for feeding them simultaneously, of an arc-inclosing globe provided at each of its ends with a cover having an opening through which one of the carbons is fed and within which it snugly fits, and means for permitting of the lateral adjustment of said globe, substantially as set forth.

5. In an arc-lamp the combination with its carbons and means for feeding them simultaneously, of an arc-inclosing globe provided at each of its ends with a cover having an opening through which one of the carbons is fed and within which it snugly fits and means for permitting of the lateral adjustment in all directions of either end of the globe, substantially as set forth.

6. In an arc-lamp, the combination with its carbons and means for feeding them simultaneously, of an arc-inclosing globe provided at each of its ends with a cover having an opening through which one of the carbons is fed and within which it snugly fits, and means for maintaining the globe at any desired vertical adjustment and means for permitting the globe to adjust itself laterally in all directions, 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,
C. S. DRURY.