(No Model.) 2 Sheets—Sheet 1.

J. H. J. HAINES.

ELECTRIC ARC LAMP.

No. 603,687. Patented May 10, 1898.

Fig. 1.

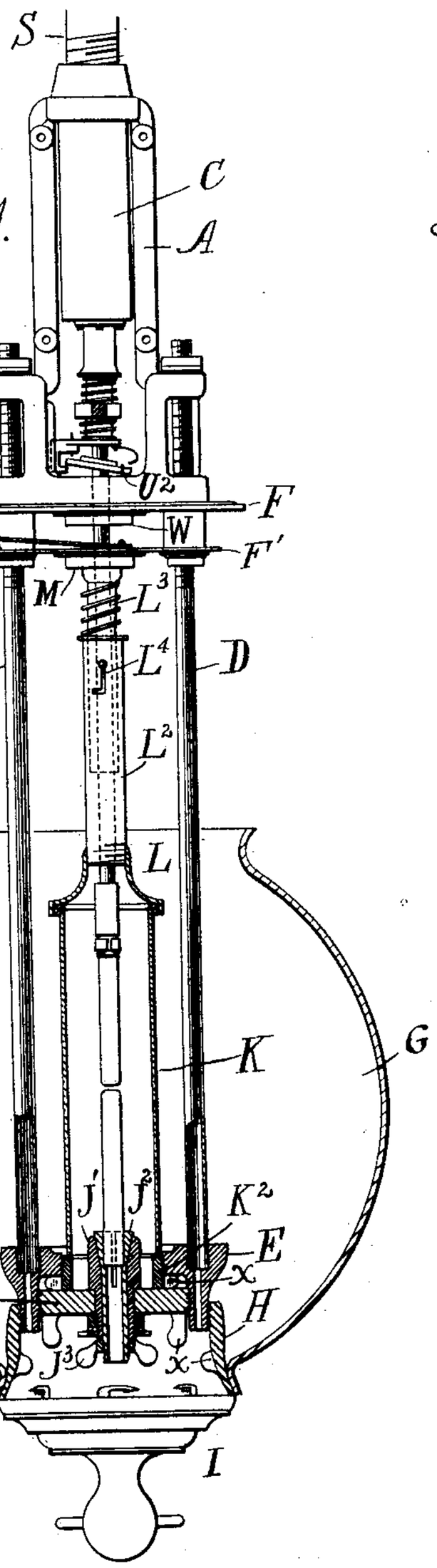


Fig. 2.

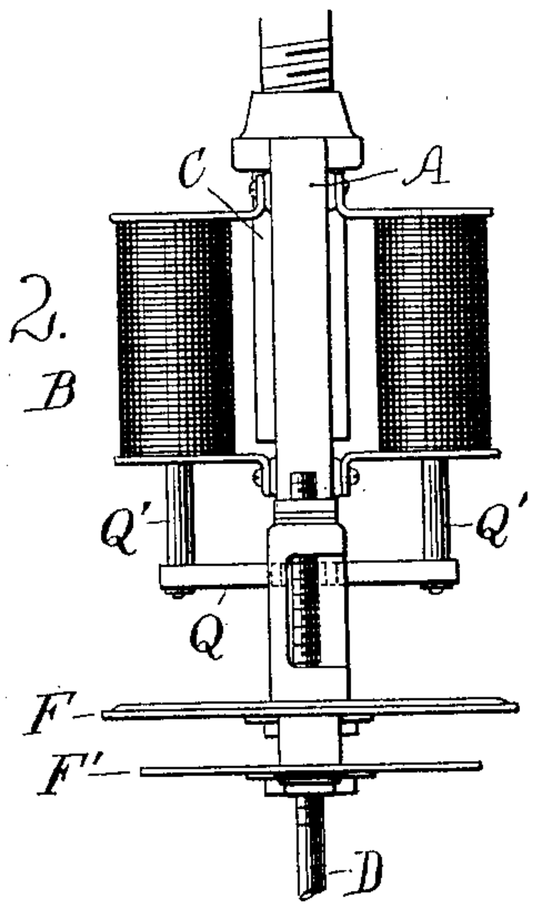
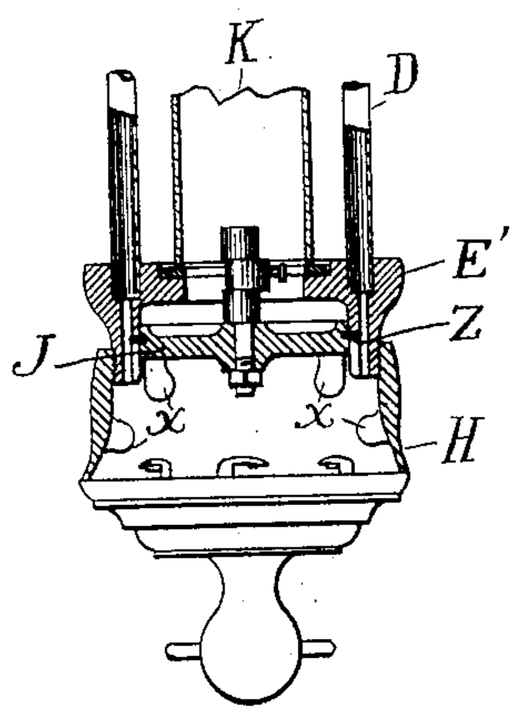


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

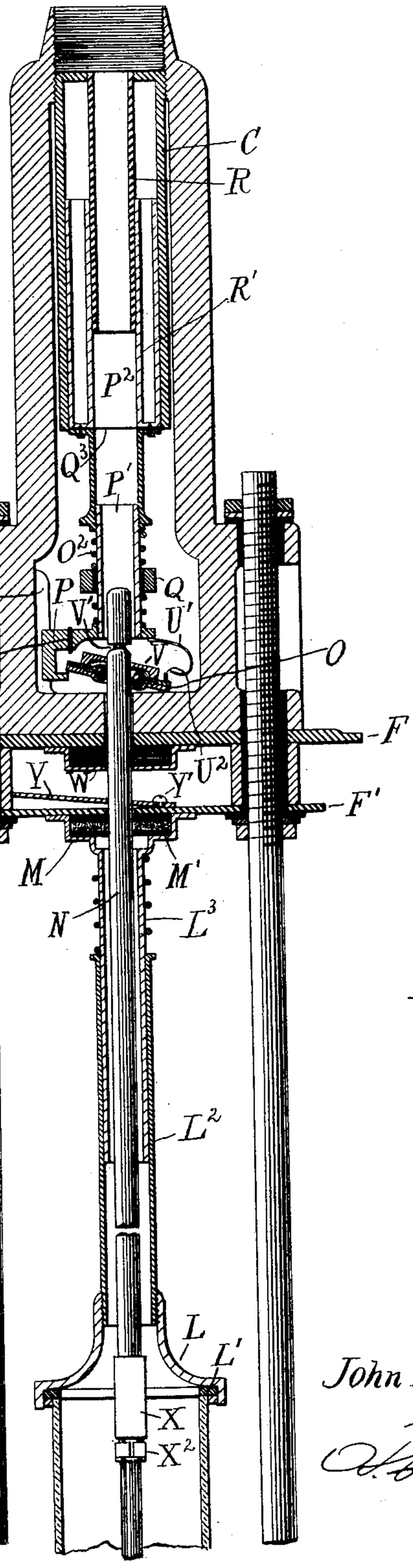
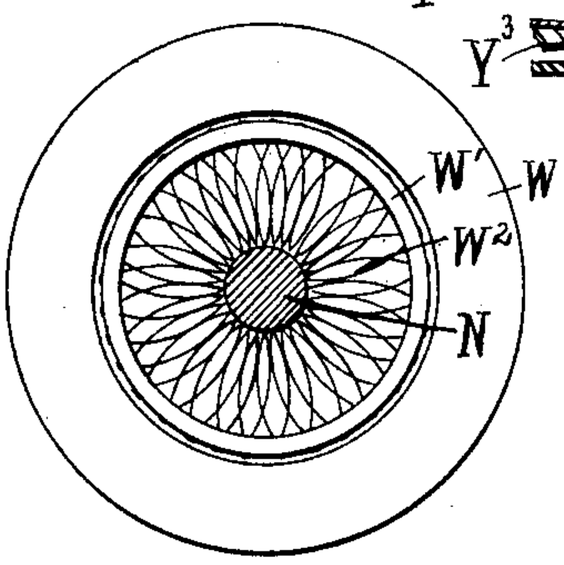


Fig. 5.



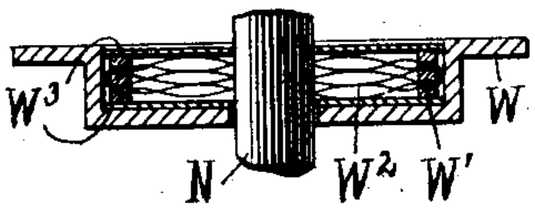
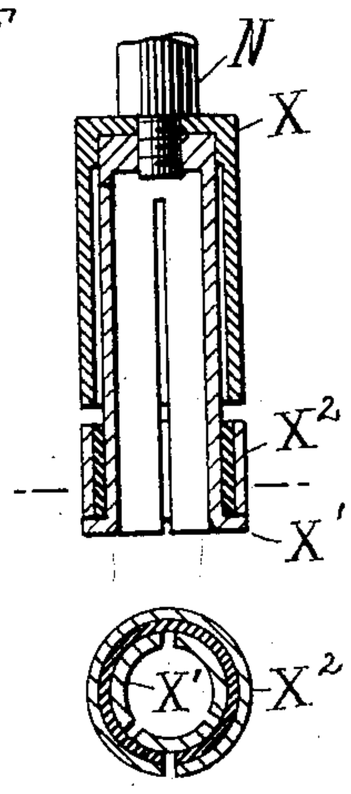


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN H. J. HAINES, OF NEW YORK, N. Y., ASSIGNOR TO THE HAINES ELECTRIC COMPANY, OF JERSEY CITY, NEW JERSEY.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 603,687, dated May 10, 1898.

Application filed May 27, 1897. Serial No. 638,390. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. J. HAINES, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Electric-Arc Lamps, of which the following is a specification.

This invention relates to electric-arc lamps, and particularly to that class of such lamps in which the arc is inclosed and which are commonly called "inclosed-arc lamps."

In such lamps as heretofore constructed it has been a difficult matter to provide a chamber about the arc which would be sufficiently tight to be of any real service in increasing the longevity of the carbons and at the same time allow perfect freedom of motion to the feeding carbon. In said lamps also there has been great difficulty experienced in trimming, such operation necessitating opening into the arc-inclosure or in removing it in order to get at both carbon-holders.

The objects of this invention are to overcome the above objections and to improve upon details of construction in a manner to produce a highly-efficient lamp of this class and one in which the time and trouble in trimming shall be reduced to the minimum.

With these objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter described, and set forth in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 represents, in partially-sectionized side elevation, an arc-lamp involving the features of this invention. Fig. 2 represents a portion thereof in side elevation. Fig. 3 is a modification of the lower portion of the lamp. Fig. 4 is a vertical central section through the upper portion of the lamp. Fig. 5 represents, in plan and central section, an improved form of contact for transmitting current to the removable carbon-carrier. Fig. 6 represents, in vertical and transverse section, an improved form of carbon-holder.

What may be termed the "frame" of the lamp is indicated at A. Upon this frame are mounted the feed-controlling magnets B, which are shown in Fig. 2, though omitted from Fig. 1 for the purpose of disclosing the centrally-located dash-pot C. From this frame depend the insulated side rods D, to which the annular base-plate E is secured.

F indicates the usual plate, which may be circular or of other form, constituting the floor of the upper chamber of the lamp, and to which the jacket is connected, said jacket being of the usual form and omitted from the drawings.

A lamp-globe is shown at G as supported upon the flaring ring H, which is removably connected to the base E in any suitable manner. To this ring is attached in any suitable way the terminal rosette I, closing the opening therein and concealing the base-ring and its appurtenances. Above the globe and extending to plate F may be placed any suitable inclosing jacket desired, which is also omitted from the drawings as containing nothing novel and being non-essential to the illustration of the invention.

The lower-carbon holder may be constructed in any desired manner and for the purposes of my invention is mounted upon a plate, as J, which is removably mounted in any suitable way, as by screw-thread (seen in Fig. 1) or bayonet or other lock joint. (Indicated in Fig. 3.) The carbon-holder (shown in Fig. 1) consists of a socket J′, having a flaring seat at its upper end and exteriorly screw-threaded at its lower end for the reception of suitable nuts, by which it may be secured to the plate J. Within this socket is seated a clamping-tube J^2, whose upper end has a conical exterior to fit the flaring socket and whose lower end is screw-threaded to receive the clamping-nut J^3. The upper end of the clamping-tube is split, as indicated, so that upon turning the nut J^3 the carbon may be tightly clamped in the holder.

K represents the arc-inclosing cylinder, which, as represented in Fig. 1, may be inserted and removed through the bottom of the lamp. To this end a ring, as K^2, is removably secured to the annular base E. Upon this ring and sealed thereto by means of a suitable gasket rests said cylinder. For the removal of the ring H, the plate J, and the ring K^2 suitable ears or projections *x* may be provided.

In electric lamps having inclosed arcs, as generally constructed, attempts have been

made to seal the upper end of the arc-inclosing chamber upon the movable upper carbon. This has not only been wrought with difficulty in making a satisfactory seal upon the carbon, but it has prevented economical consumption of the upper carbon, a long stub always being left. In this invention the sealing of the arc-inclosing chamber is made upon the carbon-carrying rod, and the upper carbon is then free to be consumed as close to the carbon-holder as is practicable in any lamp. To this end the arc-inclosing cylinder K is provided with a telescoping-cap. This cap consists of the lower bell-shaped portion L, which is provided with a suitable gasket L′ for making a proper seal upon said cylinder, and the tube L^2, constructed to slide vertically upon the tube L^3, which in turn is connected to the plate F′, located a short distance below the plate F and secured to the depending rods D in any suitable manner. About the tube L^3 is placed a spring bearing upon the upper end of tube L^2 for the purpose of forcing the cap into sealing engagement with the cylinder K. In inserting or removing the said cylinder the lower portion of the cap may be raised and held in elevation by any suitable means—such, for instance, as the pin and angle-slot, (represented at L^4.)

At the upper end of the tube L^3 is formed or attached thereto a chamber M, which, as indicated in Fig. 4, constitutes a gland or stuffing-box. This may be constructed in any suitable way to make a seal upon the carbon-carrying rod N. In one practical form of construction it contains a layer of asbestos M′, confined between a couple of plates, which serve to maintain a closer union between the asbestos and the rod.

The feeding mechanism for the upper carbon is of the ring-clutch order, as set forth in my application for patent filed October 29, 1896, Serial No. 610,404, and is not claimed herein. It consists of a tilting ring, as O, provided on its inner periphery with a series of balls or other antifriction devices, as illustrated in Fig. 2. One edge of the ring in its normal feeding position rests upon the base of the frame A, while the opposite edge is supported upon a vertically-moving part, as P, which is connected in any suitable way to the feed-controlling magnets B.

The preferred form of connection herein shown consists of a tube P′, concentric with the carbon-carrying rod and connected by any suitable means to the piston P^2 of the dash-pot C, this tube P′ being surrounded by the yoke Q, to whose ends the cores Q′ of magnets B are attached. The spring connection between the cores of the magnets and the part P may be provided in any suitable way, but preferably by the means shown, which consists of mounting the yoke Q loosely upon the tube P′ and interposing springs Q^2 between it and the support P below and a shoulder upon the tube P′ above. To secure perfect freedom of motion of the piston P^2, a slightly-open joint between it and the upper portion of tube P is left, as indicated at Q^3, Fig. 4.

The form of dash-pot preferred is that illustrated in Fig. 4, wherein the cylinder has the central core R and the piston is formed of concentric tubes R′. By this construction it is possible to secure perfect freedom of the carbon-carrying rod in its passage through the dash-pot and its appurtenances, said construction being adapted to the extension of said rod up into the lamp-supporting tube S, a portion of which only appears in Figs. 1 and 2. The ring-clutch support is guided in its action by suitable projections, as T, on the frame A. Through this support is passed a pin or screw, as U, to limit the play of the supported edge of the clutch-ring. To the opposite side of this support P is connected a spring-stop U′ for limiting the upward movement of the clutch-ring upon the elevation of the rod N when trimming the lamp. To assist in holding the clutch-ring to the proper operating position, suitable stops, as pins U^2, may be inserted in the frame A at the lower side of said ring.

One of the novel features of this invention is the feed cut-off. This consists of a ring, as V, which surrounds the carbon-carrying rod and rests upon the ring-clutch. The cooperation of this ring with the rod N is effected by providing a suitable notch in the rod, which, because of the freedom of rotation of said rod about its axis and also because of the freedom of movement of the ring-clutch, is extended around the rod, as indicated at V′. As the carbon-carrying rod descends to the point at which the consumption of the carbons is to cease this ring V slides into the notch V′ and stops further descent of the rod. The movement of the ring V into this notch is insured by the tremulous action produced upon the parts of the lamp by the alternating current.

It will be noted that the lower edge of the notch V is rounded off, as is also the upper end of the rod. By this means the rod is readily inserted through the clutch and the cut-off ring V. When there is no current on the lamp, the ring V will not readily slide upon the clutch-ring. Therefore to release the rod from the cut-off ring V it is only necessary to push the rod up through the ring, when it may be readily drawn down through the same.

In arc-lamps as heretofore constructed it has been customary to use a brush applied laterally to the carbon-carrying rod to insure transmission of current from the frame to said rod. To make the contact between this brush and the rod satisfactorily, more or less pressure must be applied, with the detrimental result of adding friction to the feeding of said rod. In this invention it is proposed to make the contact between the rod and the frame in a form to bear upon the rod from all sides equally. To this end a suitable box, as W,

is formed about the rod N in any convenient location, preferably under the plate F, as shown. Within this box is located a perforated ring W′, through the perforations of which are threaded a large number of loops of very fine wire, (indicated at W^2,) the bent ends of which loops bear upon the rod N. By preference also metal plates, as W^3, are placed above and below this mass of wire loops to assist in keeping them in place against the rod and in conducting current therefrom to the box W and to the frame of the lamp. This annular brush of fine wire may be constructed in various ways; but the form shown is preferable, as in this form it is easily constructed and readily inserted and removed, and the loops cause less friction upon the rod than would the ends of wires inserted in the manner usual in brushes.

The carbon-holder for the upper carbon is also of special construction, it being automatic in its clamping action and limited in cross-section, so that it may pass freely through the upper portion of the arc-inclosing chamber, as it does up to the gland M. This carbon-holder is shown in detail in Fig. 6, and consists of the socket X, reduced at its inner end, the split-tube clamp X′, secured to the lower end of rod N and confining the socket X thereby to said rod, and the bimetallic split ring X^2, encircling the lower end of said split tube and resting upon a flange projecting from said tube, as shown. The socket and ring are so proportioned with relation to the carbon that the latter may be readily inserted, though against sufficient friction to hold it in place, which retention is insured as soon as the holder becomes heated, the outer layer of metal constituting said ring having a greater coefficient of expansion than the inner layer. Any suitable metals adapted to this purpose may be employed. A clamp constructed on this plan is virtually a thermostatic clamp, and though especially designed for use in an arc-lamp may obviously be used in other locations.

In order to retain the carbon-rod in any fixed position while trimming the lamp or at other times, a supplemental clutch or brake is provided. A simple form of such brake is illustrated in Figs. 1 and 4 as consisting of a plate Y, of any suitable material. This plate is perforated for the passage of the rod N and at its inner end is secured movably in place by means of a screw or pin Y′, which passes through it into the plate F′. To insure the proper location of this plate Y, its outer end may be held in place by encircling one of the collars Y^2, which serve as distance-pieces between the plates F and F′. By raising the outer end of the plate Y it is made to bite the rod N and hold the same against movement. It may be held in this elevated position by any suitable device, such as a stop or button Y^3, pivoted or otherwise secured to the plate F′ and adapted to be inserted under the end of plate Y. When this button is removed from under said plate, the latter will rest upon the plate F′ and allow the rod to move freely through it.

In the modified form of base-plate E′, Fig. 3, provision is made for the cylinder K being supported directly upon said plate, as indicated, from which it is only removable after the removal of globe G. The lower-carbon holder is, however, removable through the bottom of the lamp, as in Fig. 1, and its more rapid removal and insertion are insured by employing a bayonet-joint connection, as indicated by the pins Z, which project therefrom into suitable angle-slots in the base E′, only the vertical portions of which are illustrated.

In trimming the lamp it is only necessary to remove the rosette I and the plate J and take out the lower-carbon holder. When this is done, the upper-carbon holder, which has been stopped in its descent by the ring V, may be readily removed through the bottom of the lamp simply by giving it a slight upward movement to disengage the ring V and then drawing it down sufficiently to remove the carbon stub and inserting a fresh carbon. After the fresh carbon is inserted the rod may be pushed back to place and clamped there by means of the plate Y and stop Y^3 until the lower carbon and its holder are put in place, when the brake may be removed from the rod and the carbons brought together.

If it is desired to remove the globe G, the ring H is removed from the base-plate. Then if it is desired to remove the cylinder K it may be removed from above by lifting the tube L^2 and holding it up by means of the device at L^4, or in the construction shown in Fig. 1 it may be removed through the bottom of the lamp by unscrewing the ring K^2.

It will be noted that the arc-inclosing chamber is sealed by the gaskets at the lower and upper ends of cylinder K and by the stuffing-box M at the upper end of said chamber, the plate J making a close joint in the base-plate E′.

It will be seen from the construction described that the carbons may be as completely consumed in this lamp as in any open-arc lamp.

This lamp, while adapted for use on any circuit, has been especially constructed for use on an alternating-current circuit, in connection with which any suitable transformer may be used, though a transformer especially adapted for inclosed-arc lamps has been designed for use herewith and forms the subject-matter of an application filed by me June 18, 1897, Serial No. 641,379.

Many variations in form and changes in construction aside from those above described and suggested may be made without departing from this invention.

What I claim as my invention is—

1. The combination of the annular base-plate, the outer globe supported thereon, the removable ring for sustaining the globe, the

arc-inclosing chamber mounted directly upon said plate over the opening therein, and a removable plate closing said opening and carrying the lower-carbon holder.

2. The combination with the base-plate suspended directly from the upper framework of the lamp and having an opening through the center, of the lamp-globe supported upon said base, the arc-inclosing globe also supported upon said base-plate, the cap for the arc-inclosing globe secured to the upper framework of the lamp, the plate removably fitted to the opening in the base-plate, the lower-carbon holder mounted thereon, and the upper-carbon carrier removable through the base-plate, substantially as and for the purpose set forth.

3. The combination with the carbon-carrying rod and the plate F, through which it passes, of the cap portion of the arc-inclosing chamber having at its upper end an enlargement which is secured to the under side of said plate and thereby forms the chamber M, an asbestos packing in said chamber about the rod, and plates on either side of the asbestos to insure its engagement with the rod.

4. In an arc-lamp, a dash-pot having a central tube concentric with the outer wall, and having a piston consisting of concentric tubes working in the space between said central tube and the outer wall, and a hollow piston-rod, as and for the purpose set forth.

5. The combination with the dash-pot and its piston, of the solenoids on either side thereof, the yoke connecting the cores of the solenoids and embracing the stem of the piston and spring-seated thereon, and the feeding-clutch operatively connected to said piston.

6. In an alternating-current arc-lamp, the combination with the feeding mechanism, of a cut-out coöperating therewith to stop the feeding and adapted to be thrown into operation by the tremor of the lamp, substantially as set forth.

7. The combination with the carbon-carrying rod, provided with a nick or projection, of an inclined plate mounted to slide into engagement with said nick or projection to stop the feeding of the rod.

8. The combination with the tilting clutch and the nicked rod, of a plate carried on said clutch, and adapted to slide into said nick.

9. The combination with the tilting clutch, of a plate mounted movably thereon, and the nicked rod having a rounded shoulder below said nick for the purpose set forth.

10. The combination with the carbon-carrying rod and its feeding-clutch, of a supplemental clutch or brake wholly independent of the feeding-clutch and consisting of a perforated plate embracing the carbon-carrying rod but out of engagement therewith during feeding and adapted to be tilted to bite the rod and hold the same up during trimming.

11. The combination with the carbon-carrying rod, of the perforated tilting plate or brake embracing the same but out of engagement therewith during feeding, and means for holding the said plate in a tilted position to clutch the rod and retain it against movement during trimming.

12. A thermostatic clamp, consisting of a split tube surrounded by a bimetallic ring.

13. The combination with the carbon-carrying rod, of a socket upon its lower end, a split tube located therein, and a thermostatic device for decreasing the diameter of said tube.

14. In an arc-lamp, the combination with the carbon, of a thermostatic clamp embracing a bimetallic ring, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 25th day of May, A. D. 1897.

JOHN H. J. HAINES.

Witnesses:
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C. L. BELCHER.