No. 693,706.

Patented Feb. 18, 1902.

J. A. HEANY.

ELECTRIC ARC LAMP.

(Application filed Oct. 3, 1901.)

(No Model.)

4 Sheets—Sheet 1.

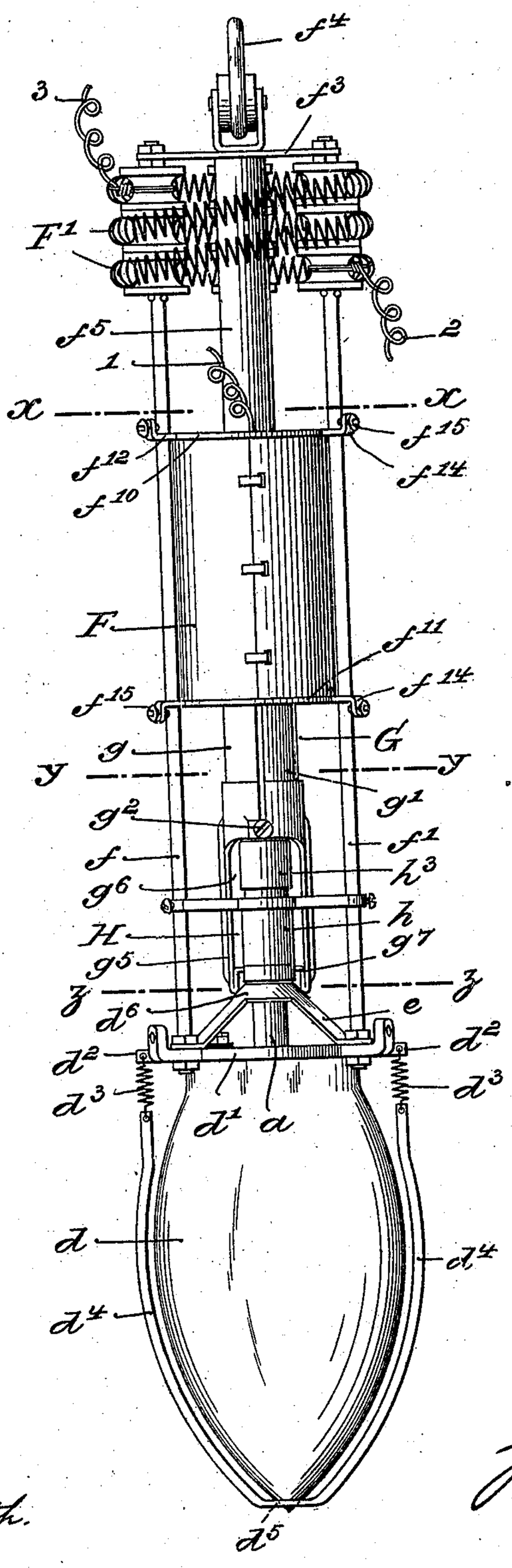

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

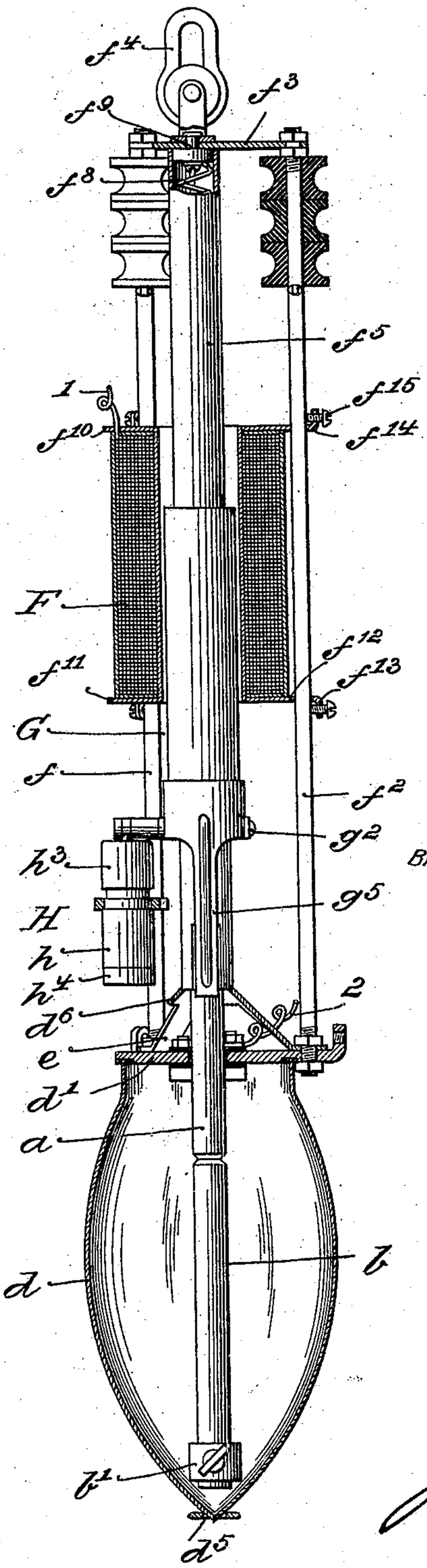
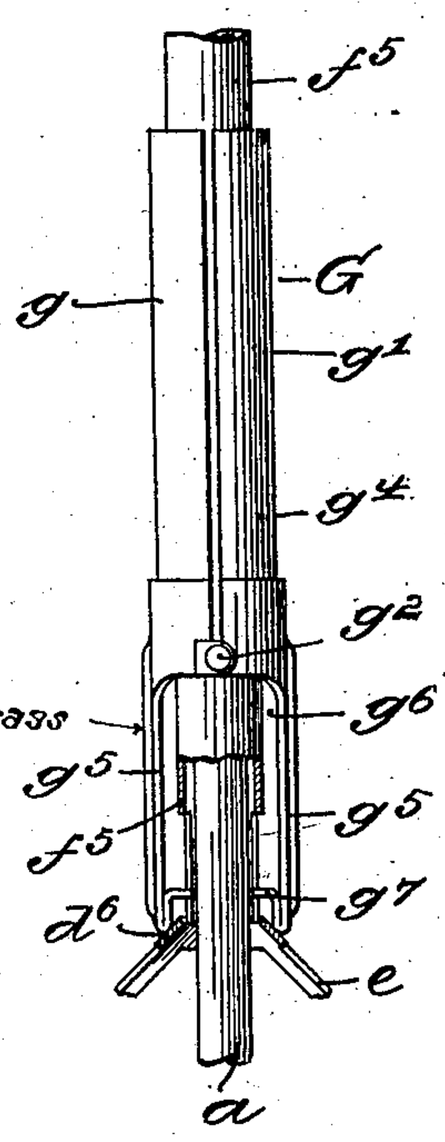


Fig. 3.



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No. 693,706. Patented Feb. 18, 1902.

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(No Model.) 4 Sheets—Sheet 3.

Fig. 4.

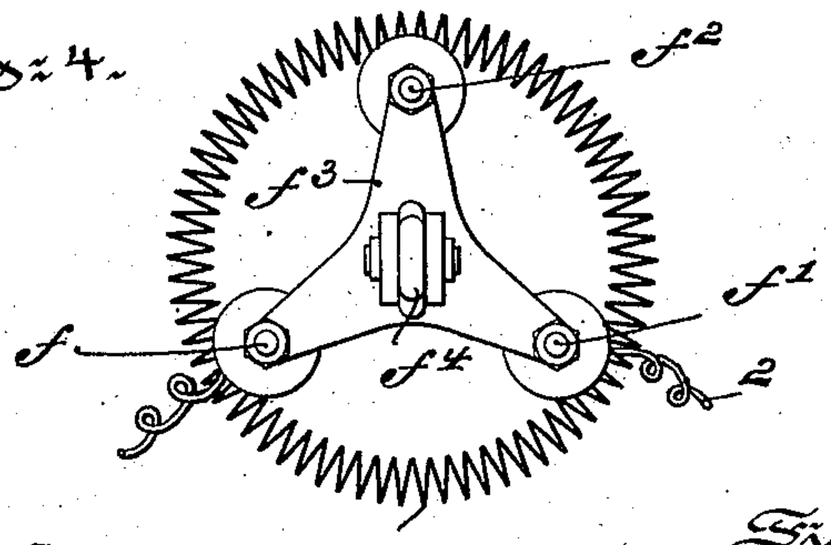

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Fig. 5.

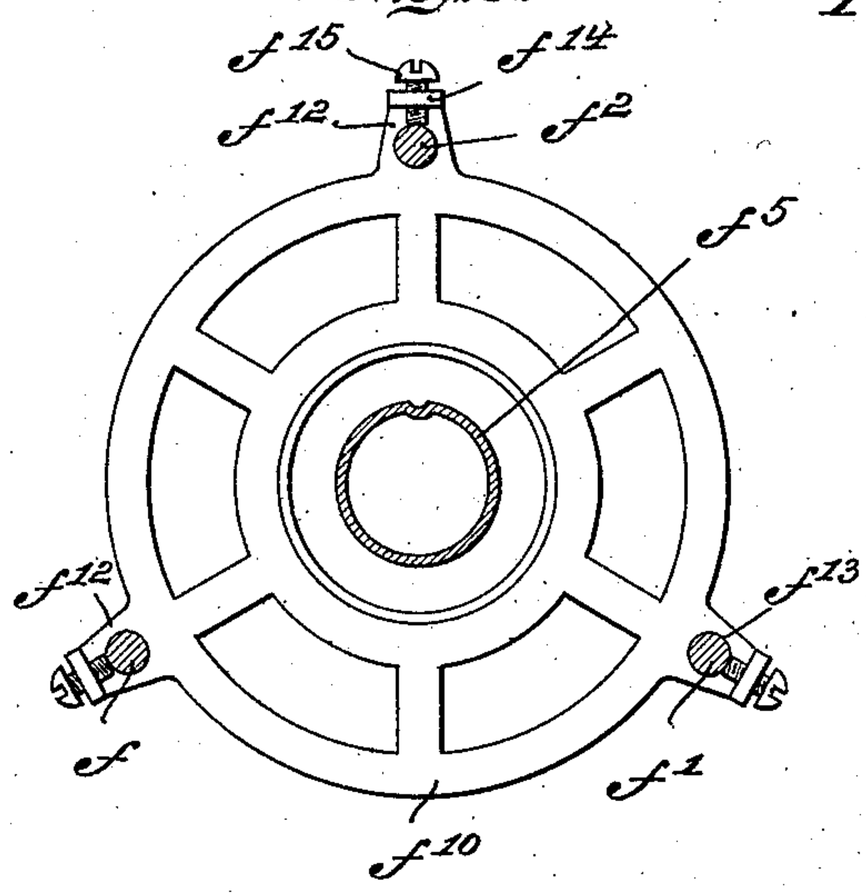


Fig. 6.

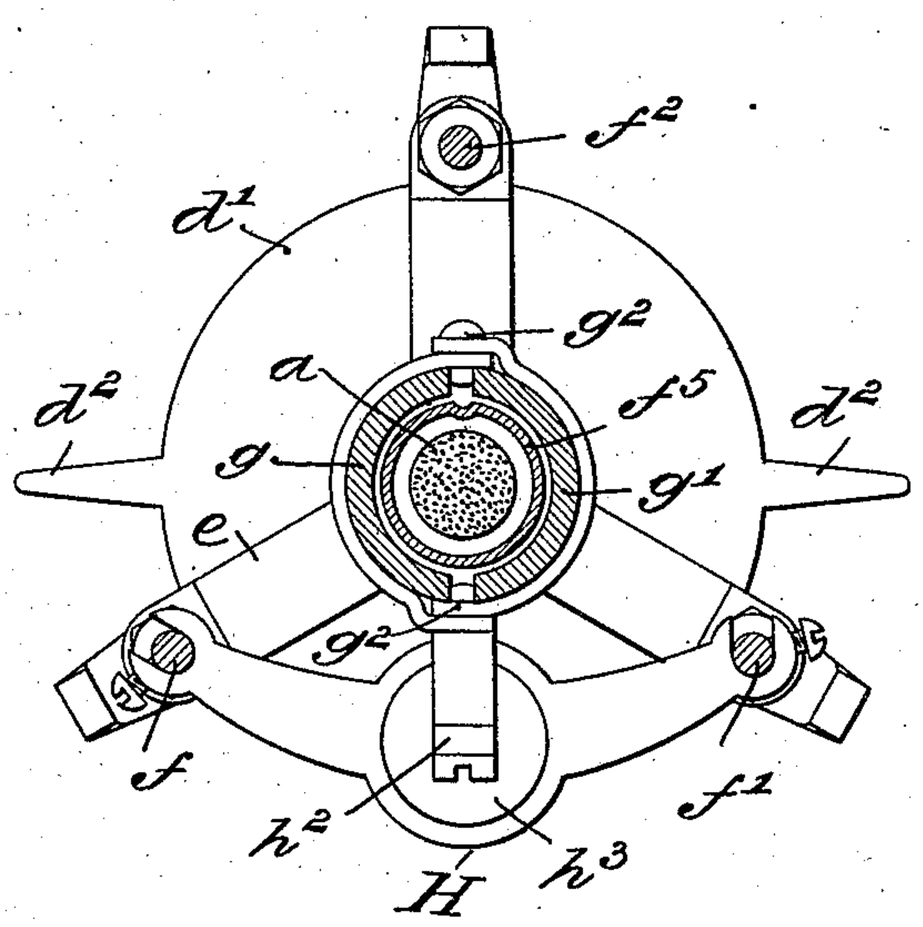
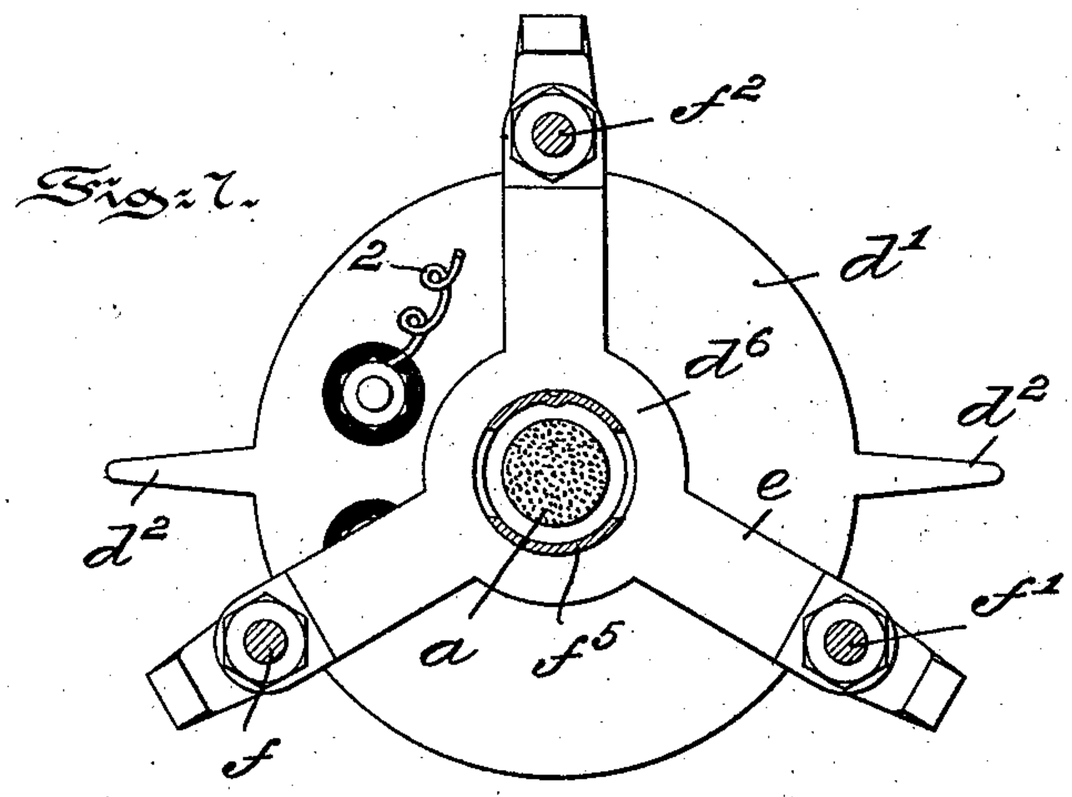


Fig. 7.



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No. 693,706. Patented Feb. 18, 1902.

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ELECTRIC ARC LAMP.

(Application filed Oct. 3, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 8.

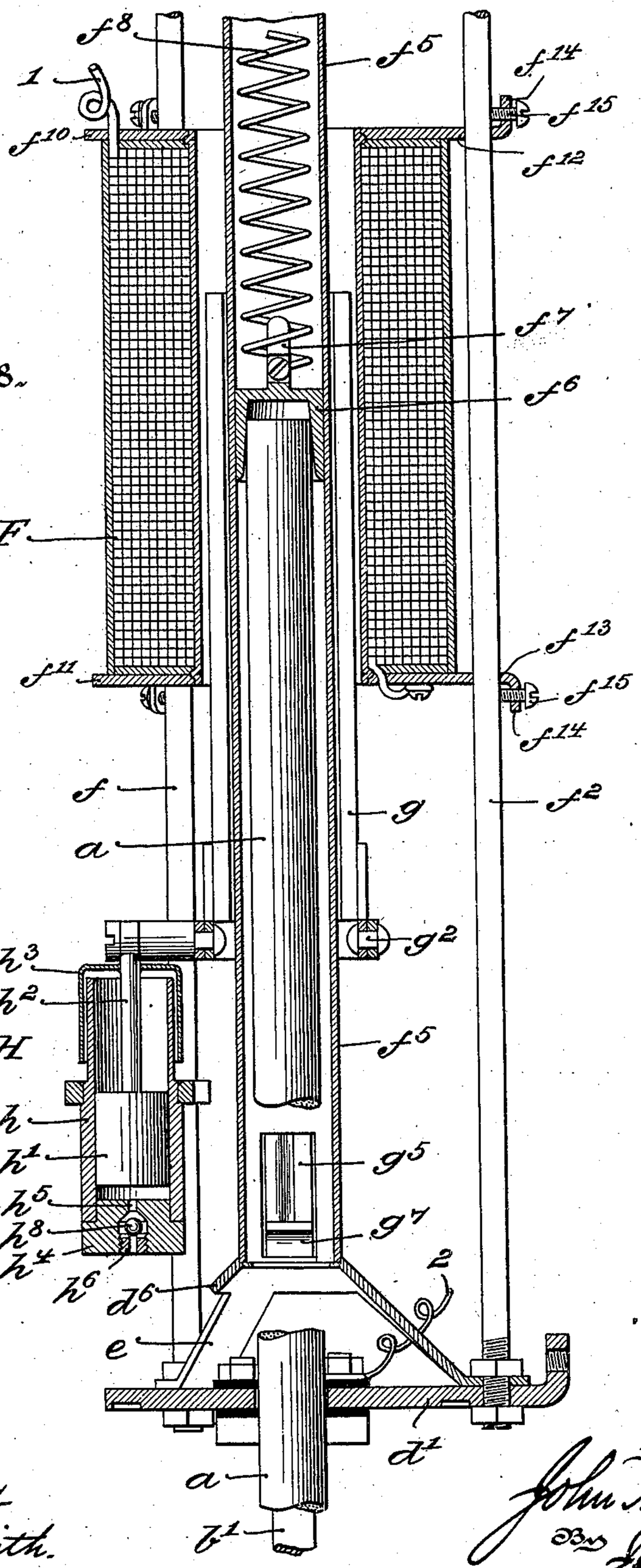
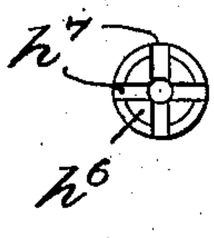


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN ALLEN HEANY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE TETER-HEANY DEVELOPING COMPANY, OF CHARLESTON, WEST VIRGINIA, AND PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF WEST VIRGINIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 693,706, dated February 18, 1902.

Application filed October 3, 1901. Serial No. 77,359. (No model.)

To all whom it may concern:

Be it known that I, JOHN ALLEN HEANY, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention has relation to an electric-arc lamp; and in such connection it relates to the construction and arrangement of the members of the lamp.

The principal objects of my present invention are, first, to provide an electric-arc lamp in which the character of illumination is improved and the lamp simplified and the working parts of the lamp lessened; second, to provide a lamp in which the amperage of the lamp can be readily adjusted without necessary change in the regulating resistance of the lamp, and, third, to provide an electric-arc lamp in which the arc is so regulated that a certain movement of the carbon is permitted to maintain the arc uniform and a rapid movement of the carbon prevented to obviate perceptible chattering of the carbons in the use of the lamp.

The nature, characteristic features, and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is an elevational view of a lamp embodying main features of my invention. Fig. 2 is a view, partly in front elevation and partly in section, of the lamp. Fig. 3 is a broken sectional view of the casing of one of the carbons, the solenoid-core and clutch device, and a portion of the spreader therefor. Fig. 4 is a top or plan view of the triangular-shaped plate for positioning the upper ends of the standards and also showing the resistance-coil. Figs. 5, 6, and 7 are respectively transverse sectional views, enlarged, on the lines $x\,x$, $y\,y$, and $z\,z$ of Fig. 1. Fig. 8 is a vertical sectional view, enlarged, of the main working parts of the lamp; and Fig. 9 is a top or plan view of the ball or check valve and its seat of a mechanical dash-pot pivotally connected to the clutch device of the lamp.

Referring to the drawings, a represents the movable carbon, and b the fixed carbon of the lamp. These carbons a and b are arranged to be consumed in an air-tight receptacle, comprising a suitably-shaped globe d and a plate or cover d', having lugs d^2 d^2 opposite each other for supporting, by means of springs d^3 d^3, the arms d^4 d^4 of a frame, provided with an opening d^5 in the bottom, into which the nose or bottom of the lamp engages and in which by means of the spring-controlled frame the lamp-globe is firmly and securely seated against the plate or cover d', surrounding the carbons a and b.

e is a cone-shaped spider-frame secured to the plate or cover d' and projecting therefrom to form a spreader d^6 for a clutch device and mechanism connected therewith, to be presently fully explained.

f, f', and f^2 are standards suitably secured into the plate d' and supporting a solenoid-coil F and a resistance-coil F', the former of which may be readily adjusted either upward or downward on said standards to adjust the amperage of the lamp in use without necessary change in the regulating resistance induced by the coils F' when arranged in multiple arc, but which in series lighting may be omitted. In order to readily adjust the solenoid-coil in a vertical plane and to clamp the same to the standards f, f', and f^2 in any given position, the solenoid-coil is provided at both ends with disks f^{10} and f^{11}, having projecting arms or lugs f^{12}. These lugs are provided with openings f^{13}, through which extend the standards f, f', and f^2, and beyond the openings in the lugs they are bent to form projections f^{14}, through which may be inserted screws f^{15} to adjustably engage the solenoid-coil to the respective standards f, f', and f^2. By loosening the screws f^{15} the solenoid-coil F can be readily shifted on said standards and again clamped in any position thereto.

f^3 is a triangular-shaped top plate for supporting in required position the upper extremities of the respective standards. This

[redacted]pporting the
[redacted]r.
[redacted]p to the entrance
[redacted]adapted to slide a
[redacted]d-cup shape to re-
[redacted]per end of the car-
[redacted]provided with a pin
[redacted]adapted to be secured
one end of a flexible bond f^8, the other end of which is secured to either the plate f^3 or, as shown in Fig. 2, [redacted] button or stud f^9, extending from the under side of the plate f^3.

The core G of the solenoid-coil F′ forms the means for feeding the upper carbon a. This core consists of two semitubular members g and g', pivoted together at g^2 and arranged to slide up and down and to vibrate or oscillate on their pivots. Each member consists of a main body portion g^4, formed of iron or magnetizable material, and the lower or gripping-jaw portion g^5 of each member is formed of brass or other non-magnetizable material and cut away at g^6 to form limbs with inturned lugs g^7 g^7, adapted to engage the wall of the movable carbon a and by contact of the limbs g^7 of the clutch device with the spreader d^6 to free the limbs from the carbon and the main body portion g^4 and then to contact with the casing for the carbon a to permit the carbon to shift or fall.

H is a check-valved dash-pot consisting of a piston-chamber h, suitably supported from the framework of the lamp and provided with a piston h', the stem h^2 of which carries a depending cap h^3, movable up and down along the wall of the piston-chamber h, and which stem of the dash-pot H is movably connected with one of the pivots of the clutch device G. In the bottom of the piston-chamber is provided a plug h^4, with an opening h^5 extending therethrough and with a recessed seat h^6, having a series of channel-ways h^7 leading from the central opening to the periphery thereof, and within the body of the plug h^4 is mounted a ball h^8, forming a check-valve for controlling the action of the dash-pot to permit of a slow movement of the movable carbon a when the voltaic arc has been interrupted, arising from any cause, and to prevent a too sudden or quick movement of the carbon a and also chattering of the carbons. When the carbon a moves rapidly or suddenly in an upward direction by means of the piston actuated indirectly by the clutch G, the ball in the plug h^4 will be caused to seat against its upper seat, and thus to check any movement of the carbon a; but when the carbon a is moving normally in an upward direction the action of the piston of the dash-pot will be such as to cause the ball to remain upon its lower seat, so that any undue movement of the carbon a in either case will be compensated for and guarded against, and thereby more efficient action of the carbon than hitherto be insured in the maintenance of the voltaic arc between the two carbons of the lamp.

The mechanical dash-pot II, operating in unison with the action of the clutch device G in the operation of the lamp, tends to maintain steady the voltaic arc, and thereby greater uniformity in the character of the illumination derived from consuming the carbons a and b within the globe. In the initial position of the parts of the lamp before the current is turned on the carbons a and b touch each other. The current now travels from the wire 1 through the solenoid-coil F, which current is grounded on the metal-work of the coil. The current then passes through the framework f, f', and f^2 of the lamp to the button or stud f^9 by the flexible bond f^8 and the cup-shaped cap f^6 to the carbon a to establish an arc between the two carbons a and b, and by the lower carbon b the current passes through its support b' (shown in Fig. 2) to the wire 2, through this wire and the resistance-coil F′, and by the wire 3 from said resistance-coil to the main-line circuit. When both carbons touch, the lamp is short-circuited, the current passing through both carbons a and b and its holder b'. The wire 2 leads to the return-wire of the main circuit through the resistance-coil F′. When so short-circuited, no arc or resistance between the carbons existing, the solenoid-coil will be energized and the magnetic lines of force given out will first repel the magnetizable portion of the clutch-core to cause the gripping-jaws of the carbons to bite on the carbon a. Then the clutch-core endeavors to center itself within the interior of the coil, which coil is so wound as that the strength of its magnetic lines of force when energized will exactly balance the weight of the clutch-core and carbon.

If the lamp is to be run on a certain voltage—say one hundred and ten volts—and is to consume four amperes with resistance in series with the lamp of five and one-half ohms and the arc to be formed is three-eighths of an inch, there will ordinarily be at the arc a voltage of seventy-five volts. This, according to the arrangement of the lamp hereinbefore described, is under particular control, due to the arrangement of the solenoid-coil, which permits of the adjustment of the same for changing the amperage of the lamp without changing the regulating resistance induced by the coils F′—that is, by either shifting the solenoid-coil F upward or downward on the standards f, f', and f^2 of the lamp. Commercially it is of importance to maintain the lamp during the period of its burning, with the exception of the feeding of the carbon, under the above conditions—that is, to maintain a steady unfluctuating consumption by the lamp of the current through the burning of the lamp, which will necessarily result in a steady unflickering light and the avoidance of chattering of the carbons. Again, if the

energization of the coil be too strong and yet the elevation of the core be so limited that only an initial arc of three-eighths of an inch could be formed, still the coil will continue to hold the core in its uppermost position until the arc is increased by the consumption of the upper carbon sufficiently to break the current and permit the clutch-core and carbon to fall. However, as the coil is such that it will balance its clutch-core when the unit of amperage is consumed and the required arc is formed the drawing of a larger arc will lessen the amount of current passing through the lamp, the coil will lose a portion of its strength, and the core-clutch will fall until the required arc is reëstablished.

If the lamp can be so arranged that the upper carbon could be limited so that the size of the arc could not exceed a certain limit and the resistance was adjusted so that the lamp running under one hundred and ten volts would normally consume, say, five amperes when the arc-resistance is fixed, a rise in voltage to, say, one hundred and twenty volts would cause the amperage to rise to, say, five or seven amperes. The fixed arc in this instance would be too small for the amount of the current passing through it, and under these circumstances there would be a rapid traveling or wavering of the arc and an increased consumption of energy. By my present construction of lamp these defects are effectively obviated, for if there is a rise in the line-voltage the arc drawn will accommodate itself to the increased voltage, and if the voltage diminishes the arc will be drawn smaller to accommodate itself to the drop in potentiality in the line-voltage, and in either case the ampere consumption will be constant or uniform throughout the burning of the lamp, due not only to the arrangement of the solenoid-coil and its susceptibility to adjustment for varying charges of amperage, but also to the mechanical dash-pot operating in conjunction therewith to control the movement of the carbon *a*, so that its action will be a regular one in adjusting its position to reëstablish the arc and maintain the same in contradistinction to a rapid adjustment, which would tend to produce a flickering in the reëstablishing of the arc and during maintenance of the arc and in some instances even chattering of the carbons.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-arc lamp, a fixed and a movable carbon, a solenoid-coil, a clutch device, consisting of two pivoted members, whereof one portion forms the core for said coil, and whereof the other forms gripping-jaws for the movable carbon, a dash-pot comprising a chamber within which is adapted to be moved a piston by means of said clutch device, with which it is in pivotal connection, said chamber provided with a plug having an opening and channel-ways leading therefrom, a ball adapted to seat in said opening and said chamber as so arranged adapted to permit of the entrance of air by a slow movement of said movable carbon and piston and to check or cut off the air by any sudden movement of said movable carbon and piston.

2. In an electric-arc lamp, a fixed and a movable carbon, a solenoid-coil adjustably mounted in the lamp, a clutch device, whereof one portion forms the core for said solenoid-coil and whereof the other portion forms the gripping-jaws for said movable carbon, a dash-pot connected with one of the pivots of said clutch device, and comprising a piston-chamber, wherein a piston is adapted to be afforded a range of movement, the stem of which carries a cap adapted to move along said chamber, a plug in one end of said chamber provided with an opening and channel-ways, and a ball adapted to seat in said opening, substantially as and for the purposes described.

3. In an electric-arc lamp, a fixed and a movable carbon, a casing surrounding said movable carbon, said movable carbon held under yielding action within said casing and adapted to be afforded a range of movement therein, a solenoid-coil, a clutch device, consisting of two members pivoted together, one portion of which forms the core for said solenoid-coil, and whereof the other portion forms the gripping-jaws for said movable carbon, a dash-pot, consisting of a chamber within which is adapted to move a piston, the stem whereof carries a cap movably back and forth on the exterior of said chamber, a plug mounted in said chamber and provided with openings and channel-ways, and a ball adapted to be seated in said openings, substantially as and for the purposes described.

4. In an electric-arc lamp, a fixed and a movable carbon, a solenoid-coil adjustable in the lamp, a clutch device, consisting of two members pivoted together, whereof the upper semitubular members form the core for said solenoid-coil, and whereof the lower gripping-jaw members are adapted to engage the movable carbon, and a mechanical dash-pot consisting of a chamber provided with a piston having a stem carrying a hood fitting over said chamber and slidable thereon, and a plug in the lower portion of said chamber and provided with an opening and with channel-ways therefrom, and a ball adapted to seat in said opening, substantially as and for the purposes described.

5. In an electric-arc lamp, a fixed and a movable carbon, a casing surrounding said movable carbon, means for holding said carbon within said casing, a clutch device, consisting of two pivotal members, whereof the upper members of magnetic material form the core for said solenoid-coil, and whereof the lower members of non-magnetic material form gripping-jaws for the movable carbon, and a dash-pot in movable connection with

said clutch device, comprising a chamber provided with a piston, the stem of which carries a cap movable on said chamber, and the bottom of said chamber provided with an opening and with channel-ways extending therefrom and in which opening is adapted to seat a ball, substantially as and for the purposes described.

6. In an electric-arc lamp, a fixed and a movable carbon, a casing surrounding said movable carbon, means for holding said carbon within said casing, a series of standards, regulating resistance-coils fixed thereto, a solenoid-coil adjustably mounted on said standards so as to regulate the amperage of the lamp without change of said regulating resistance of the lamp, a clutch device, consisting of two pivotal members, whereof the upper members of magnetic material form the core for said solenoid-coil and whereof the lower members of non-magnetic material form gripping-jaws for the movable carbon, and a dash-pot having a piston in pivotal connection with said clutch device, said pot in the bottom having an opening and channel-ways leading therefrom and in which opening is adapted to seat a ball.

7. In an electric-arc lamp, a fixed and a movable carbon, an air-tight receptacle in which the carbons are adapted to be consumed, a solenoid-coil adjustably mounted in the lamp, and its core provided with a clutch device pivotally supporting and controlling a piston-chambered dash-pot provided with a check-valve, and means mounted in the lamp for spreading the jaws of said clutch device to release the same from contact with said movable carbon, substantially as and for the purposes described.

8. In an electric-arc lamp, a fixed and a movable carbon, a solenoid-coil adjustably mounted in the lamp, and its core provided with a clutch device having projecting limbs forming gripping-jaws for the movable carbon, and said device pivotally supporting and controlling a dash-pot having a piston and a check-valve, and means whereby contact of the gripping-jaws of the clutch device is adapted to free the same from contact with said movable carbon, substantially as and for the purposes described.

9. In an electric-arc lamp, a fixed and a movable carbon, an air-tight receptacle in which the carbons are adapted to be consumed, a resistance-coil, a solenoid-coil and its core consisting of semitubular members provided with a clutch device having depending limbs forming gripping-jaws for contacting with the movable carbon and said clutch device pivotally supporting and controlling the action of a piston-chambered dash-pot having a check-valve in the bottom thereof and a cone-shaped skeleton spreading device wherewith the jaws of said clutch are adapted periodically to contact, substantially as and for the purposes described.

10. In an electric-arc lamp, a fixed and a movable carbon, a resistance-coil, a solenoid-coil adjustable in the lamp to provide for changes of the amperage of the lamp without necessary change of the regulating resistance of the lamp, a combined solenoid-core and clutch device adapted to control the movable carbon, and a dash-pot with a ball check-valve in said pot and adapted in conjunction with said device to prevent chattering of the carbons, and means to permit of the periodic release of the jaws of said clutch device from contact with said movable carbon, substantially as and for the purposes described.

11. In an electric-arc lamp, a fixed and a movable carbon, a resistance-coil, an adjustable solenoid-coil, a combined solenoid-core and clutch device adapted to control the movable carbon mounted in a casing under tension yet permitted a sliding movement in said casing, a dash-pot with a check-valve adapted in conjunction with said device to prevent chattering of the carbons, and means for releasing the clutch device from contact with the movable carbon in establishing the arc of the lamp, substantially as and for the purposes described.

12. In an electric-arc lamp, a fixed and a movable carbon, a series of standards, a regulating resistance-coil fixed to said standards, a solenoid-core arranged within said standards, a solenoid-coil adjustably secured to said standards and surrounding said core, said coil adapted to be raised and lowered on said standards in respect to said fixed regulating resistance and solenoid-core to adjust the amperage of the lamp without change in said fixed regulating resistance of the lamp.

13. In an electric-arc lamp, a fixed and a movable carbon, a series of standards, a regulating resistance-coil fixed to said standards, a solenoid-coil adjustably secured to said standards so as to permit of the raising and lowering of the same thereon in respect to said fixed regulating resistance to adjust the amperage of the lamp without change in said fixed regulating resistance of the lamp and a clutch device consisting of two pivotal members, whereof the upper members of magnetic material form the core for said solenoid-coil, and whereof the lower members of non-magnetic material form gripping-jaws for the movable carbon and a dash-pot having a piston in pivotal connection with said clutch device, said pot in the bottom having an opening and channel-ways extending therefrom and in which opening is adapted to seat a ball.

14. In an electric-arc lamp, a fixed and a movable carbon, a series of standards, a regulating resistance-coil fixed to said standards, a solenoid-core arranged within said standards, a solenoid-coil adjustably secured to said standards and surrounding said core, said coil adapted to be raised and lowered on said standards in respect to said fixed regulating resistance and core to adjust the am-

perage of the lamp without change in said regulating resistance of the lamp, and a dash-pot connected with said core and arranged so as to permit of the entrance of air by a slow movement of said movable carbon and core and to check or cut off the air by any sudden movement of said movable carbon and core.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOHN ALLEN HEANY.

Witnesses:
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THOMAS M. SMITH.