No. 638,614. Patented Dec. 5, 1899.

E. WOLTMANN.

ELECTRIC ARC LAMP.

(Application filed Mar. 19, 1898.)

(No Model.) 3 Sheets—Sheet 1.

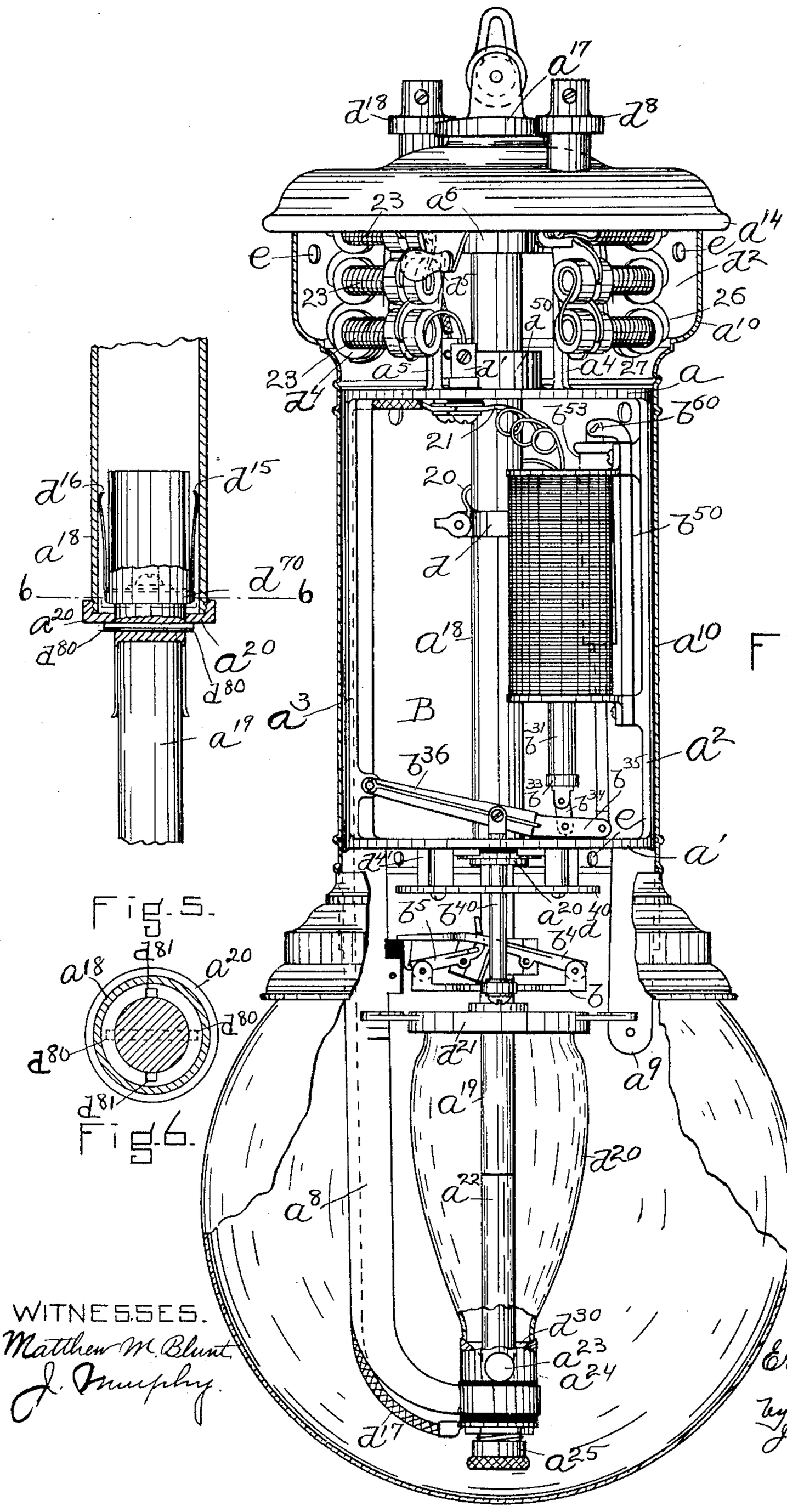

Fig. 1.

Fig. 5.

Fig. 6.

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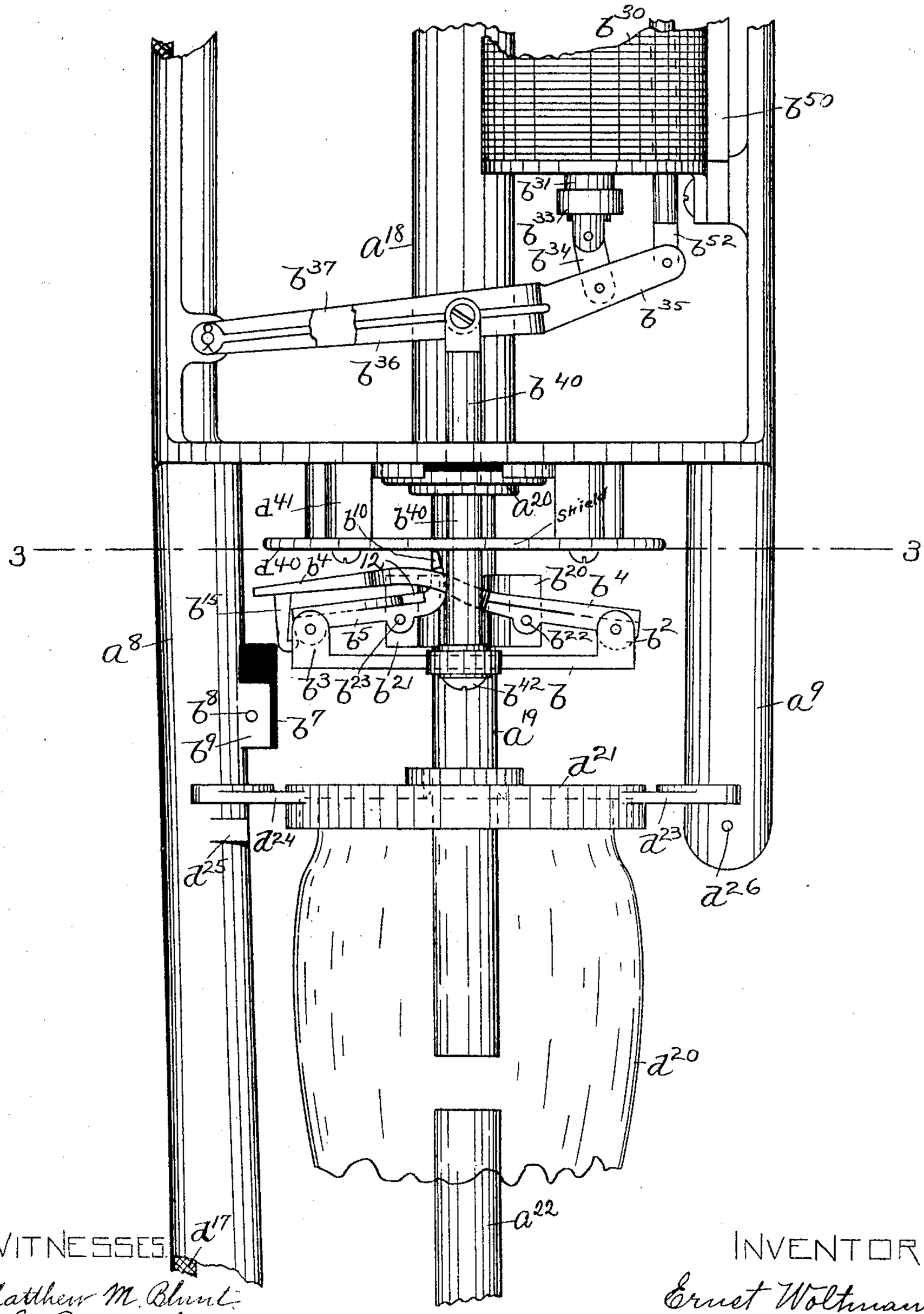

Fig. 2.

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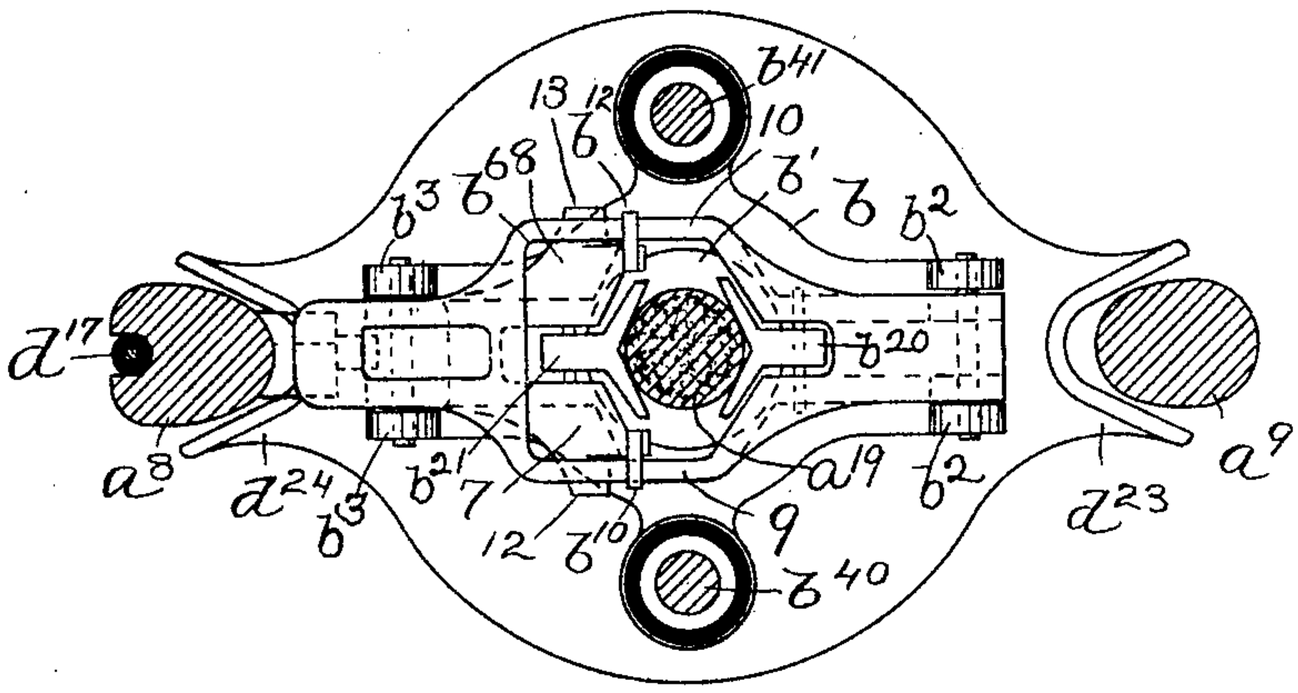

Fig. 3.

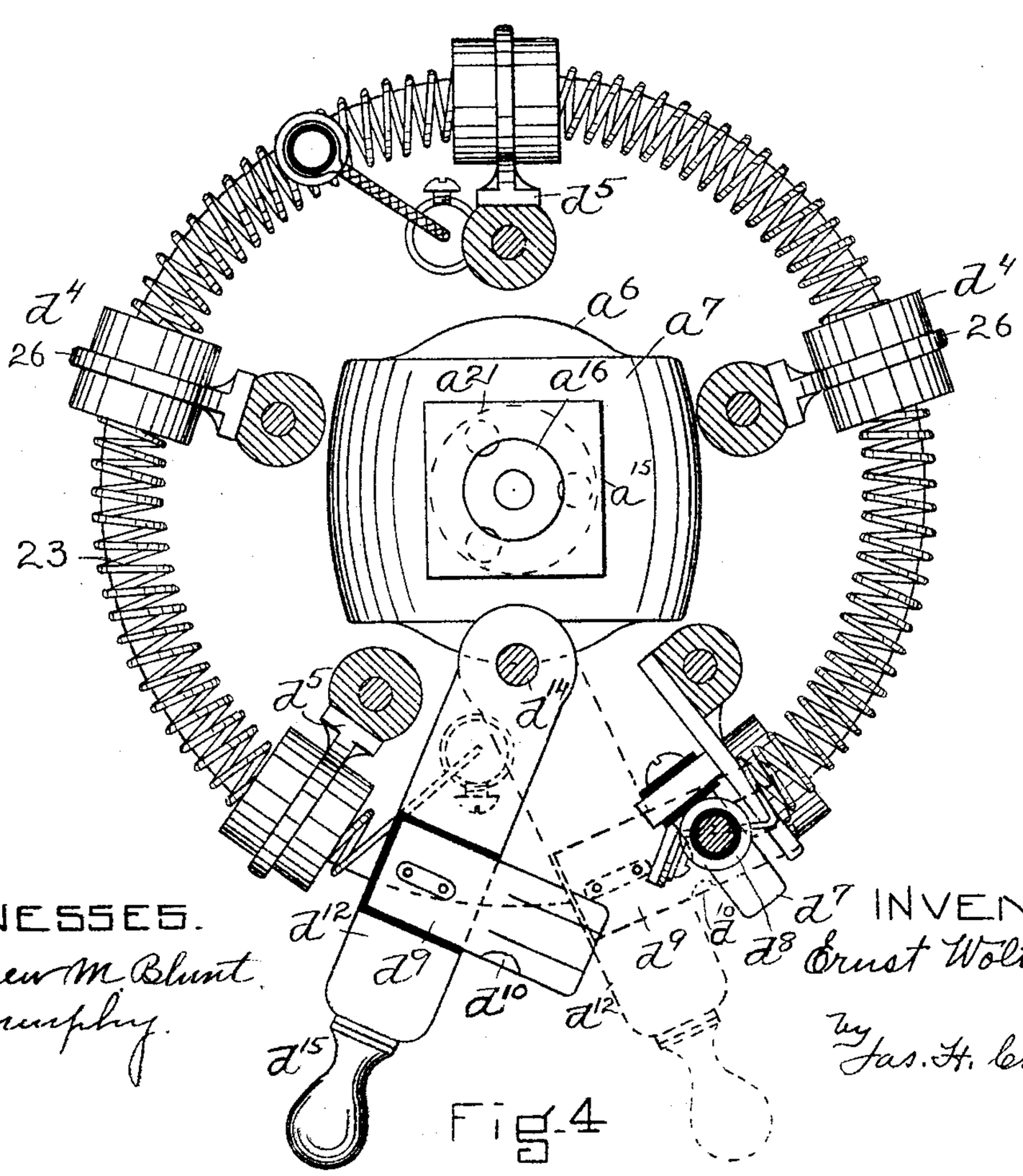

Fig. 4

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UNITED STATES PATENT OFFICE.

ERNST WOLTMANN, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO ALBERT ANDERSON AND JOHAN M. ANDERSEN, OF BOSTON, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 638,614, dated December 5, 1899.

Application filed March 19, 1898. Serial No. 674,465. (No model.)

To all whom it may concern:

Be it known that I, ERNST WOLTMANN, a citizen of the United States, residing in New York, in the county of New York and State of New York, have invented an Improvement in Electric-Arc Lamps, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to electric-arc lamps, and is herein shown as embodied in an arc-lamp of the class commonly known as "inclosed" arc-lamps, and has for its object to improve, simplify, cheapen the cost, and increase the efficiency of arc-lamps of the class referred to.

Figure 1 is a section and elevation of an inclosed arc-lamp embodying this invention, the inclosing casing being shown in section; Fig. 2, a detail in elevation and on an enlarged scale, showing the lamp in its operative condition; Fig. 3, a section on the line 3 3, Fig. 2; Fig. 4, a top or plan view, on an enlarged scale, with the cover removed; and Figs. 5 and 6, details to be referred to.

Referring to Fig. 1, the framework of the lamp is shown as composed of two substantially horizontal metal disks, plates, or bars a a', connected by side bars a^2 a^3, uprights a^4 a^5, erected from the disk a and connected together by cross bars or webs a^6 a^7, and arms or brackets a^8 a^9, depending from the disk a'. These parts may and preferably will be cast in one piece. The framework referred to is designed to be inclosed, which may be effected by a casing or cylinder a^{10}, provided with an enlarged upper portion or end, a glass globe a^{13}, and a metal top or hood a^{14}. The hood a^{14} may be secured to the cross-bar a^7 of the lamp-frame by providing it with an angular opening, into which fits an angular projection a^{15} (see Fig. 4) on the said cross-bar and which projection is provided with a screw-threaded opening a^{16} for the reception of the threaded shank of a screw or bolt a^{17}. The disks a a' have extended through them a tube a^{18} for the reception of the upper carbon pencil a^{19}, which tube may be firmly secured in position by means of a collar or nut a^{20} below the disk a' and a collar or nut a^{21} (indicated by dotted lines, Fig. 4) above the cross-bar a^6, the said tube being insulated from the lamp-frame in any suitable manner. The carbon pencil a^{19} coöperates with a lower carbon pencil a^{22}, which, as herein shown, is held stationary by a set-screw a^{23} in a holder a^{24}, provided with a removable bottom in the form of a screw-cap a^{25}, the said holder being sustained in position by the metal arm or bracket a^8. The upper carbon pencil a^{19} is movable and is adapted to be lifted by a clutch mechanism, which may and preferably will be of novel construction, as will be described.

Referring to Figs. 1, 2, and 3, the clutch mechanism herein shown is composed of a frame or carrier b, provided with a central opening b' and having at its opposite ends lugs or ears b^2 b^3, between which are pivoted toggle or jaw-carrying levers b^4 b^5. The jaw-carrying lever b^4 herein shown is provided with an enlarged central opening b^6 and is extended so as to project over a stationary piece or stop b^7, preferably of insulating material and which is herein shown as fastened by a screw or pin b^8 to a lug b^9 on the bracket or arm a^8.

The jaw-carrying lever b^5 is forked at its free or inner end and is provided with upwardly-extended arms 7 8, which project up into the opening b^6 in the lever b^4 and are provided with lateral projections or ears b^{10} b^{12}, which project above and are adapted to engage the upper surface of the side bars 9 10 of the lever b^4. The forked arms of the lever b^5 are also provided with laterally-extended lugs 12 13, which project under and are adapted to engage the under surface of the side bars 9 10 of the lever b^4. The lever b^4 may also be provided at its outer or free end with a depending arm b^{15}, having a hook which is adapted to engage the rear end of the lever b^5 for a purpose as will be described. It will thus be seen that the levers b^4 b^5 are practically connected together by the lugs b^{10} b^{12} 12 13, so that when the carrier b is lifted the free ends of the said levers tend to assume a substantially horizontal position, which movement brings the clamping-jaws b^{20} b^{21} into engagement with the carbon pencil a^{19}, the said jaws being pivoted to the said levers, as at b^{22} b^{23}, so that the said jaws may tilt toward

and from the carbon pencil and assume a substantially vertical position irrespective of the position of the levers b^4 b^5. The carrier b is adapted to be lifted, as herein shown, by means of a solenoid-electromagnet b^{30}, preferably provided with two spools or coils having cores b^{31}, only one of which is shown and which are joined by a tie-bar or armature b^{33}, connected at or near its center by a link b^{34} to an arm of a forked lever b^{35}, having its forks b^{36} b^{37} pivoted to the side bar a^8 of the lamp-frame and to which forks are pivotally connected the upper ends of rods b^{40} b^{41}, extended through the disk a' and fastened to the carrier b, as by screws b^{42} or in any other suitable or desired manner, so that when the forked lever b^{35} is lifted the carrier will be raised bodily.

The coils of the electromagnet b^{30} may be detachably connected to a back strap or bar b^{50}, and the said bar may be attached to the side bar a^2 of the lamp-frame in any suitable manner. The lever b^{35} may have pivotally connected to it a piston-rod b^{52} of a dash-pot b^{53}, containing a piston, (not shown,) the said dash-pot being pivotally suspended at its upper end, as at b^{60}, from the bar b^{50}.

The electromagnet b^{30} has one end 20 of its coil connected by a clamping-ring d to the metal tube a^{18}, and the other end 21 of said coil is connected to a binding-post d', attached to the disk a and extended up into the chamber d^2, formed by said disk a, the cover a^{14}, and the inclosing casing a^{10}. The binding-post d' has connected to it one end of a resistance, preferably made as herein shown and consisting of a plurality of coils 23, arranged in circles, one above the other, with their ends connected in series, the said coils being extended through and supported in bushings d^4, of porcelain, rubber, or other insulating material, which are substantially encircled by fingers 26 27 on brackets d^5, herein shown as five in number, which are arranged in a circle about the upper portion of the lamp-frame and are firmly attached to the under side of the cover or hood a^{14}.

One end of the resistance, as aforesaid, is connected to the binding-post d' and the other end is secured to a metal plate or bar d^7, which coöperates with a binding-post d^8, extended through the hood, but insulated therefrom, and which post coöperates with the bar d^7 to form stationary terminals of a switch or circuit-controller having its movable member, as herein shown, composed of copper or other conducting brushes d^9 d^{10}, secured to the opposite sides of a lever d^{12}, but insulated therefrom, the lever d^{12} being pivoted, as at d^{14}, to the under side of the hood a^{14} and provided with a handle d^{15}, extended beyond the edge of the hood and through a suitable opening in the casing a^{10}, so as to be accessible from outside of said casing. The brushes d^9 d^{10} act as a bridge to connect the binding-post d^8 with the bar d^7 when the lamp is included in the line-circuit.

The electric current is conducted to the carbon pencil a^{19} preferably by spring-brushes d^{15} d^{16}, attached to a carbon-holder d^{70}, (see Fig. 5,) which is adapted to be moved longitudinally in the tube a^{18}, and the springs or brushes of which holder make a slight frictional contact with the interior of said tube. The lower-carbon holder a^{24} is connected by the outgoing wire d^{17} to a binding-post d^{18}, attached to the cover or hood a^{14}. The binding-post d^8 may be regarded as the positive post and the binding-post d^{18} as the negative post for the lamp.

The arc formed between the carbons a^{19} a^{22} may be inclosed by a substantially small globe d^{20}, held in position by the lower-carbon holder a^{24} and a disk a^{21}, having a depending annular flange and provided with laterally-projecting forked arms d^{23} d^{24}, which somewhat loosely embrace the depending arms a^8 a^9 of the framework. The disk d^{21} is capable of being raised and lowered to permit removal of the globe d^{20} and is adapted to be supported by projections d^{25} d^{26} on the arms a^8 a^9. The lower-carbon holder a^{24} is preferably made with a conical socket d^{30} for the reception of the lower end of the globe d^{20}, so as to enable the lower end of the said globe to fit the holder even when it is not perfectly true or straight, while the upper end of the globe may accommodate itself to the loose disk d^{21} by reason of the forked arms fitting the arms a^8 a^9 somewhat loosely and permitting the disk to tilt or tip according to the upper edge of the globe d^{20}.

In order to protect the chamber B containing the electromagnet b^{30} from becoming highly heated, a shield d^{40} may be provided, which may be a metal disk provided with a facing of asbestos, the said shield being attached to lugs or projections d^{41}, depending from the disk a'.

The operation of the lamp may be briefly described as follows, viz: When the lamp is cut out of circuit by moving the switch-lever d^{12} from its dotted to its full line position, Fig. 4, the carbons a^{19} a^{22} and the operative parts are in the position shown in Fig. 1. When the switch is thrown into its dotted-line position, Fig. 4, the circuit of the lamp is completed, which circuit may be traced as follows, viz: from the positive binding-post d^8 through the resistance-coils to the binding-post d', thence through the magnet b^{30} to the tube a^{18}, thence by the carbon-holder d^{70} and upper carbon a^{19} to the lower carbon a^{22}, thence by the lower-carbon holder and wire d^{17} to the negative binding-post d^{18}. The electromagnet b^{30} is thus energized and attracts its cores b^{31}, thereby lifting the yoke-shaped lever b^{35} and the clutch-carrier b, and as the latter is lifted the toggle-levers b^4 b^5 are straightened or turned on their pivots, so that their free ends move toward the carrier and tend to assume a substantially horizontal position in line with their pivots. This movement of the toggle-levers is arrested by

the upper carbon pencil a^{19}, which is thus grasped between the clamping-jaws b^{22} b^{23}, so that on the continued upward movement of the carrier b, the carbon pencil a^{19} will be lifted away from the lower carbon a^{22} and the arc will be established. When the arc increases to an abnormal size or length, the resistance in the lamp-circuit is increased to such amount as to reduce the current strength, so that gravity overcomes the attractive force of the magnet, and as a result the magnet-cores, the lever, and the carrier descend sufficiently to again establish the normal condition of the arc. The carrier b responds to the slightest movement of the magnet-cores, thereby rendering the lamp sensitive and insuring a steady-burning lamp. The clutch or clamping jaws retain their hold on the upper carbon until the descent of the carrier is such as to bring the free end of the lever b^4 into engagement with the stop b^7, and on further downward movement of the carrier b the free ends of the toggle-levers are arrested in their downward movement, and the clamping-jaws are thereby released from the upper carbon, which is permitted to descend by gravity until it makes contact with the lower carbon or until the arc is diminished to such extent as will enable the magnet b^{30} to again lift the carrier b.

The inclosing casing a^{10} may and preferably will be provided with suitable openings e for the admission and circulation of air through the lamp, and in order to render the magnet-containing chamber B as dust-tight as possible and yet permit of the passage of heated air from it into the resistance-containing chamber d^2, the disk a is provided with an annular flange or raised boss d^{50} through which the tube a^{18} passes, so that any dust entering into the chamber d^2 may be deposited on the disk a and will not be liable to pass down over the raised flange or boss d^{50} into the chamber B.

The hooked arm b^{15} is preferably provided so as to limit the upward movement of the free end of the lever b^5, and thereby reduce the movement of the jaws away from the carbon.

The carbon-holder d^{70} is provided, as shown, with an enlarged upper portion which is of greater diameter than the opening or bore of the nut or collar a^{20} and which limits the movement of the carbon-holder out of the tube. The lower portion of the carbon-holder is capable of projecting through and below the nut or collar a^{20} to permit the upper carbon to be renewed, and this lower part is provided with one or more lateral projections d^{80}, which are adapted to pass through slots d^{81} (see Fig. 6) in the collar or nut a^{20} when it is desired to trim the lamp, and the lower portion of the carbon-holder d^{70} after passing through the collar may be turned so as to bring the projections d^{80} out of line with the slots d^{81}, and thereby lock the carbon-holder against upward movement into the tube a^{18} when a new carbon is forced up into the holder. When the lamp is being trimmed, the operator forces the upper carbon into the lower portion of the holder d^{70}, which is held stationary by the projections d^{80} engaging the under side of the collar or nut a^{20}.

I claim—

1. In an electric-arc lamp, the combination of the following instrumentalities, viz: a carbon-lifting magnet provided with an armature, and a clutch mechanism operatively connected to said armature, and comprising a carrier and toggle-levers pivoted to said carrier on opposite sides of the carbon to be lifted and having their free ends in engagement with each other and moving toward a horizontal line through their pivots when the carbon is lifted, and jaws to engage said carbon carried by said levers, substantially as described.

2. In an electric-arc lamp, the combiuation of the following instrumentalities, viz: a carbon-lifting magnet provided with an armature, a clutch mechanism comprising a carrier and jaw-carrying levers pivoted to said carrier and having their free ends in engagement with each other and jaws pivoted to said levers to engage the carrier to be lifted, and a lever interposed between said carrier and armature and to which said carrier and armature are connected, substantially as and for the purpose specified.

3. In an electric-arc lamp, a clutch mechanism comprising a carrier, jaw-carrying levers pivoted to said carrier on opposite sides of the carbon to be lifted, and provided with pivoted jaws between said carbon and the pivots for said levers, one of said levers being extended beyond the carbon and engaging the other lever whereby the upward movement of the pivoted ends of the jaw-carrying levers effects movement of the free ends of said levers toward a horizontal line through their pivots, substantially as described.

4. In an electric-arc lamp, the combination of the following instrumentalities, viz: a carbon-lifting magnet located at one side of the longitudinal center of the lamp and provided with an armature, a lever pivoted at the opposite side of said longitudinal center to move in a substantially vertical plane, means to connect said armature to the free end of said lever, a clutch mechanism for the carbon to be lifted comprising jaw-carrying levers having their free ends in engagement with each other, and a carrier to which the other ends of said jaw-carrying levers are pivoted, and means to suspend said carrier from the lever to which the said armature is connected, substantially as described.

5. In an electric-arc lamp, the combination of the following instrumentalities, viz: a metallic framework provided with separated disks, plates or bars forming a magnet-containing chamber, a cover or hood coöperating with the upper disk to form a resistance-chamber, an inclosing shell or casing for said chambers, a stationary carbon-receiving tube extended through said chambers, a clutch

mechanism outside of and below the magnet-chamber, a resistance in said resistance-chamber, an electromagnet in the magnet-chamber connected with said resistance and with the stationary carbon-receiving tube, an armature for said magnet, and mechanism connecting the said armature with said clutch mechanism, substantially as described.

6. In an electric-arc lamp, a clutch mechanism comprising a movable carrier having an opening for the passage of the carbon to be lifted, jaw-carrying levers pivoted to said carrier on opposite sides of the said carbon and provided with pivoted jaws between the said carbon and the pivots for said levers, one of said levers being extended beyond the carbon and adapted to engage a stop to effect the disengagement of the said jaws from said carbon, substantially as described.

7. In an electric-arc lamp, the combination of the following instrumentalities, viz: an inclosing case, a framework comprising disks or plates forming with said case a magnet-containing chamber, and a cover forming with said case a resistance-containing chamber above the magnet-containing chamber, an arm or bracket a^8 depending from the lower disk to support the lower stationary carbon-holder, a carbon-receiving tube a^{18} extended through the said disks or plates, a globe inclosing the ends of the carbons, a socket for the lower end of the said globe, a flanged disk for the reception of the upper end of the said globe provided with laterally-extended arms to loosely embrace the arm a^8 and a second arm a^9 depending from the said lower disk, substantially as described.

8. In an electric-arc lamp, a clutch mechanism comprising a carrier having a hole for the passage of the movable carbon, a jaw-carrying lever b^4 pivoted at one end to said carrier and provided with an opening through which the carbon passes, a jaw-carrying lever b^5 pivoted to the carrier at one end and having its other end forked and extended up into the opening in the lever b^4, and lugs or ears on the said forked end of said lever extended above and below the sides of the opening in the lever b^4, substantially as described.

9. In an electric-arc lamp, a clutch mechanism comprising a carrier having a hole for the passage of the movable carbon, a jaw-carrying lever b^4 pivoted at one end to said carrier and provided with an opening through which the carbon passes, a jaw-carrying lever a^5 pivoted to the carrier at one end and having its other end forked and extended up into the opening in the lever b^4, and lugs or ears on the forked end of said lever extended above and below the sides of the opening in the lever b^4, and a depending arm on the lever b^4 to engage the lever b^5, substantially as described.

10. In an electric-arc lamp, a clutch mechanism comprising a carrier, and jaw-carrying levers adapted to engage the carbon to be lifted, rods extended upward from said carrier, a forked lever pivoted to move in a substantially vertical plane above the clutch and to the arms of which the said rods are pivotally connected, and a solenoid electromagnet having its armature pivotally connected to said forked lever, substantially as described.

11. In an electric-arc lamp, a clutch mechanism comprising a carrier, and jaw-carrying levers adapted to engage the carbon to be lifted, rods extended upward from said carrier, a forked lever pivoted to move in a substantially vertical plane above the clutch to the arms of which the said rods are pivotally connected, and a solenoid electromagnet having its armature pivotally connected to said forked lever, and a dash-pot having its piston-rod pivotally connected to the said forked lever, substantially as described.

12. In an electric-arc lamp, a carbon-receiving tube, a carbon-holder movable in said tube and adapted to project through the bottom of said tube for a portion of its length, and means on the lower portion of said holder adapted to prevent upward movement of the holder into the said tube when the carbon is renewed, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNST WOLTMANN.

Witnesses:
HARRY SANDHAM,
CLIFFORD BOESE.