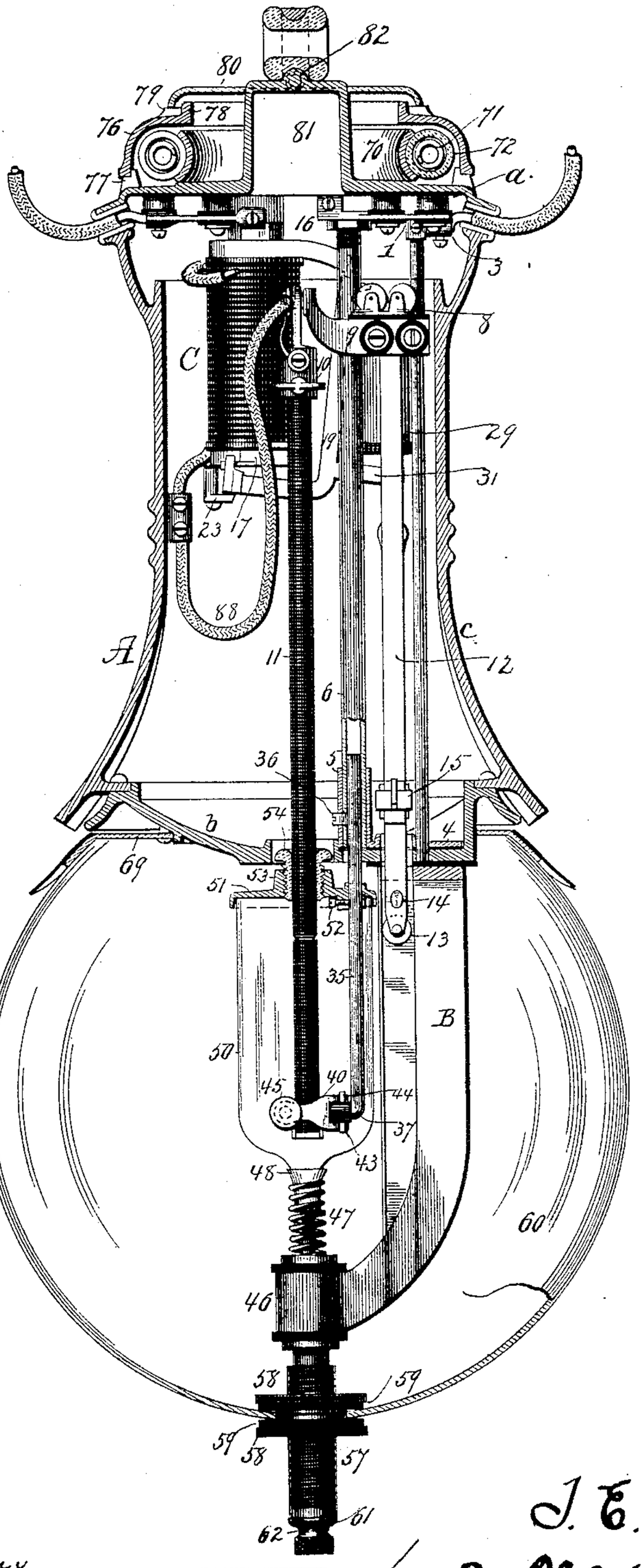
(No Model.) 6 Sheets—Sheet 1.

T. E. ADAMS.

ELECTRIC ARC LAMP.

No. 579,032. Patented Mar. 16, 1897.



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G. F. Downing

Inventor
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FIG. 1.

(No Model.)

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ELECTRIC ARC LAMP.

No. 579,032. Patented Mar. 16, 1897

Fig. 2.

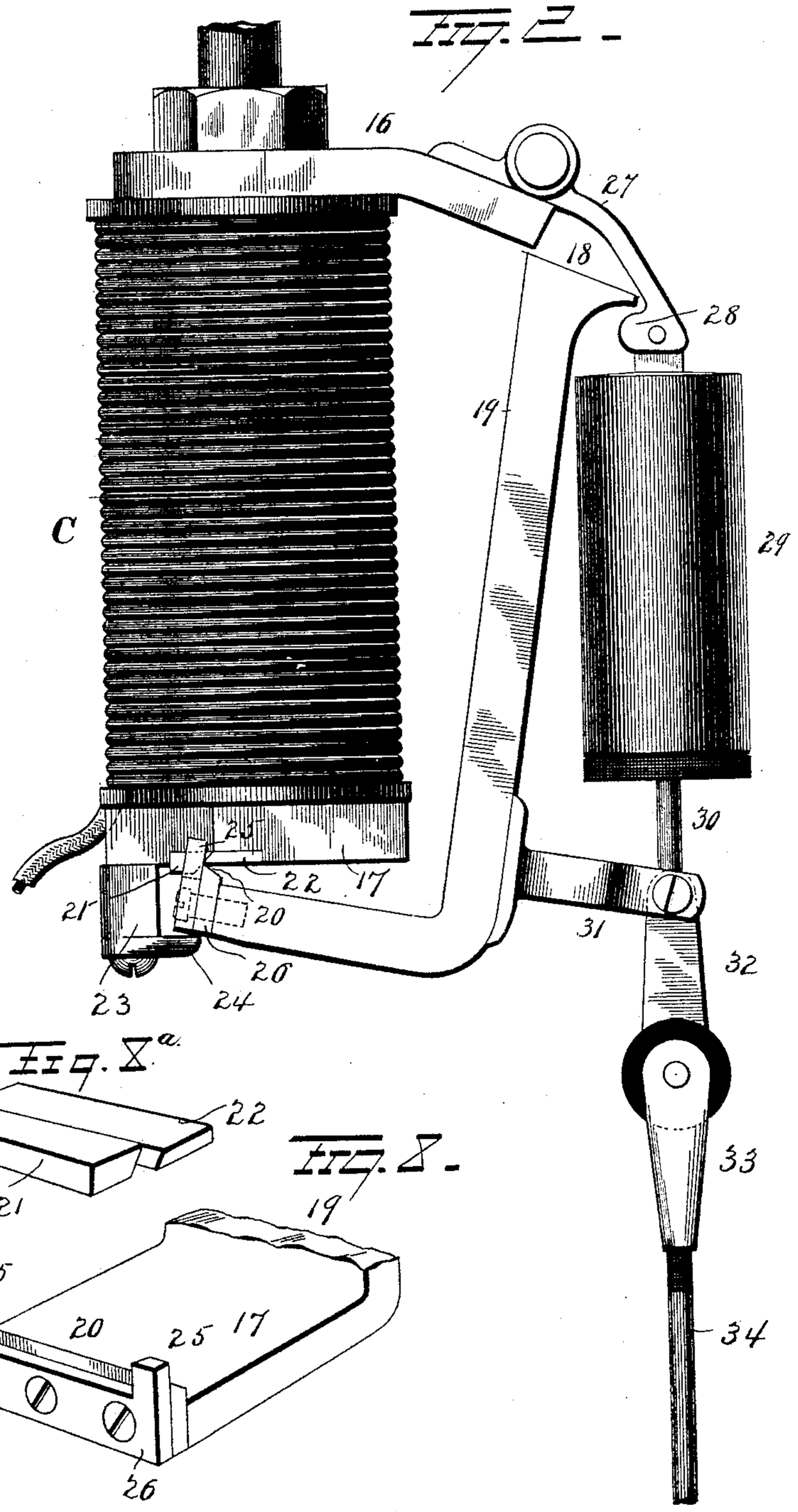

Fig. 3a.

Fig. 3.

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(No Model.) 6 Sheets—Sheet 3.

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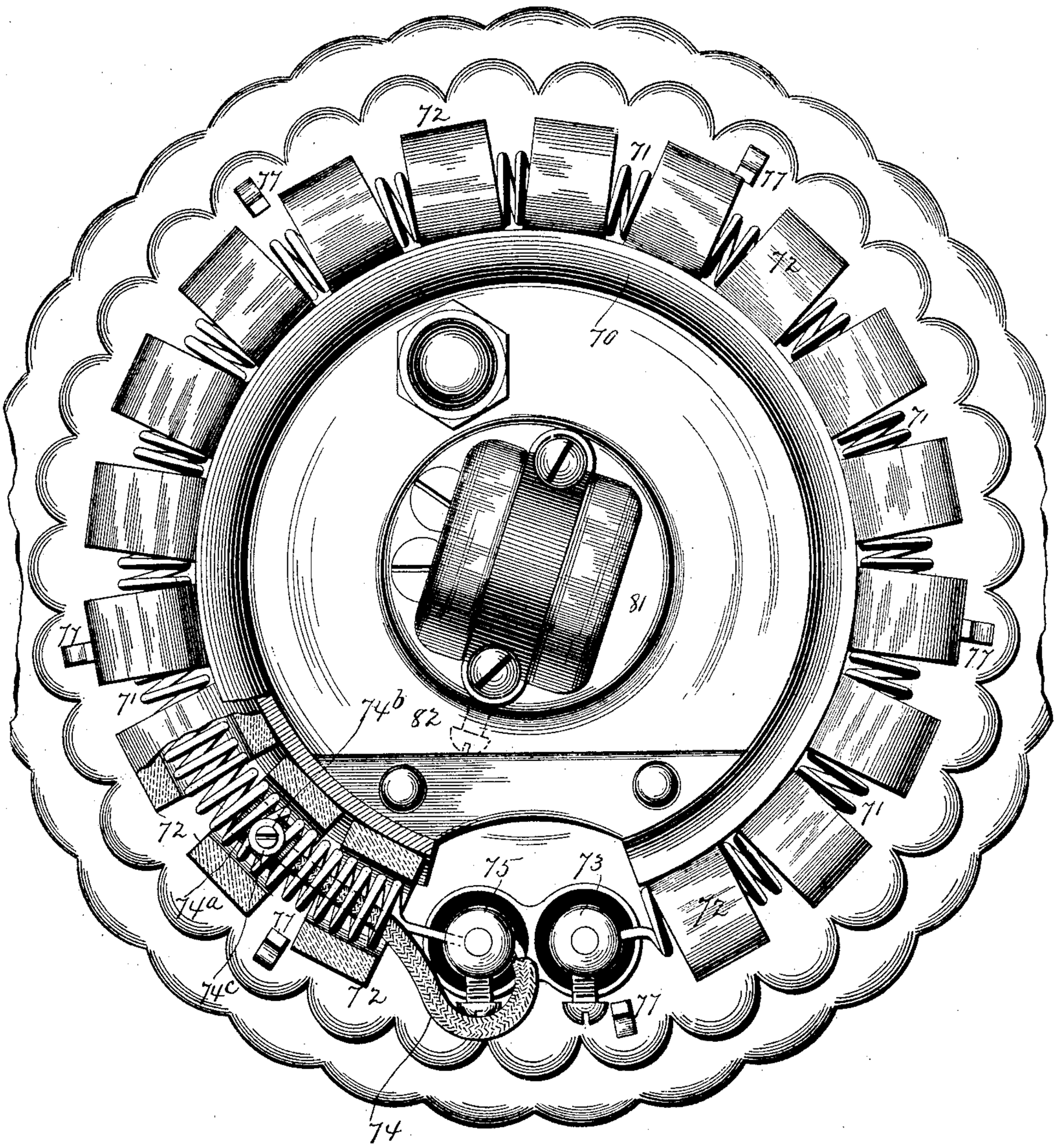
Fig 3.



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(No Model.) 6 Sheets—Sheet 4.

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ELECTRIC ARC LAMP.

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Fig. 7.

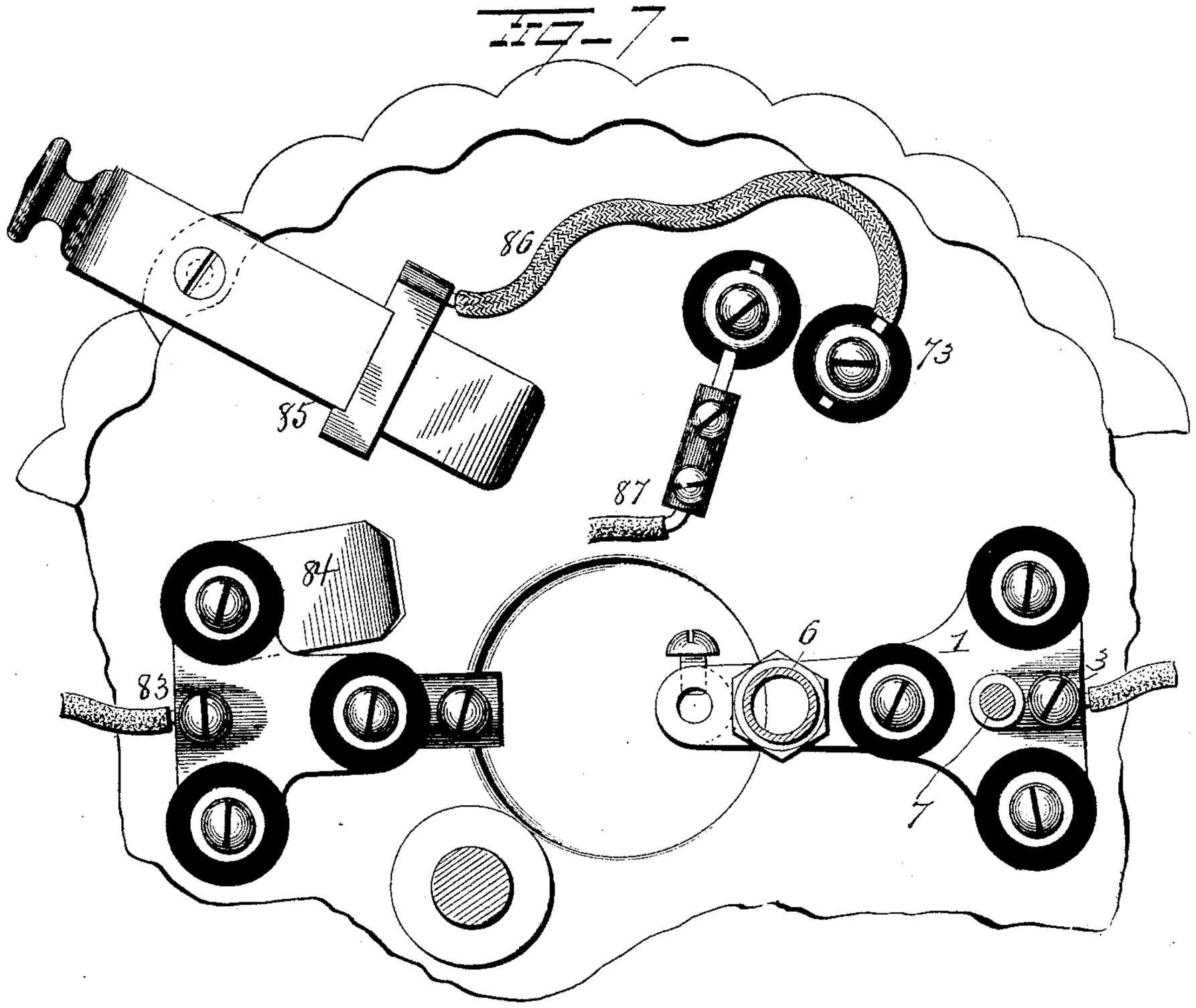
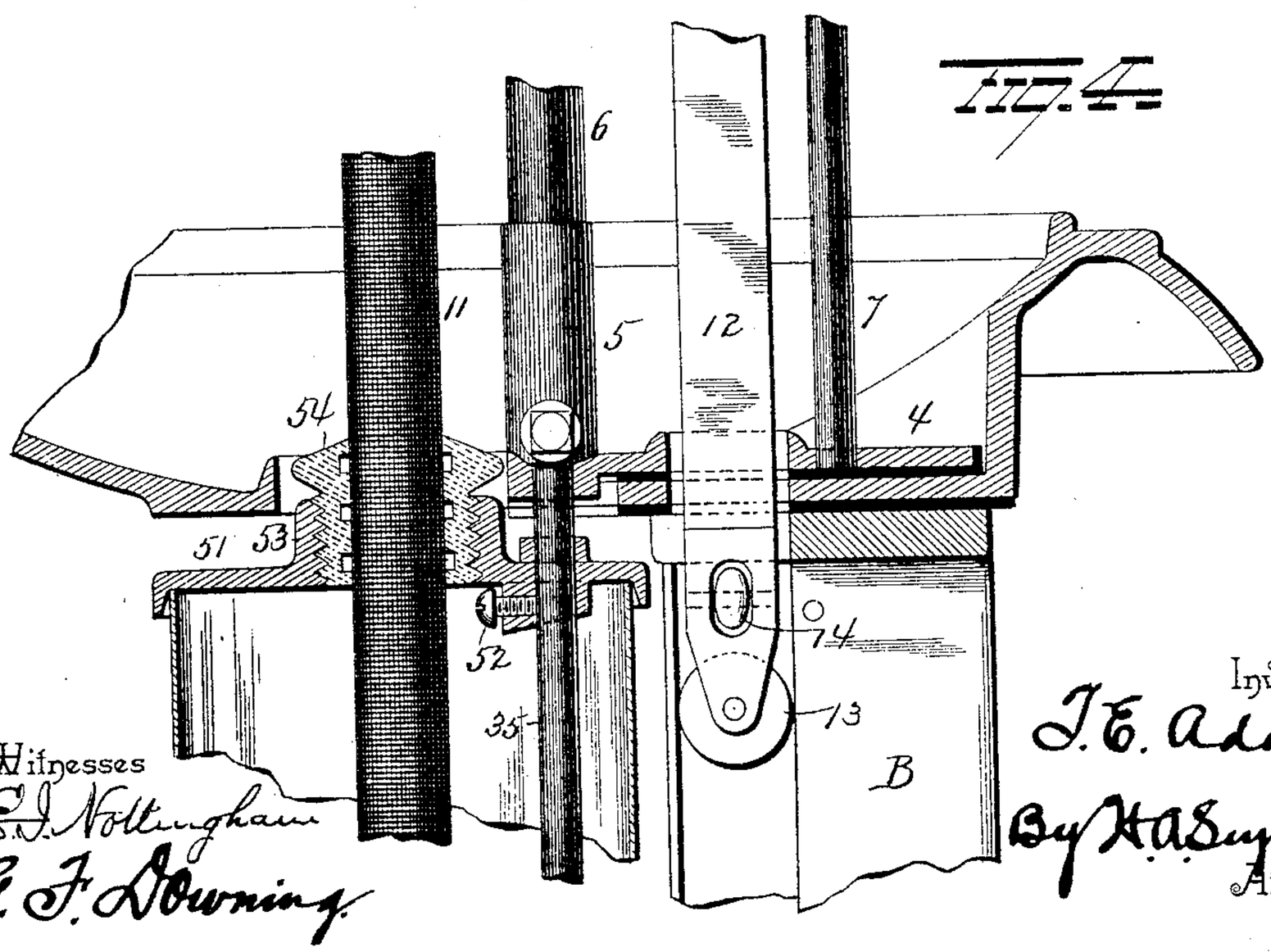


Fig. 4.



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(No Model.)

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ELECTRIC ARC LAMP.

No. 579,032. Patented Mar. 16, 1897.

Fig. 5.

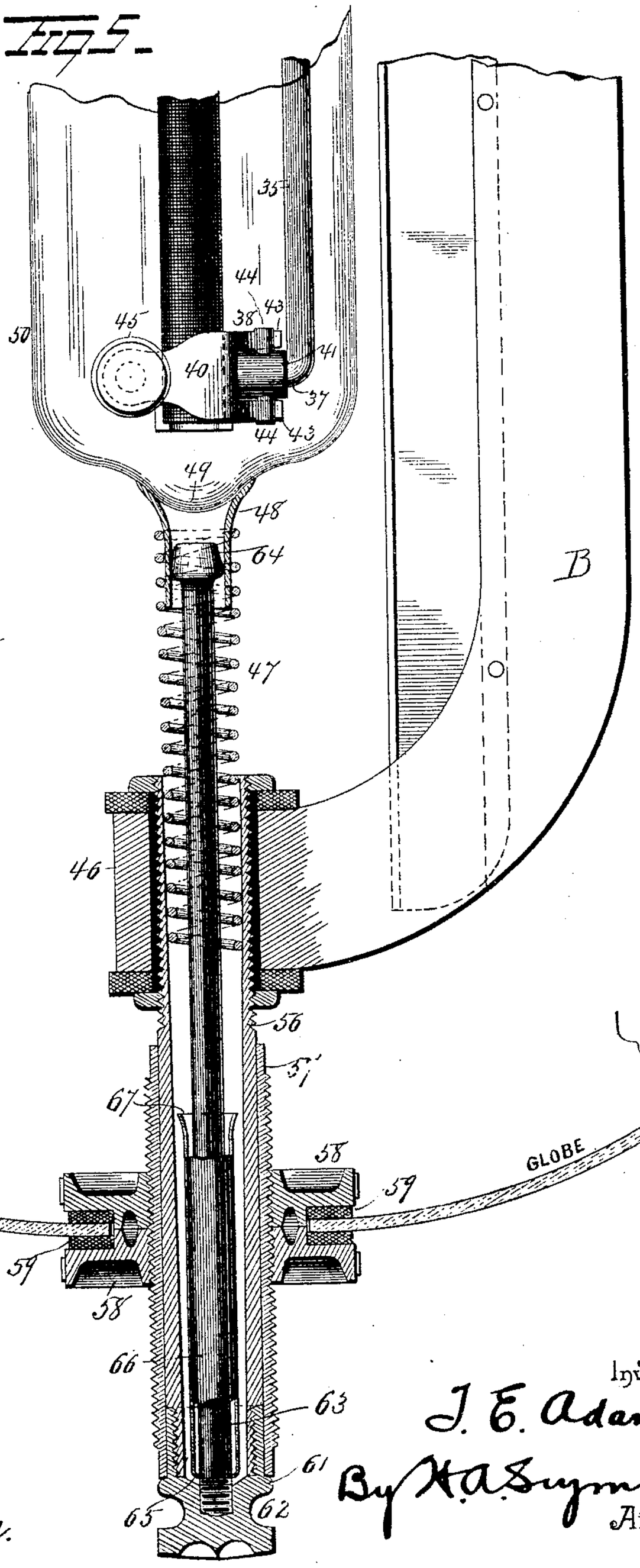
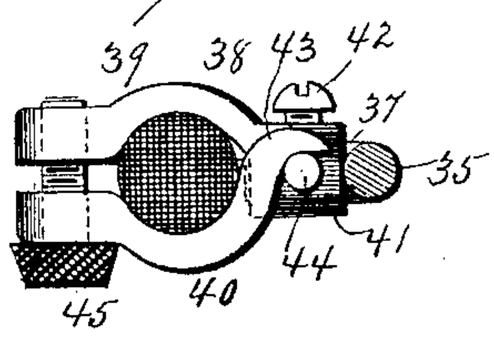


Fig. 9.



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(No Model.)

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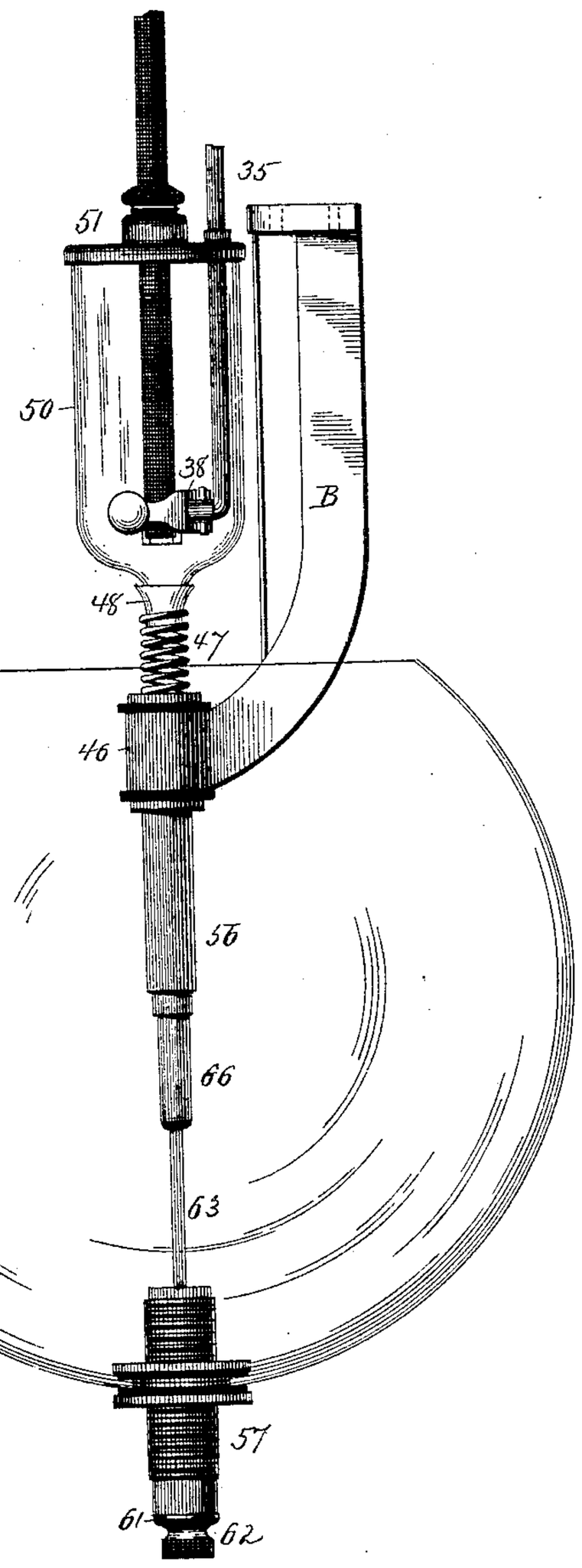
ELECTRIC ARC LAMP.

No. 579,032. Patented Mar. 16, 1897.

Fig. 6.



Witnesses
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UNITED STATES PATENT OFFICE.

THOMAS EDGAR ADAMS, OF CLEVELAND, OHIO.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 579,032, dated March 16, 1897.

Application filed October 1, 1896. Serial No. 607,551. (No model.)

To all whom it may concern:

Be it known that I, THOMAS EDGAR ADAMS, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric-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 electric-arc lamps, and more particularly to such as employ an inner or arc-inclosing globe.

One object of the invention is to provide an electromagnet so constructed that its armature shall be capable of long range of movement and so that the "pull" of the magnet shall be uniform throughout the entire range of movement of the armature.

A further object is to so construct the motor mechanism of an arc-inclosed electric-arc lamp as to avoid the expense incident to the use of solenoids, and to so construct an electromagnet having a pivotal armature that said armature shall have a length of movement adequate to effect the wide separation of the carbons, be steady and uniform throughout its entire throw, and not be susceptible, in any degree, of "side pull."

A further object is to construct an electromagnet for an arc-lamp in such manner as to reduce the length of the magnet-circuit to a minimum, with an adequate cross-section of wire in the magnet-coil to properly energize poles of extended surface, whereby to actuate an armature accurately and uniformly throughout a long range of movement.

A further object is to so construct the electromotor mechanism of an electric-arc lamp that it shall be self-contained—that is to say, so that the armature and air-pot shall be supported by the magnet structure and the whole fastened within the casing at a single point, thus avoiding possibility of binding between the parts of the electromotor mechanism due to expansion and contraction.

A further object is to mount the armature of the magnet in such firm, durable, and frictionless manner that it will respond to the slightest changes of current flowing through the coil of the magnet.

A further object is to so mount a rheostat on an electric-arc-lamp casing as to effect ample insulation and easy adjustment.

A further object is to mount a rheostat on an electric-arc-lamp casing in such manner that it shall be waterproof and durable and comparatively cheap to construct.

A further object is to provide means whereby to readily adjust the cover of the inner or arc-inclosing globe.

A further object is to construct and arrange the negative-carbon bracket in such manner that it will serve to support the cover of an inner or arc-inclosing globe.

A further object is to so construct and arrange the cover of an arc-inclosing globe that it can be adjusted laterally, whereby to insure the alinement of the upper with the lower carbon.

A further object is to so construct and arrange a cover for an inner or arc-inclosing globe that it shall be very light and one which will readily reach a temperature practically equal to that of the arc-inclosing globe, whereby to avoid accidental breaking of the globe, which would be likely to occur if its upper edge be subjected to a cold cover while the lower portions are becoming heated by the arc when the lamp is being started.

A further object is to provide simple and efficient means for lowering and sustaining the large outer globe to facilitate trimming the lamp.

With these objects in view the invention consists in the combination in an arc-lamp, with the carbons and a clutch, of an electromagnet having pole-pieces at both ends, one of said pole-pieces having an inclined extension, an L-shaped armature, and connections between said armature and clutch, said armature having the extremity of its shorter arm pivotally connected to the shorter pole-piece of the magnet and adapted to be attracted thereby, and the longer arm of said armature having an end face to be attached by said inclined polar extension, whereby to effect a long and steady pull on said armature.

The invention also consists in the combination, in an arc-lamp, of a rod depending from the frame thereof, a vertically and laterally movable arc-inclosing globe-cover mounted on said rod, and means for normally retaining said globe-cover in a fixed position with relation to the globe.

The invention also consists in the combination in an arc-lamp, with the casing thereof, of a grooved ring located on the top of said

casing, an annular series of insulators having bearings in said grooved ring, a resistance-coil passing through said insulators, and a cap covering said ring, coil, and insulator; and the invention further consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation of an electric-arc lamp embodying my improvements. Fig. 2 is an enlarged detail view of the magnet, its armature, and attached parts. Fig. 3 is a detail view illustrating the rheostat. Fig. 4 is a detail view illustrating the cover of the arc-inclosing globe and the bracket which supports it. Figs. 5 and 6 are views illustrating the outer globe-holding devices. Figs. 7, 8, 8^a, and 9 show details.

A represents a casing comprising a top *a*, a floor or bottom *b*, and upright connecting-walls *c*.

A plate 1 is secured to but insulated from the under face of the top or cover *a* of the casing and made with a binding-post 3 for the reception of the minus leading-in wire of the lamp. Another plate 4 is secured to and insulated from the lamp-floor and made with an upwardly-projecting sleeve 5 for the reception of the lower end of a rod 6, the upper end of which is secured to the plate 1. Another rod 7 is secured at its upper end to the plate 1, and at its lower end said rod 7 may be made to project through the plate 4. A cross-head 8 is disposed between the rods 6 and 7 and provided with rollers to run on said rods. An arm 9 is secured to but insulated from the cross-head, and at its free end supports the holder 10 for the upper carbon 11. A clutch-blade 12 is secured at its upper end to the cross-head and projects loosely through the floor of the lamp and enters a flat lamp-arm B, secured to and insulated from the bottom of the lamp. In order to insure the free movement of the clutch-blade within the lamp-arm, said blade is provided with rollers 13 14, disposed at right angles to each other.

The blade 12 passes through and is engaged by a clutch 15 of any preferred form of construction, and the latter is connected with the armature of the separating and feeding magnet in a manner presently explained.

The separating and feeding magnet C of the lamp is made with a coil of comparatively large wire and is provided with pole-pieces 16 17 at the respective ends, said magnet being secured at one end to the top of the lamp. The upper pole-piece 16 projects laterally some distance from the core and coil and is bent down slightly, so as to present an extended face to the broadened end 18 of the armature 19. The armature is made L-shaped and is pivotally connected to the rear or outer part of the short pole-piece 17 of the magnet and is therefore attracted by both poles of the magnet. In order to reduce the friction of the pivotal bearing of the armature to a minimum, so that the armature will respond quickly and accurately when actuated by the magnet, a steel plate 20, having a knife-edge, is secured to the end of the short arm of the armature and bears against the beveled edge of a steel plate 21, secured to the pole-piece 17, and also against the knife-edge of a plate 22, secured to said pole-piece 17. To prevent the armature from falling when no current is passing through the lamp and the magnet is inactive, a block 23 (preferably brass) is secured to the pole-piece 17, and is provided with a flange 24, which projects under the end of the short arm of the armature. Lateral displacement of the armature is prevented by means of lugs 25, projecting from the ends of a plate 26, secured to the pole-piece 17.

An arm 27 is secured at one end to the longer pole-piece 16 of the magnet and projects outwardly and downwardly therefrom, the free end of said arm having ears 28, which constitute a stop to limit the outward movement of the armature when no current is flowing through the lamp. An air-pot 29 is pivoted at its upper end to the free end of the arm 27, and the plunger-rod 30 is pivotally connected to the free end of an arm 31, secured to the lower portion of the armature. A plate or arm 32 is also pivoted to the free end of the arm 31 and depends therefrom, the lower end of said plate or arm 32 being connected to and insulated from a coupling 33. A rod 34 is adjustably connected at its upper end to the coupling, and at its lower end is attached to the clutch 15. From this construction and arrangement of parts it will be seen that when the magnet is energized motion will be transmitted by the armature to the clutch and cause the latter to grasp the clutch-blade 12 and raise it. The clutch-blade being connected with the cross-head 8, which carries the upper carbon, the latter will be raised when the armature is actuated as above explained, and the wide separation of the carbons will be effected.

The plate 4 in the bottom of the lamp is made with a hole in line with the sleeve 5 for the reception of a rod or bracket 35, which depends from the lamp-floor and is rigidly held in place by means of a screw 36, passing through the wall of the sleeve 5. The lower end of the rod or bracket 35 is bent to form a short horizontal arm 37 for the reception of the lower-carbon holder 38. The carbon-holder 38 comprises a fixed jaw 39 and a movable jaw 40. The fixed jaw is made with a short sleeve or perforated boss 41 for the reception of the short arm 37 of the rod or bracket 35, to which it is secured by means of a screw 42. One end of the movable jaw 40 is bifurcated, so as to embrace the sleeve or boss 41, and the prongs 43 of said movable jaw have a pivotal bearing against pins 44, which project from the sleeve or boss 41 at diametrically opposite points. The outer end

of the movable jaw is made with a hole for the free passage of a screw 45, which enters a screw-threaded hole in the end of the fixed jaw. In this manner a very simple and efficient holder for the carbon is constructed.

The lower extremity of the lamp-arm B is made with a vertically-disposed sleeve or perforated boss 46, in which a coiled spring 47 is seated. The spring 47 projects above the sleeve or boss 46 and at its upper end is provided with a socket-piece 48 for the reception of a teat or enlargement 49 at the bottom of an arc-inclosing globe 50. The spring 47 serves to force the open upper end of the globe against a cover 51 of thin light metal. The cover 51 is made with a hole between its center and its periphery for the passage of the rod or bracket 35, to which said cover is adjustably secured by means of a set-screw 52. The cover 51 is made with a central opening surrounded by an annular upwardly-projecting flange 53, which latter is screw-threaded internally for the accommodation of a screw-threaded bushing 54, through which the upper carbon of the lamp passes.

It will be seen that by loosening the screw 52 the cover can be adjusted vertically on the rod or bracket 35 to properly adapt it to the length of globe or to regulate the pressure exerted by the spring 47 in forcing the globe against said cover. The cover 51 can also be moved laterally on the rod or bracket 35, whereby to adjust the upper carbon and insure its alinement with the lower carbon.

It has been found in practice that when the upper edge of the globe is allowed to remain cold while the lower portion is becoming heated when the arc is being formed there is liability of the globe breaking or cracking, owing to the unequal expansion of the glass. By making the cover 51 thin and light it will become heated almost as quickly as the glass globe and the upper edge of the latter will not be kept cool during the starting of the lamp. There will be very little liability of the globe being cracked or broken during the initial operation of the lamp.

To permit the removal of the arc-inclosing globe when the lamp is to be trimmed, the socket-piece 48 and spring 47 will be moved out of line with the globe, when the latter can be readily removed.

A tubular extension 56 is secured to and depends from the boss or sleeve 46, on which an externally-screw-threaded sleeve 57 is loosely mounted. Two disks 58 58, having screw-threaded openings, are placed on the sleeve 57 and adapted to clamp the lower end of a large globe 60 between them, suitable gaskets or washers 59 being disposed between the disks and the globe and the sleeve 57 projecting through the opening in the bottom of the latter. The globe 60 and the sleeve 57 are held in position by the engagement of the lower end of the latter with a flange 61 on a cap or knob 62, screwed on the lower end of the tubular extension 56. To the cap or knob 62 a rod 63 is screwed and adapted to project up through the tubular extension 56 and through the hollow boss or sleeve 46. The upper end of the rod 63 is made with a head 64, which, when said rod is lowered, is adapted to engage a flange or shoulder 65 at the lower end of a short tube 66, disposed within the tubular extension 56, the upper end of said tube 66 being made with a shoulder 67 to engage the tapering interior of the lower part of the tubular extension 56. From the above it will be seen that extensible holding devices are provided for the outer globe, and that when the cap or knob 62 is unscrewed from the tubular extension 56 the sleeve 57 and the outer globe 60 can be lowered.

If desired, a cover 69 may be provided for the outer globe, said cover being secured to the under side of the lamp-casing. If a larger outer globe is desired, this cover may be omitted.

On the top of the casing A of the lamp a grooved ring 70 is horizontally disposed for the accommodation of a rheostat, which in the present instance is composed of a coil 71 of resistance-wire encircled by an annular series of tubular insulators 72, which have their bearings against the grooved ring 70. One end of the coil 71 is connected to a binding-post 73. One end of a flexible conductor 74 (covered with heat-proof material, such as asbestos) is adjustably attached to the resistance-coil at or near its other end by means of a cylindrical block 74^a and a screw 74^b, a washer 74^c being inserted between the head of said screw and the resistance-wire, and the opposite end of said conductor is connected to a binding-post 75. A cap 76 is disposed over the rheostat and rests on lugs 77, projecting upwardly from the top of the casing, so as to leave a space between said cap and casing for the circulation of air. An annular flange 78 projects upwardly from the cap around the opening therein, and around this flange the cap is made with a number of lugs 79. On these lugs a dished plate 80 rests so as to permit the entrance of air under it. The plate 80 is made with a central opening for the accommodation of an enlargement 81 on the lamp-casing, and said plate and cap are retained in position by means of a screw 82, which enters said enlargement 81. From this construction and arrangement of parts it will be seen that the rheostat is mounted directly on the lamp and not separately therefrom, as has been heretofore proposed.

A rheostat constructed and arranged as above explained is thoroughly insulated, easy to adjust, practically waterproof, durable, cheap to construct, not liable to become grounded or short-circuited, can withstand heat and moisture, and will be thoroughly ventilated.

A binding-post 83 is secured within the lamp-casing for the reception of the positive leading-in wire, and to this binding-post con-

tact-plates 84 are secured and adapted to be engaged by a manually-operated switch-arm 85, the latter being pivotally connected to the lamp-casing and provided at its outer end with a knob. A conductor 86 is attached at one end to the switch-arm 85 and at the other end to the binding-post 73 of the rheostat. To the other binding-post of the rheostat a conductor 87 is attached, the other end of said conductor being connected with one end of the coil of the magnet. The other end of the coil of the magnet is connected by means of a conductor 88 with the upper-carbon holder. The current flows from the lower-carbon holder through the rod or bracket 35 to the rod 6 and thence to the plate 1 and negative binding-post 3 of the lamp, the cross-head 8 and rod 7 also serving as a portion of the negative conductor of the lamp.

In electric-arc lamps in which the arc is inclosed by an air-tight globe quite a long arc can, as is well known, be formed and maintained. For establishing such large arcs electromagnets as commonly constructed are unsuitable and solenoids have been used, but the latter are objectionable on account of the large amount of wire necessary to insure their proper operation.

The construction and arrangement of electromagnet herein described will result in an adequate movement of the armature to effect the formation of a long arc, will exert a perfectly even pull on the armature, and as the magnet-circuit is perfect, owing to its being short and of ample cross-section and the poles having large surface area, but little wire will be required. There will be no side pull of the armature and friction between the working parts will be reduced to a minimum.

My improved electromotor mechanism is self-contained—*i. e.*, the armature and air-pot are carried by the pole-pieces of the magnet and the whole fastened in the lamp-casing at a single point. The mechanism will not, therefore, be effected by unequal expansion and contraction and consequent binding and changing of adjustment.

My improvements are simple in construction, accurate in operation, and effectual in all respects in the performance of their functions.

Various slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting its scope; and hence I do not wish to limit myself to the precise details herein set forth.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-arc lamp, the combination with the carbons and a clutch, of an electromagnet having pole-pieces at both ends, one of said pole-pieces having an inclined extension, an L-shaped armature, connections between said armature and clutch, said armature having the extremity of its shorter arm pivotally connected to the shorter pole-piece of the magnet and adapted to be attracted thereby, and the longer arm of said armature having an end face to be attracted by said inclined polar extension, whereby to effect a long and steady pull on said armature, substantially as set forth.

2. The combination in an arc-lamp, of a rod depending from the frame thereof, a vertically and laterally movable arc-inclosing globe-cover mounted on said rod, and means for normally retaining said globe-cover in a fixed position with relation to the globe.

3. The combination in an arc-lamp, of a rod movably attached to the lamp-casing, an arc-inclosing globe-cover movably mounted on said rod, means for normally securing said cover in position, and a carbon-holder at the lower end of said rod, substantially as set forth.

4. The combination in an arc-lamp, of a rod depending from the lamp-casing, an arc-inclosing globe-cover having a hole therein for the passage of the upper carbon, a perforated enlargement near the periphery of the cover for the passage of said rod and a set-screw passing through the wall of said enlargement and engaging said rod, substantially as set forth.

5. In an electric-arc lamp, the combination with a magnet, a pivoted armature and an air-pot, of an arm projecting from said magnet and serving as a stop for said armature and a support for said air-pot, substantially as set forth.

6. In an electric-arc lamp, the combination with a magnet and an armature pivoted at one end to one end of the magnet, of an arm secured to the other end of said magnet, an air-pot attached to said arm and a connection between the plunger of said air-pot and the armature in proximity to the pivoted end of the latter, substantially as set forth.

7. In an electric-arc lamp, the combination with a magnet having poles at its respective ends, of an L-shaped armature pivotally connected to one pole and adapted to be actuated by both poles and an air-pot attached to one end of said magnet and having its plunger connected with the L-shaped end of the armature, substantially as set forth.

8. In an electric-arc lamp, the combination with a magnet having poles at its respective ends and an armature adapted to be actuated simultaneously by both of said poles, of knife-edge hinge-pieces for the armature on the magnet and armature, bearings for said hinge-pieces secured to the magnet and armature and a support on the magnet and projecting under the armature, substantially as set forth.

9. In an electric-arc lamp, the combination with a magnet having pole-pieces at both ends, of an armature pivotally supported by one of said pole-pieces and adapted to be actuated by both of them, an arm projecting from the pole-piece adjacent to the free end of the armature, an air-pot attached to said arm, an

arm projecting from the armature near the pivoted end of the latter, the plunger of the air-pot being attached to the arm on the armature, a clutch and a connection between said clutch and the arm on the armature, substantially as set forth.

10. In an electric-arc lamp, the combination with the lamp-casing and the negative binding-post, of a plate in the floor of the casing having a hole therein, a tubular rod electrically connecting said plate with the negative binding-post, a rod or bracket having its upper end movably inserted in the lower end of said tubular rod, said rod or bracket depending below the lamp-floor and having a carbon-holder at its lower end, means for normally securing said rod or bracket in position, and an arc-inclosing globe inclosing the lower portion of said rod or bracket and the carbon-holder, substantially as set forth.

11. In an electric-arc lamp, the combination with a rod or bracket depending from the lamp-casing and having a lateral arm at its lower end, of a carbon-holder comprising a rigid and a movable jaw, the rigid jaw having a perforated boss to receive the lateral arm on the rod or bracket, a screw passing through the wall of said boss and engaging said lateral arm, pintles on opposite sides of said boss, prongs projecting from the movable jaw and having pivotal bearings on said pintles, and a screw passing loosely through the free end of one jaw and entering a screw-threaded hole in the free end of the other jaw, substantially as set forth.

12. In an electric-arc lamp, the combination with the casing thereof, of a grooved ring located on the top of said casing, an annular series of insulators having bearings in said grooved ring, a resistance-coil passing through said insulators, and a cap covering said ring, coil and insulators, substantially as set forth.

13. In an electric-arc lamp, the combination with the casing thereof having a central projection, of a rheostat located on said casing, a cap covering said rheostat and having a central opening, a plate over said opening and a screw entering the projection on the casing and retaining said plate and cap in position, substantially as set forth.

14. In an electric-arc lamp, the combination with a casing having lugs on its top, of a rheostat located on said casing, a cap covering said rheostat and resting on said lugs, said cap having an opening in its center, lugs on said cap surrounding the opening, a dished plate resting on said lugs on the cap and covering said opening in the latter, and means for holding said cap and plate in position, substantially as set forth.

15. In an electric-arc lamp, the combination with the casing, a lamp-arm and a cross-head, of a clutch-blade secured to said cross-head and entering said arm, a clutch to grasp said blade, means for operating said clutch, and two wheels mounted at the lower end of said blade and at right angles to each other, substantially as set forth.

16. In an electric-arc lamp, the combination with the casing and a lamp-arm, of an arc-inclosing globe, a rod or bracket depending from the lamp-casing and entering said globe, a cover for said globe movably mounted on said rod or bracket, means for normally securing the cover to the rod or bracket, a coiled spring seated in the lower end of the lamp-arm and a socket-piece secured to the upper end of said spring and adapted to receive the lower end of the globe, substantially as set forth.

17. In an electric-arc lamp, the combination with the lamp-arm, of an extension depending from the lower end of said arm, an externally-screw-threaded sleeve mounted loosely on said extension, disks on said sleeve for attaching a globe thereto, and a cap removably attached to said extension and adapted to support said sleeve and the globe attached thereto, substantially as set forth.

18. In an electric-arc lamp, the combination with the lamp-arm, of a tubular extension depending from the lower end thereof, a sleeve loosely mounted on said extension, means for attaching a globe to said sleeve, a cap removably attached to said extension and adapted to support said sleeve and globe and means for lowering said cap and supporting said sleeve and globe in a lowered position, substantially as set forth.

19. In an electric-arc lamp, the combination with the lamp-arm, of a tubular extension depending therefrom, a sleeve loosely mounted on said extension, means for attaching a globe to said sleeve, a cap removably attached to said extension and adapted to support said sleeve and globe, a rod secured to said cap and projecting through the tubular extension, a head on said rod, a tube within said extension and having a shoulder at one end to receive said head, a shoulder at the other end of said tube, and a tapering portion within said extension to receive said last-mentioned shoulder on said tube, substantially as set forth.

20. In an electric arc-lamp, the combination with the lamp-casing and a rheostat thereon, of a binding-post, a flexible conductor covered with heat-proof material, attached at one end to the binding-post and having a block at the other end, said block being inserted into the end of the rheostat and a screw entering said block and bearing against the rheostat, substantially as set forth.

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

THOMAS EDGAR ADAMS.

Witnesses:
P. N. SMIT,
EDWD. ABE.