No. 667,119. Patented Jan. 29, 1901.

R. FLEMING.

ELECTRIC ARC LAMP.

(Application filed Aug. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

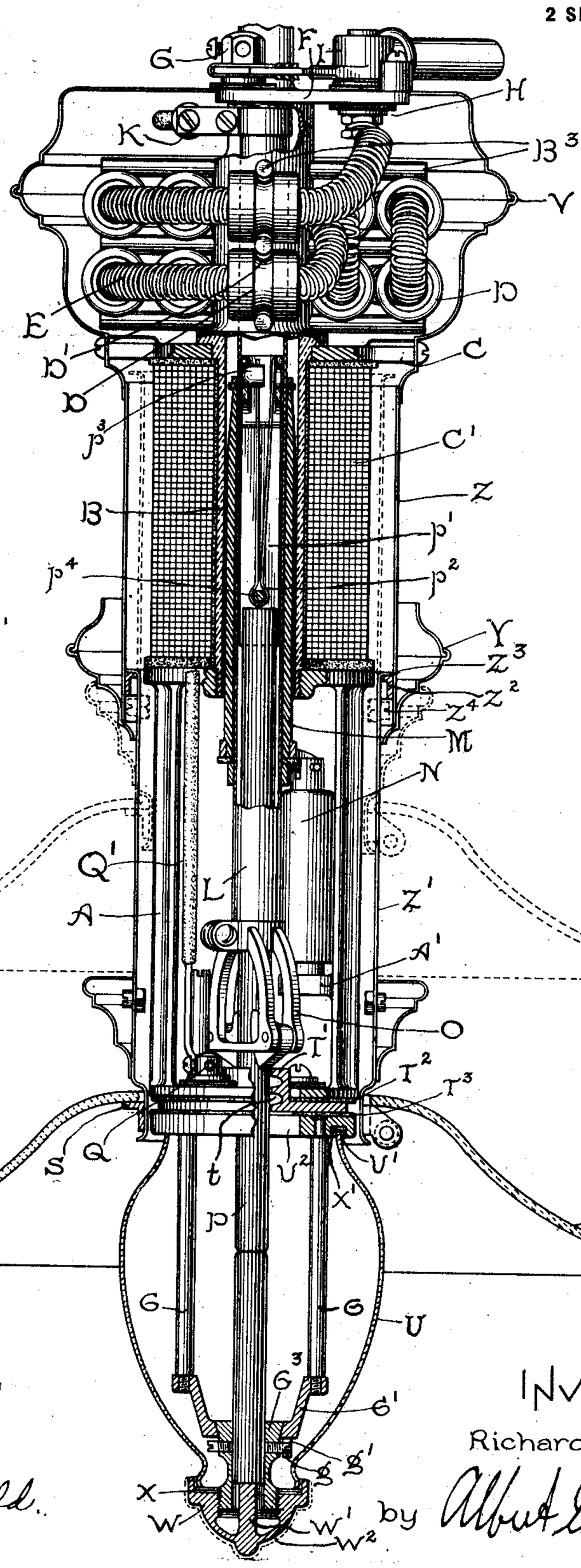

FIG. 1.

WITNESSES.
A. H. Abell.
A. F. Macdonald.

INVENTOR.
Richard Fleming,
by Albert G. Davis
Atty.

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FIG. 2.

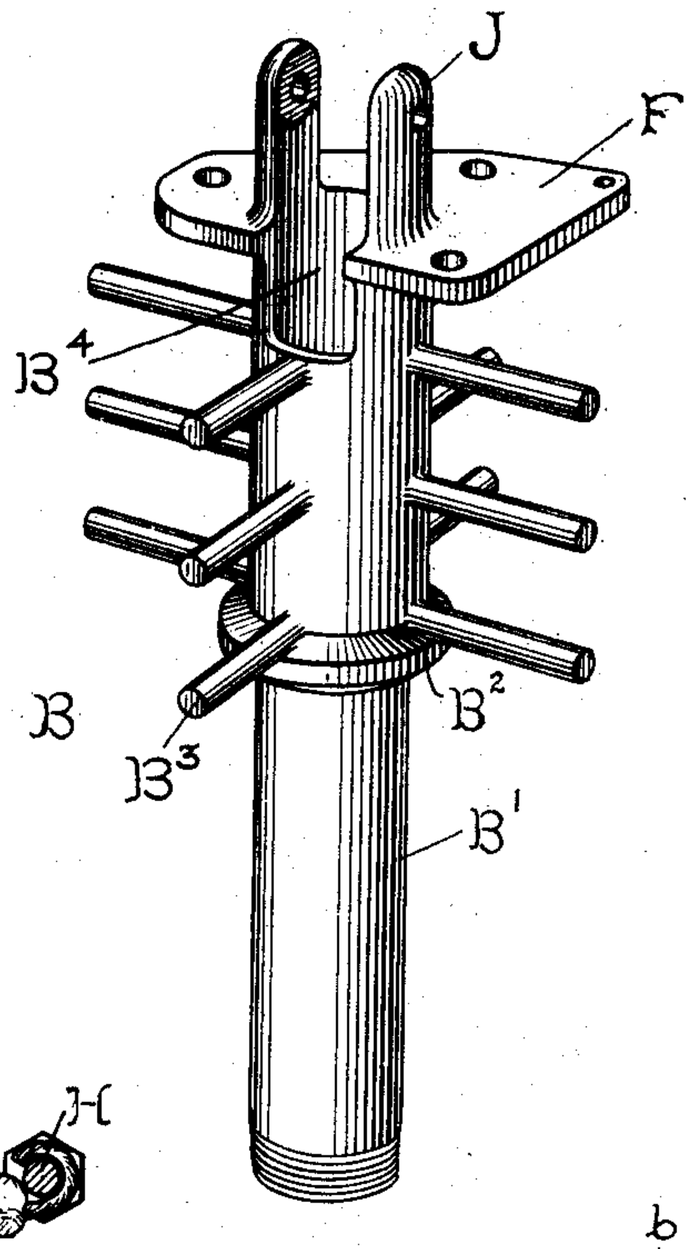


FIG. 3.

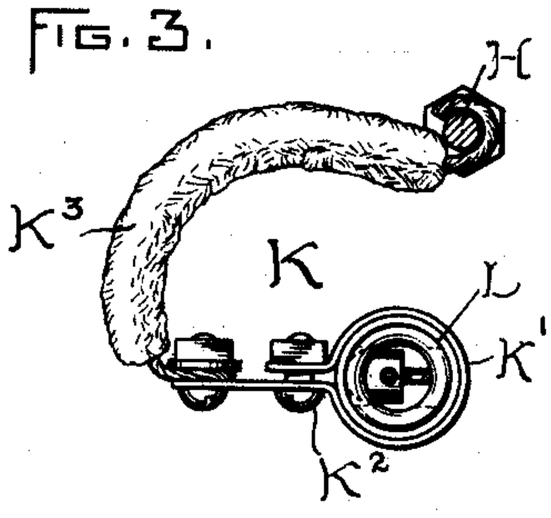


FIG. 4.

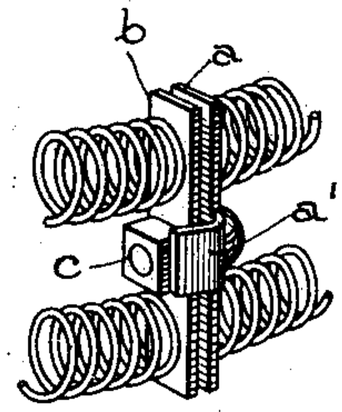


FIG. 5.

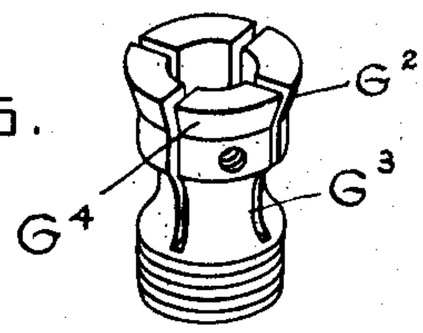
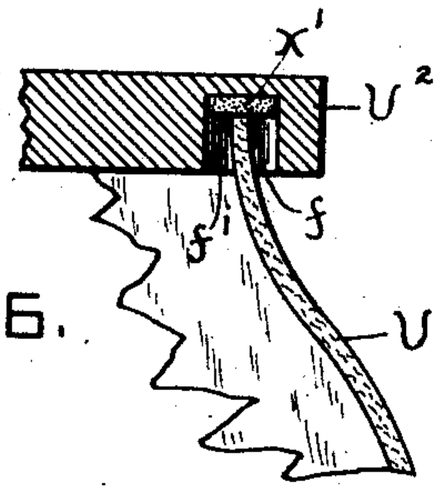


FIG. 6.



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A. H. Abell.
A. F. Macdonald.

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by Albert G. Davis
Atty.

UNITED STATES PATENT OFFICE.

RICHARD FLEMING, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 667,119, dated January 29, 1901.

Application filed August 29, 1898. Serial No. 689,762. (No model.)

To all whom it may concern:

Be it known that I, RICHARD FLEMING, a subject of the Queen of Great Britain, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Arc-Lamps, (Case No. 876,) of which the following is a specification.

My invention relates to arc-lamps, and more particularly to those of the inclosed-arc type, and has for its object to improve and also to lessen the cost of their construction; and to this end it consists in the parts and combination of parts more specifically pointed out and claimed hereinafter.

In the accompanying drawings, which show an embodiment of my invention, Figure 1 is a side elevation of an arc-lamp with certain parts in section. Fig. 2 is a perspective view of the resistance-support. Fig. 3 is a detail view of the means employed to establish connection between the carbon-tube and the stationary parts of the lamp. Fig. 4 is a detail view of the clamp employed to vary the resistance in circuit with the lamp. Fig. 5 is a perspective view of the lower-carbon holder, and Fig. 6 is a sectional view of a slight modification.

The lamp-frame consists of two parts, a rectangular frame A and a tubular frame B, made of non-magnetic material. These parts are secured together by screw-threads. The construction of frame B is best shown in Fig. 2. Formed on the lower end of the tubular portion B′ is a shoulder which rests on the upper end of the frame A, and about the middle of the frame is a second shoulder B^2, against which the plate or flange C of the magnet-coil C′ abuts. With the arrangement shown I have found it desirable to assemble the frame and then wind the magnet-coil C′ thereon; but, if desired, the coil C′ may be separately wound and insulated.

Extending radially from the frame B are a plurality of pins or projections B^3, forming supports for the insulating-bushings D, employed to support the coiled resistance-wire E. By varying the length of the pins B^3 the number of bushings, and consequently the number of turns of the resistance-wire, may be varied. The bushings D are preferably made of some non-combustible material—as porcelain, for example—and are grooved at D′ on their outer periphery to receive the pins B^3. Two layers of resistance-wire are shown, and the bushings are therefore held by three pins; but the number of layers of wire and pins can be varied as desired. The bushings are secured in place mainly by the resistance-wire; but the pins B^3 are so disposed that they tend to clamp the bushings between them. In Fig. 4 is shown an adjustable clamp for changing the amount of resistance in circuit with the lamp, which consists of two flat plates *a* and *b*, secured together by the bolt *c*. Formed integral with the plate *a* is a lug *a*′, adapted to be bent over, as shown, for the purpose of holding the nut from turning. This arrangement is a desirable one, for it permits the adjustments to be made quickly, it occupies only a very small amount of space, and it is not dependent for its efficiency upon the condition of the resistance-wire, as it readily adjusts itself.

Formed integral with the upper end of the frame is a platform F, arranged to form a support for the lamp-terminals G and H and also for the switch I. Extending upward above the platform and formed integral with the frame are two lugs J, from which the lamp may be suspended.

The tubular frame B is cut away at B^4 to permit the flexible connection K to move up and down as the position of the carbon-tube changes, due to changes in field strength of the magnet-coil C′. The construction of the flexible connection K is best shown in Fig. 3, wherein L represents the carbon-tube, K′ a thin metal band surrounding the tube and clamped thereto by a bolt K^2, and K^3 the insulated flexible cable, which extends from the binding-post H to the clamp. The up-and-down movement of the tube is comparatively slight, and the connector K is so flexible that it offers practically no opposition to the movement.

Surrounding the carbon-tube and secured thereto is a cylindrical armature M for controlling the action of the lamp. The upper end of the armature is tapered slightly, so that the pull of the armature throughout its range of movement will be practically con-

stant. Loosely secured to the armature M is a cylinder of a dash-pot N, arranged to check the movements of the armature. The piston of the dash-pot is supported by a lug A′, formed integral with the rectangular lamp-frame A. Supported by the lower end of the carbon-tube L is a clutch O, arranged to work directly on the upper carbon P. The clutch, as shown, consists of two pivoted eccentrics so arranged that they grip the carbon between them; but any other form of clutch may be employed, if desired.

The upper carbon is provided with a holder or follower p', comprising a cylindrical body of metal slotted or grooved in the center to receive the U-shaped spring p^2. In the present instance the spring is made of wire, and carried by one end is an insulated button p^3, arranged to slide along the inside of the carbon-tube L and push the follower p' against the tube in order to establish good electrical connection between the tube and the upper carbon. The button p^3 is made of insulating material, so that the current will not heat the spring, thereby destroying the temper. The spring is prevented from getting out of place at the bottom by the transverse pin p^4; but the upper ends are free to adjust themselves with respect to the carbon-follower.

In arc-lamps having an inner globe which incloses the arc and an outer globe surrounding the first-named globe a great deal of the light from the arc is absorbed by the outer globe. For out-of-door work it is preferable to provide an outer globe for protecting the cylinder from rain and wind; but for indoor work, where the lamp is not subject to moisture and wind, the outer globe may be dispensed with. This arrangement is a very desirable one on account of the decrease in the amount of light absorbed and wasted, and by mounting a white shade or reflector R above the cylinder practically all of the available light may be utilized. One desirable feature in connection with a lamp having a single globe is that it runs considerably cooler than lamps having double globes.

The "inner globe" or "cylinder" U may be of any suitable design and is arranged to fit into a groove U′ formed in the flat ring U^2, which is secured to the bottom of the frame A. Secured to the plate and extending downwardly are two rods G, forming a support for the yoke G′ and also arranged to convey current to the lower carbon.

In order to simplify the construction, a single clamp is provided for both the lower carbon and the cylinder. Located within the yoke G′ is a cylindrical body of metal G^3, (see Figs. 1 and 5,) having a central opening for the reception of the lower carbon, and extending radially through said body are slots G^2 to permit the segmental pieces thus formed to clamp the carbon. The outer surface of these segmental pieces is tapered, as shown at G^4, and this taper engages with a corresponding taper on the yoke G′. The lower end of the cylindrical piece G^3 is screw-threaded, and mounted upon this screw-threaded portion is a combined nut and cylinder holder W. The carbon-holder G^3 is prevented from turning by the short screws g, which engage with lugs g' formed on the yoke.

The combined nut and holder W is cup-shaped, and extending upwardly therefrom to the bottom of the carbon is a projection W′, which serves as a stop and also as a guide in retrimming the lamp. The nut W is in circuit with the lamp, and to prevent injury to persons making contact therewith a layer of insulating material W^2 is placed over the nut, as shown in dotted lines.

When it is desired to recarbon the lamp, the nut W and the cylinder U are removed. This loosens the carbon-holder and permits the lower carbon to drop downward and out of the lamp. After new carbons have been inserted in place the cylinder is slipped into position and the nut W mounted in place and tightened until the top and bottom edges of the cylinder are firmly seated on the asbestos washers X and X′, which washers prevent the entrance of air into the cylinder at these points.

Surrounding the upper carbon and located between the bottom of the frame A and the flat grooved ring U^2 is a gas-check or device for preventing the free entrance of air into the cylinder. The said device consists of a circular piece of metal having a hub T′ formed integral therewith, and formed in this hub are circular air-chambers t, which prevent the free entrance of air around the upper carbon. Since the flat ring U^2 and the rods G are electrically connected to the lower carbon, it is necessary to insulate the air-restricting device from the lower parts of the lamp. This is accomplished by placing a mica washer T^2 above the said device and a second washer T^3 below. Connection between the lower carbon and the exterior circuit is established through the binding-post Q and wire Q′. The binding-post Q is insulated from the lamp-frame and gas-check T^2, but is electrically connected with the ring U^2.

In Fig. 6 is shown a slight modification of the flat ring U^2. I have found that the expansion of the rods G is somewhat greater than that of the cylinder U, and in consequence after the lamp gets hot air will be admitted around the top of the cylinder. To prevent this, a deep groove U′ is turned in the flat ring U^2 and an asbestos packing X′ is used, as before. I have found that the spaces f and f' between the cylinder and the sides of the groove act as a check and prevent the free entrance of air. The carbon life of a lamp having the deep groove, as shown in Fig. 6, is a few per cent. greater than that of the form shown in Fig. 1.

Surrounding and supported by the lower ends of the casing is a shade or reflector R, which is so designed that it will reflect the rays of light from the arc and at the same

time protect the cylinder to a certain extent from accident. The reflector is supported in place by a split ring S, which is retained by the upturned edge of the casing, and the halves of the ring are united by a screw.

Surrounding the upper part of the lamp mechanism is a cylindrical casing Z, made of sheet metal, and situated below this casing is a second and cylindrical casing Z′, slightly smaller in diameter than the first, the arrangement being such that the two parts will telescope to permit the retrimming of the lamp. Secured to the upper end of the cylinder is a band or cornice V, which surrounds and protects the resistance-wire from dust and dirt and at the same time presents a pleasing appearance. Situated between the two cylinders and secured to the upper one is an ornamental band or cornice Y, so arranged that it tapers downward to the size of the lower cylinder, so that the telescoping feature of the two parts of the casing is not noticeable. At the lewer end of the cylinder is an ornamentation, band, or cornice, which is open on its upper end, so that it will slip over the lower part of the cornice Y when it is raised to the position shown in dotted lines, Fig. 1, for the purpose of trimming the lamp. This permits the lamp to be somewhat shortened. On the inside of the upper casing Z is a ring Z^2, and when the lower part of the casing is in its normal position the outwardly-flaring flange Z^3 rests thereon.

When it is desired to retrim the lamp, the cylindrical casing Z′ and the shade R are moved upward to the position shown in dotted lines, and as soon as the nut Z^4 strikes the under side of the ring Z^2 the casing is given a slight twist, which locks it in place temporarily. To replace the parts, the cylinder is given a slight twist in the opposite direction, which releases it, and the shade is lowered to its normal position. It will be seen that this is a desirable arrangement, for it permits the shade to be moved out of the way of the trimmer, but does not have to be removed from the lamp.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric-arc lamp, the combination of a frame supporting the working parts of the lamp, a non-magnetic tubular frame secured thereto, a plurality of radially-extending arms having different horizontal planes formed integral with the tubular frame, a plurality of insulators having holes therein mounted between the arms, and a resistance which is threaded through the holes in the insulators.

2. In an electric-arc lamp, the combination of a rectangular frame, within which certain of the working parts of the lamp are mounted, a tubular frame screw-threaded to the rectangular frame, a shoulder formed on the tubular frame against which the spool of the magnet abuts, a magnet wound on a spool and mounted on the tubular frame, a plurality of radial arms formed integral with the tubular frame, a resistance-coil mounted on the lamp and supported by the radial arms, and insulating-bushings between the arms and the coil.

3. In an electric-arc lamp, a support for a resistance comprising a tubular frame having a central opening for the reception of certain of the moving parts of the lamp, radial arms for supporting the resistance-wire, a resistance, insulators mounted between the arms through which the resistance is threaded, and a platform integral with the support for supporting certain of the fixed parts of the lamp.

4. In an electric-arc lamp, the combination of a tubular frame for supporting the resistance, a platform formed integral with the frame and designed to support the binding-posts, a carbon-tube mounted within the frame, and a flexible connection between one of the binding-posts and the tube.

5. In an electric-arc lamp, the combination of a carbon-tube adapted to be moved up and down as the strength of the operating-magnet changes, a carbon-follower mounted within the tube and arranged to establish electrical connection between this tube and the carbon, an insulated U-shaped spring for forcing the follower against the tube at at least one point, and a transverse pin for retaining the spring-arm in the holder.

6. In an electric-arc lamp, the combination of a carbon-tube, a carbon-follower mounted within the tube and arranged to establish electrical connection between the carbon-holder and one terminal of the lamp, the said follower consisting of a slotted tubular piece of metal having a spring-pressed insulated contact for pressing the follower against the surrounding tube.

7. In an electric-arc lamp, the combination of a carbon-tube, a tubular armature for raising the carbon-tube which is slightly tapered at its upper end to give a practically constant pull, a magnet-coil for actuating the armature, and a slotted tubular follower which carries the upper carbon mounted within the carbon-tube, said follower being provided with a U-shaped spring carrying an insulated button which presses the follower against the carbon-tube.

8. In an electric-arc lamp, the combination of a globe-holder, supporting the same, mounted in a tapering seat secured to the lamp-frame, a carbon-holder, and means for simultaneously clamping the carbon and securing the globe in position.

9. In an electric-arc lamp, the combination of a globe or cylinder, a holder therefor, a carbon-holder, and a means for simultaneously drawing down the carbon-holder and forcing the globe-holder upward, thereby clamping the carbon and seating the globe.

10. In an electric-arc lamp, the combination of a yoke, rods for supporting the yoke, a tapered carbon-holder mounted in the yoke, means for preventing the holder from rota-

tion, a globe or cylinder and a holder therefor which is screw-threaded to the carbon-holder, the arrangement of parts being such that as the cylinder is pushed upward against its seat, the carbon-holder is drawn downward and firmly clamps the carbon.

11. In an electric-arc lamp, the combination of a yoke, side rods for supporting the yoke and lower-carbon holder, a globe or cylinder which surrounds the yoke, a holder for the globe electrically connected to the lower carbon, and an insulated covering for the globe-holder.

12. In an electric-arc lamp, the combination of a supporting-frame, a ring secured to the frame and having an annular globe-seating groove, a gas-check having a flange, which flange is secured between the ring and the frame, a globe-holder, and rods secured to the ring, which support the holder.

13. In an electric-arc lamp, the combination of a supporting-frame, a globe for inclosing the arc, a holder therefor, a ring having an annular groove forming a seat for the globe, a gas-check surrounding the upper carbon consisting of a flat metal plate, and a hub having a groove therein, means for securing the frame, gas-check and ring together, and side rods located within the globe and secured to the ring for supporting the holder.

14. In a single-globe arc-lamp, the combination of a frame, a globe, a flat grooved ring forming a seat for the globe, the said ring being in circuit with the lower carbon, a gas-check located between the frame and the grooved ring, the said gas-check being in circuit with the upper carbon, and insulation between the frame and the gas-check and between the grooved ring and the gas-check.

15. In an electric-arc-lamp casing, the combination of a cylindrical section, a ring secured thereto, a second section telescoping with the first and provided with a flange which engages a ring on the first section and a groove, a ring mounted in the groove, and a shade carried by the ring.

16. In an electric-arc lamp, the combination of a frame-piece, a casing-section which is provided with an enlargement or cornice at its upper end, that is secured to the lamp-frame, a cornice located at the lower end of the section, a ring secured to the section, a second section arranged to telescope with the first, a flange formed thereon which engages with the ring, and means for holding the parts together when telescoped, for the purpose of inspecting the working parts of the lamp.

17. In an electric-arc lamp, the combination of a lamp-frame, a casing-section which is provided with a cornice at its upper end, both of which are secured to the lamp-frame, a cornice secured to the lower end of the section, a ring mounted on the section, a second section arranged to telescope with the first, a flange formed thereon which engages with the ring, a cornice at the lower end of the second section which nests with the cornice at the lower end of the first section when the parts are raised for the purpose of inspection, a ring which is clamped in a groove formed in the second section, and a shade supported by the ring.

18. In an electric-arc lamp, the combination of a coiled resistance situated at the top of the lamp, and means for varying the amount of resistance included in the circuit, which consists of two flat metal plates adapted to grip the turns of the resistance-wire between them, a bolt for holding the plates together, and a lug formed on one of the plates for preventing the nut of the bolt from turning.

19. In an electric-arc lamp, the combination of a frame, a central tube which is screw-threaded to the frame, a shoulder formed thereon, a magnet-coil, a spool therefor the heads of which are retained in place by the frame and the shoulder, insulators mounted on the central tube and provided with openings, and a coiled resistance-wire which is threaded through the openings in the insulators.

20. In an electric-arc lamp, the combination of a magnet, a stationary tube which extends through the center of the magnet and is connected to the framework of the lamp, an armature movable within the magnet, a dash-pot the piston of which is mounted on the side frame of the lamp and is fixed with respect to the central tube, and a cylinder therefor which is pivotally secured to and movable with the armature.

21. In an electric-arc lamp, the combination of a frame consisting of side pieces connected at the top and bottom by heads formed integral therewith, and a tube which is screw-threaded at the upper end and is provided with radially-projecting arms, insulators mounted between the arms and having openings therein, a resistance-wire wound like a coiled spring, which in turn is wound in spiral around the top of the lamp and is threaded through the openings in the insulators and serves to hold the insulators in place.

In witness whereof I have hereunto set my hand this 25th day of August, 1898.

RICHARD FLEMING.

Witnesses:
DUGALD MCKILLOP,
HENRY C. SPINNEY.