No. 667,128. Patented Jan. 29, 1901.

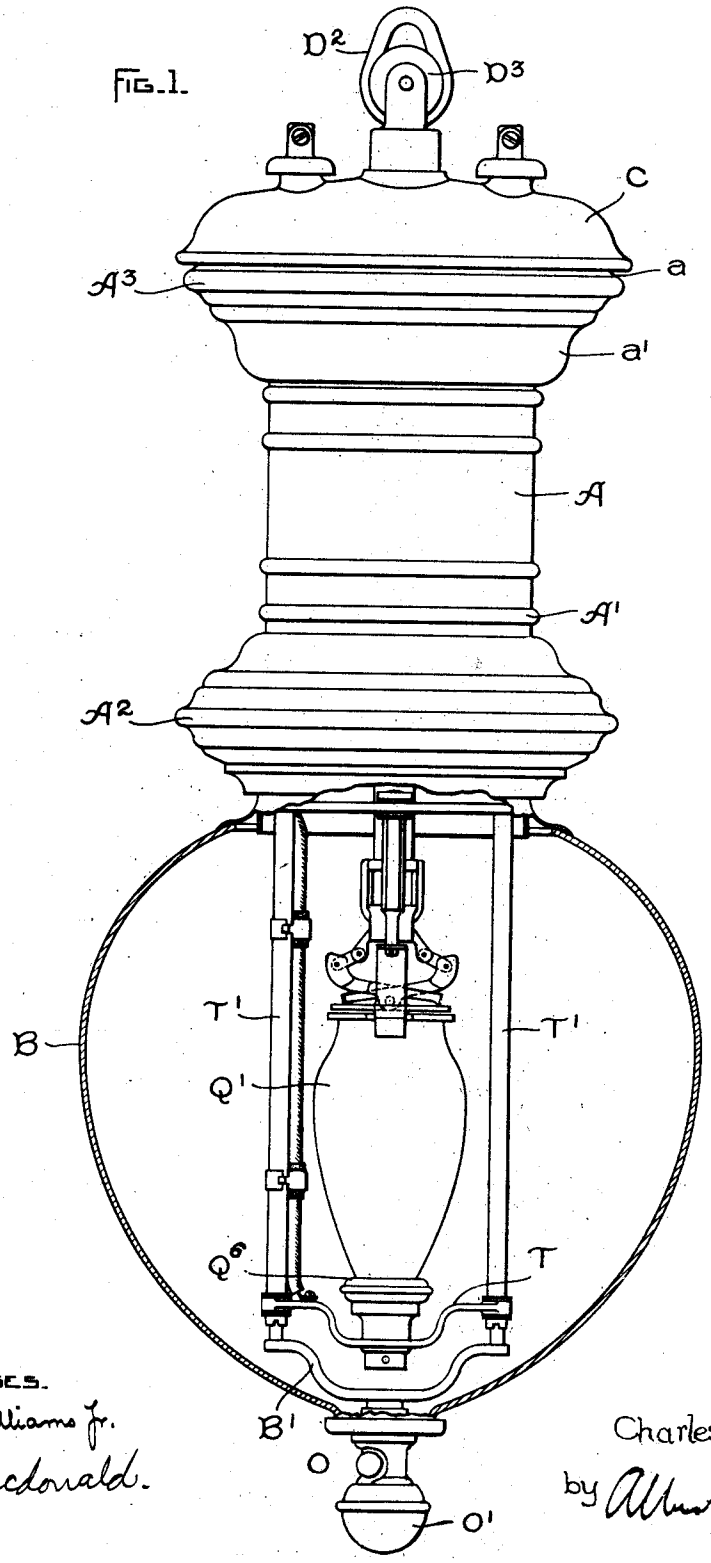
C. E. HARTHAN.

ELECTRIC ARC LAMP.

(Application filed July 27, 1898.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.




WITNESSES.
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INVENTOR.
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by Albert G. Davis
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FIG. 2.

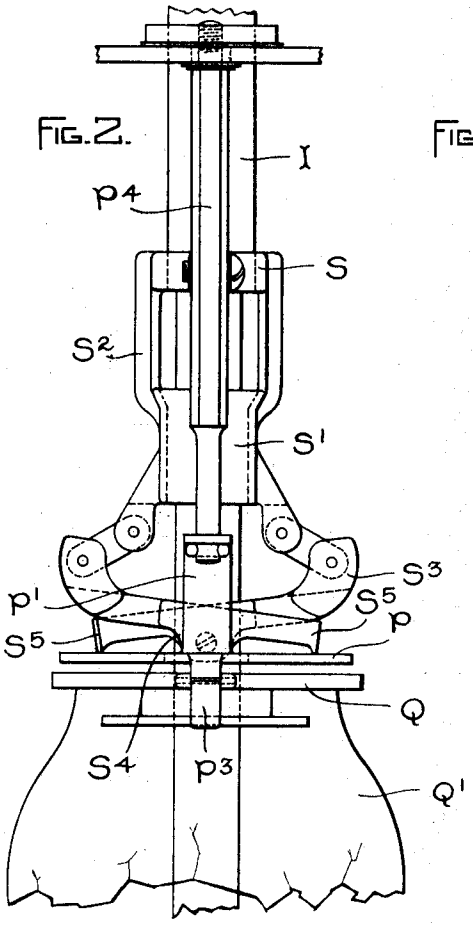


FIG. 3.

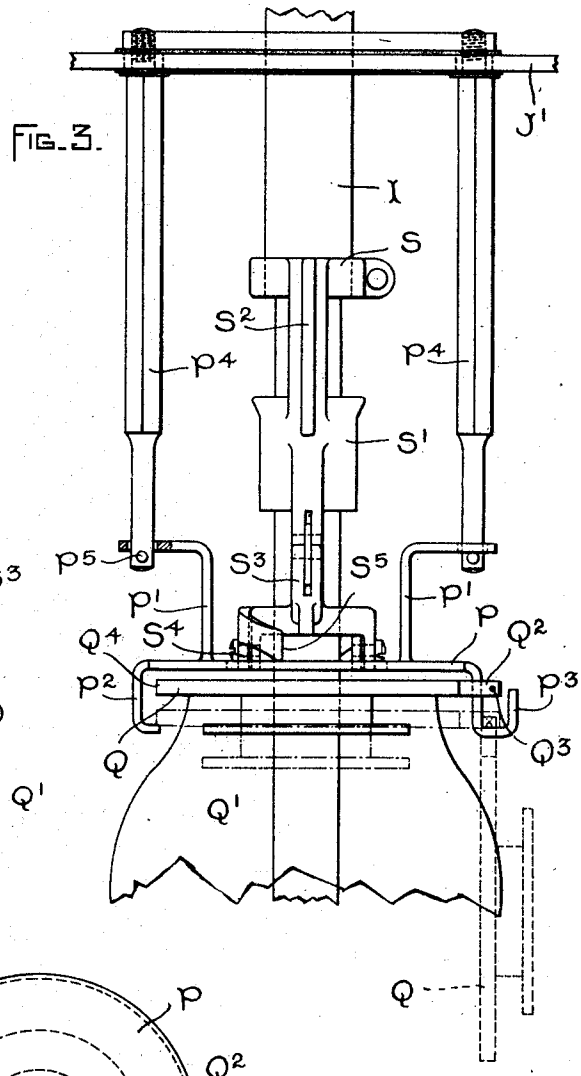


FIG. 4.

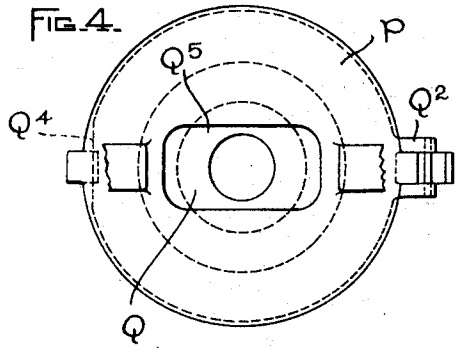


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FIG. 5.

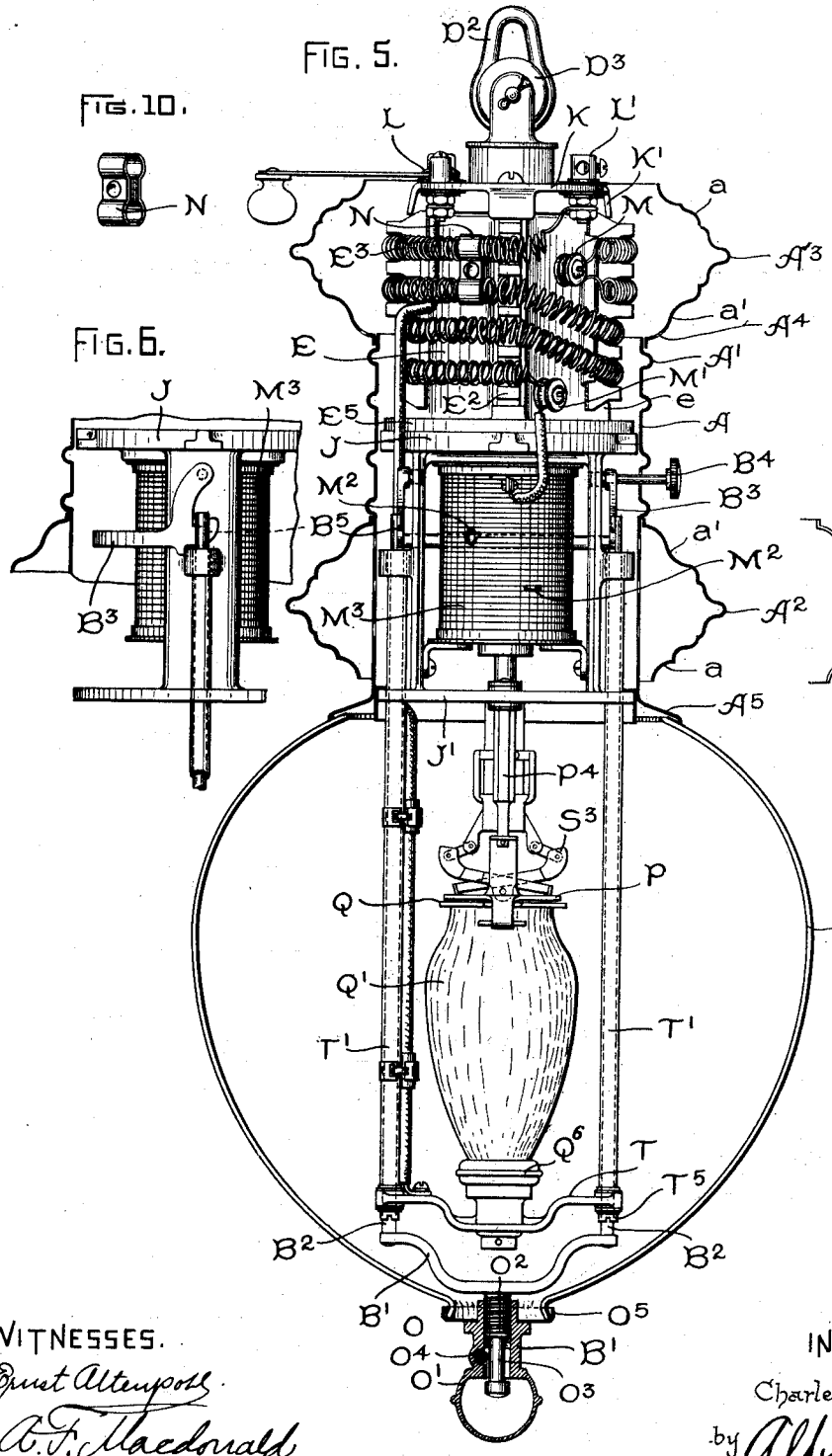


FIG. 10.




FIG. 6.




FIG. 11.

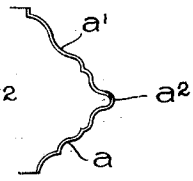


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FIG. 7.

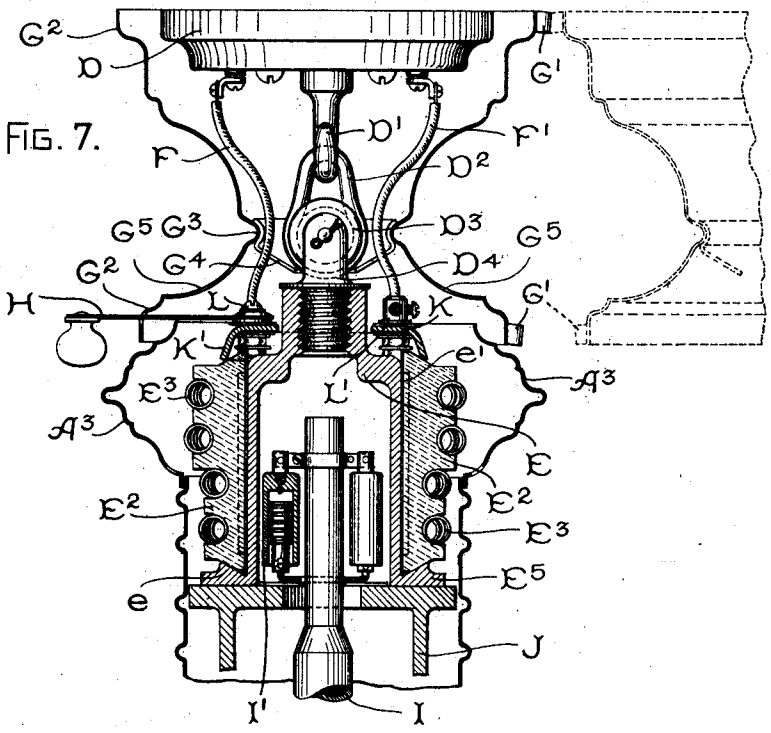



FIG. 8.

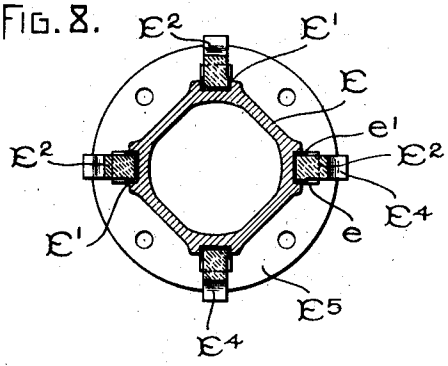
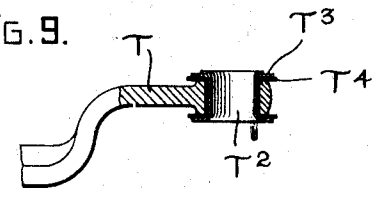



FIG. 9.

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Att'y.

# UNITED STATES PATENT OFFICE.

CHARLES E. HARTHAN, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 667,128, dated January 29, 1901.

Application filed July 27, 1898. Serial No. 686,978. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. HARTHAN, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Arc-Lamps, (Case No. 788,) of which the following is a specification.

My invention relates to arc-lamps, and has for its object to improve their construction; and to this end it consists in the parts and combination of parts hereinafter described and claimed.

In the accompanying drawings, which show an embodiment of my invention, Figure 1 is a front elevation of a lamp with the outer globe in section. Fig. 2 is a side elevation of the mechanism employed to support the cylinder-cap. Fig. 3 is a front elevation of the same. Fig. 4 is a plan view of the cap-support with portions broken away. Fig. 5 is a front elevation of a lamp with the globe and casing in section. Fig. 6 is a detail of the globe-locking device. Fig. 7 is a sectional detail of the resistance-supporting frame and also of the canopy. Fig. 8 is a detail of the resistance-support. Fig. 9 is a detail illustrating the means employed in insulating the side rods. Fig. 10 is a perspective view of a resistance-slide. Fig. 11 shows the shape of the cornice of the lamp-casing.

In manufacturing arc-lamps it is desirable from a selling point of view to make them attractive, and it is necessary to construct them as cheaply as possible. The mechanism of the lamp is usually surrounded by a casing, and in order to make this casing as cheaply as possible I construct it of sheet metal and make it into the form of a cylinder A, having suitable bands or ornamentations A′, formed by rolling the sheet metal of which it is composed between rolls during the process of construction. The lower end of the casing is perforated, as shown, to permit ventilation and keep the parts cool. Mounted on the ends of the cylinder A are cornices $A^2$ and $A^3$. These cornices are similar in construction and are formed by the same formers. As it is necessary to ventilate the lamp-casing, the side $a$ of the lower cornice is made a trifle shorter than the side $a'$, so that air can enter at a point above the outer globe B and pass upward through the lamp parts, thereby keeping the temperature of the lamps down to a predetermined amount.

In Fig. 11 is shown the construction of the cornices. For convenience and cheapness of construction the cornices are made of two pieces $a$ and $a'$, which lap over each other at point $a^2$. The two pieces are formed separately and are afterward secured together by spinning, which makes a water-tight joint between them. In so far as the construction of the cornices is concerned it does not matter whether they are provided with side portions $a$ and $a'$ of the shape and length shown or not, the essential feature being to make the cornice in two parts and to secure them in the manner shown. The side $a'$ of the cornice is secured to the casing A in any suitable manner—as, for example, by riveting or soldering. The upper cornice $A^3$ is reversed with respect to the lower one and extends above the casing A and is secured in place by riveting or soldering the long side $a'$ to the casing. The upper cornice commonly surrounds a resistance in a direct-current lamp and a reactance in an alternating-current lamp, and for ventilating the resistance or reactance the long side $a'$ of the cornice $A^3$ is perforated by a series of small holes $A^4$, as shown in Figs. 5 and 7.

When the lamp is intended for out-of-door service, a metal cover C is provided resembling an inverted saucer, which extends down over the short side $a$ of the upper cornice and prevents water from entering the casing. By making the cornices similar and reversing the upper one sufficient room is provided at the top for the resistance or reactance, and the size of this resistance or reactance may be varied without altering the size of the casing. This makes all of the lamps present a uniform appearance whether they are intended for alternating or continuous current.

When a lamp is intended for indoor use, where ornamental appearance is an important feature, the arrangement shown in Fig. 7 is employed. Secured to the ceiling or other suitable support is a ceiling-board D, made of insulating material and preferably of non-combustible material—as porcelain, for example. On the under side of the board is

a hook D′, arranged to support the lamp by the ring $D^2$, which ring is insulated from the lamp by the bushing $D^3$. The bushing is mounted in a U-shaped casting $D^4$, which is screw-threaded to the resistance-supporting dome E. Electrical connection between the hanger-board and the lamp is made by the cables F and F′.

Surrounding the ceiling-board, cables, and hook is a split canopy, so arranged that one-half of it may be swung outward on hinges G′ to permit inspection and also to permit the removal of the lamp. The canopy is provided with enlarged heads $G^2$ and a contracted neck $G^3$, the upper head surrounding the ceiling-board D and the lower head the cornice $A^3$. The lower head is slotted to receive the actuating-handle of the switch H. Secured to the neck of the canopy is an internal flange or collar $G^4$, which closely surrounds the U-shaped casting $D^3$, suitable openings being provided for the reception of the cables F and F′. This prevents the heat from passing upward to the ceiling. The heat passes outward from the casing through the space between the upper cornice $A^3$ and the canopy and also through the holes $G^5$ in the canopy.

It will be seen that the canopy projects downward over the cornice, so that the lamp presents an unbroken ornamentation from the globe to the ceiling, a feature which adds greatly to the appearance of the lamp.

In direct-current lamps designed for constant-potential circuits it is customary to mount a resistance in the top of the lamp, and for this purpose a cast-metal dome E is provided, having radial slots E′ for the reception of the blocks of insulating material $E^2$, which carry the resistance-coil $E^3$. The dome is made hollow in order to radiate the heat generated by the resistance-coil and also to receive certain of the operating parts of the lamp. In the present instance the upper end of the tube I and the dash-pot I′ are within the dome. On the lower end of the dome is a cylindrical flange $E^5$, adapted to be secured to the lamp-frame J by screws.

Situated at the bottom of the insulating-blocks $E^2$ and formed integral with the flange $E^5$ are beveled lugs or projections *e*, arranged to secure the blocks at their lower end. The blocks $E^2$ are preferably made of porcelain or other non-combustible material and are provided with openings $E^4$ for the reception of the resistance-coils $E^3$. Between the blocks and the slots E′ in the dome are strips of asbestos or similar material *e*′, which compensate for any slight irregularities in the parts and at the same time assist in retaining the blocks in place. The insulating-blocks are secured in place at the top by a plate K, having downwardly-projecting feet K′, which rest upon the upper beveled ends thereof. The plate also acts as a support for the binding-posts L and L′ and is secured to the dome by screws.

Referring more particularly to Fig. 5, the method of winding the resistance will be described. The resistance-wire is first coiled like a helical spring and the spring wound around the dome. The outer end of the resistance is connected to the binding-post L′ and is wound in an anticlockwise direction until it arrives at the insulating-bushing M, where it is given half a turn, and the balance of the coil wound in a clockwise direction and finally secured to insulating-bushing M′. The inner end of the resistance is so arranged that it may be connected to any one of the loops $M^2$ formed on the magnet-winding $M^3$. This is to adapt the lamp for use on different circuits or for different currents.

In order to adjust a lamp for use on different circuits, it is often necessary to change the amount of resistance in circuit therewith, and for this purpose a two-part clamp or slider, Fig. 10, is provided and so arranged that it may be slid along two turns of the coil and cut out more or less resistance. By arranging the resistance-coil in such manner that part is wound in one direction and part in the reverse direction a wide range of regulation by the resistance is obtained. When the clamp N is in the position shown, current in passing from the coil $M^3$ to binding-post L′, or vice versa, is practically shunted past two turns of the resistance-wire, whereas if the clamp N is placed across the two lower turns only a single turn of resistance is cut out. Sliding the clamp along the wire will of course vary the amount of resistance in circuit.

The arrangement of the resistance-wire and its supports is a particularly desirable one, for it permits the adjusting of the wire after it has been mounted in place, and where the turns of wire of which the resistance is composed are close together this is an important feature.

In order to prevent carelessness on the part of the trimmer, the globe B is carried by a holder B′, which is secured to the lower ends of rods $B^2$, and the rods in turn are locked in their raised position by the pivoted bail $B^3$. The bail is controlled from the outside of the casing by the thumb-nut $B^4$. This necessitates the use of both hands when the globe is lowered, for the globe has to be raised slightly before the hook-shaped end of the latch $B^3$ can be withdrawn from the openings $B^5$ in the side rods.

To prevent the entrance of water into the outer globe B, a cylindrical flange $A^5$ is mounted on the lower end of the casing A, which flares outward over the opening in the globe. In order to make a tight joint between the fiange and the globe and also to compensate for different-sized globes, the globe is supported by an adjustable holder O, which in the present instance comprises a cast-metal holder O′, having a loosely-fitting cup-shaped ring $O^5$ at its upper end for receiving the globe. By making the ring $O^5$ a loose fit

the holder O may be rotated without turning the globe. The holder is supported from cross-piece B′ by a screw-threaded stud $O^2$, having a cut-away portion $O^3$, and extending across this cut-away portion is a pin $O^4$, which prevents the removal of the support, but permits it to be freely adjusted in a vertical direction.

In retrimming the lamp the holder O is first turned in a direction to lower the globe. The globe and holder are then moved bodily upward, which permits the withdrawal of the hooked latch $B^3$, and after this has been done the globe may be lowered in the usual way. To return the parts of the lamp to their normal position after retrimming, the reverse of the operation is performed.

In retrimming lamps it frequently happens that the trimmer will drop the cap for the inner cylinder, and thus break the outer globe. When the cap is cold, this is not so liable to happen; but when the cap is too hot to be taken in the hand and it is necessary to use pliers or some similar device there is great liability of accident. To guard against this, the cap is permanently secured to the lamp, but is so arranged that it may be removed from its normal position when it is desired to insert a new carbon in the upper holder. Since it is desirable to have the floor of the clutch which controls the feed of the upper carbon located at a fixed point with respect to the working parts of the lamp, I provide a fixed support which constitutes a floor for the clutch and at the same time serves to prevent the cylinder-cap from dropping.

Referring more particularly to Figs. 2, 3, and 4, the support consists of a flat metal plate P, having two upwardly-extending lugs P′ and two downwardly-extending lugs $P^2$ and $P^3$, lug $P^2$ being arranged to support the free end of the cylinder-cap Q after the cylinder Q′ has been removed and lug $P^3$ to form a hinge-support for one side of the cap. The support P is retained in place by two vertically-extending rods $P^4$, which are screw-threaded to the under side of the frame J′. The holes in the outer ends of the lugs P′ are large enough to make an easy fit, so as to permit the support to adjust itself, and by taking out the pins $P^5$ the support may be removed from the lamp. The arrangement of the support P and the rods $P^4$ is such that the support is practically capable of universal motion—that is to say, there is enough play between the parts so that the support can tilt both on a horizontal and a vertical axis.

The clutch is secured to the lower end of the tube I and consists of a pair of collars S and S′, which are connected by side bars $S^2$. Pivotally secured to the lower collar S′ is a pair of clutch members $S^3$, arranged to grip the upper carbon and feed it downward as the carbons are consumed. The clutch members are provided with extensions $S^5$, arranged in such manner that they will, when the tube I is lowered a certain amount, strike the top of the support P and trip the clutch. By referring to Fig. 4 it will be seen that the support P is provided with a rectangular central opening $Q^5$. This opening is arranged to receive the downwardly-extending lugs $S^4$ of the clutch members, thereby shortening the space required by the clutch. The opening between the collars S and S′ of the clutch is so arranged that the carbon can be held by the fingers or pliers, or the contact device secured to the end of the carbon can be held while the carbon is inserted in place.

The cylinder-cap Q is substantially circular in outline and is provided with a U-shaped lug $Q^2$ on one side, which extends around the lug $P^3$ on the support, and the ends of the lug are connected by a pin $Q^3$. The cap is provided with two circular flanges, the upper one being arranged to rest on the top of the cylinder Q′, while the lower one is somewhat smaller than the cylinder and forms, together with the cylinder, a gas-chamber for preventing the free entrance of air at this point. The cap is normally supported by the cylinder Q′, as shown by the full-line position; but when it is desired to retrim the lamp the cylinder-holding device $Q^6$ is released and the cylinder lowered until the cap rests on the lugs $P^2$ and $P^3$ in the manner shown in the broken and dotted lines, Fig. 3. The upper carbon is then raised, either by hand or with a pair of pliers, which permits the cap to be moved slightly to the right, and the flattened edge of the cap $Q^4$ will slip past the end of the lug $P^2$ and permit the cap to drop to the position shown in dotted lines, Fig. 3, the pin $Q^3$ preventing it from dropping. With this arrangement the cap is out of the way and does not interfere with the retrimming of the lamp and at the same time is prevented from dropping and breaking the globe. After the new carbons have been placed in the lamp the cap is placed in the broken and dotted line position and the cylinder mounted in place, which moves the cap upward to the full-line position.

It is necessary in certain types of lamps to insulate the lower-carbon holder from the side frames, and it has been a matter of considerable difficulty to provide a satisfactory construction. In Fig. 9 the construction is shown in detail, in which T represents the frame connecting the side tubes T′, (the latter are shown in Fig. 5,) and it is provided with a hole or opening at its outer end for the reception of the tube. Mounted within the hole is a metal bushing comprising a main body $T^2$ and a washer $T^3$. Between the metal bushing and the frame is an insulating-bushing $T^4$, preferably composed of mica, but other forms of insulating material may be used, if desired. The metal and insulating bushings are secured in place by riveting the main body $T^2$ of the metal bushing over the washer $T^3$. The frame T is secured to the side tubes by means of the hollow screws $T^5$. The arrangement above described is particularly useful where

it is desired to remove the frame T, for the insulation is so arranged that it is not disturbed and the metal bushing makes a good working fit with the tube. With other constructions previously employed it was necessary to use a new insulating-bushing each time the lamp was taken down, whereas with the present construction a single bushing lasts as long as 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 an actuating-magnet, a device for steadying the action of the lamp, a frame for carrying the device which is located above the magnet, a circular casing for the magnet which is provided with ventilating-openings admitting air to that portion of the casing surrounding the magnet, an annular cornice secured to the upper end of the case and surrounding the steadying device, the said cornice being open at its upper end; a second annular cornice like the first, but reversed with respect thereto, the said cornice being secured to the casing at its upper end, but standing away from it at its lower end to permit air to freely enter the ventilating-openings, at the same time preventing dirt from passing into the openings.

2. The combination of an electric-arc lamp, a fixed support, means extending between the support and the lamp for sustaining the latter, a split canopy which surrounds the support and said means and is provided with a restricted neck and two enlarged or flaring ends, and an internal flange or collar secured to the canopy which closely surrounds the lamp-sustaining means.

3. The combination of a hanger-board, an arc-lamp, means for supporting the lamp from the board, a canopy which consists of a split cylindrical body having a restricted neck and two outwardly-flaring end portions, one of which surrounds the hanger-board, the other the lamp, the latter end being provided with ventilating-holes and a collar or flange secured to the inside of the canopy for directing the hot air from the lamp out through the ventilating-openings and preventing it from passing up to the hanger-board.

4. In an electric-arc lamp, the combination of a ceiling-board, means for supporting the lamp, a split canopy surrounding the support and comprising a metal cylinder having a contracted neck and outwardly-flaring ends, and a split internal collar or flange which prevents the heat from passing upward from the lamp to the ceiling-board.

5. In an electric-arc lamp, the combination of a ceiling-board, means for supporting the lamp, a split canopy surrounding the support and comprising a metal cylinder having a contracted neck and outwardly-flaring ends, a split internal collar or flange which is secured to the neck and prevents the heat from passing upward from the lamp, the split in the canopy and in the collar coinciding, and ventilating-openings permitting the free egress of heated air from the lamp.

6. In an electric-arc lamp, the combination of a supporting resistance-dome, a frame to which the dome is secured, a coiled resistance-wire one portion of which is wound in a clockwise direction, and a second portion wound in an anticlockwise direction around the dome, insulating-blocks mounted on the dome which serve to separate the resistance from the dome and at the same time hold the turns of the resistance-coil in fixed relation to each other, and a contact device for establishing electrical connection with the resistance.

7. In an arc-lamp, the combination of a cast-metal resistance-dome, notched radial blocks mounted thereon, a coiled resistance-wire mounted on the blocks, the arrangement of the coils being such that one part of the wire is wound in a clockwise direction and the balance in an anticlockwise direction, and an adjustable slider mounted on the resistance-wire for varying its active length.

8. In an electric-arc lamp, the combination of a metal resistance-dome having beveled lugs formed at the base, a detachable support at the top of the dome having downwardly-extending feet, notched insulating-blocks mounted in the dome and secured in place by the feet and beveled lugs, and a resistance-wire coiled in the notches in said blocks.

9. In an electric-arc lamp, the combination of a metal resistance-dome having a flange at its lower end formed integral therewith, beveled lugs on the flange, a sheet-metal support located at the top of the dome and having downwardly-extending feet, insulating-blocks mounted on the dome between the feet and the beveled lugs, and a layer of non-combustible material between the blocks and the dome, which serves to compensate for slight irregularities.

10. In an arc-lamp, the combination of a resistance-dome, insulating-blocks mounted thereon, coiled resistance-wire wound thereon in spirals, the arrangement being such that one part of the wire is wound anticlockwise and the balance clockwise, means for holding the resistance at the point of turning, means for securing the outer ends of the wire, and a sliding contact arranged to bridge more or less of two turns of the coil.

11. In an electric-arc lamp, the combination of a globe-holder, a locking device therefor, means for limiting the upward movement of the globe, and means for adjusting the globe so arranged that it is necessary to lower the globe slightly before the lock can be released.

12. In an electric-arc lamp, the combination of a globe-holder, a locking device therefor, and means so arranged that it is necessary to lower the globe slightly before the lock can be released.

13. In an electric-arc lamp, the combination of a globe, a vertically-adjustable support for the globe, a lock for securing the globe in po-

sition, and means for raising the globe slightly against a stationary part of the lamp so as to prevent the entrance of water and dirt into the globe, the relation of the globe-holder and the lock being such that it is necessary to lower the globe-holder slightly before the lock can be released.

14. In an electric-arc lamp, the combination of a globe, a globe-holder mounted on a screw-threaded stud carried by a suitable frame, an outwardly-flaring flange against which the globe is normally pressed, and a lock for the holder, comprising a moving bail having hooked ends and a pair of vertically-movable side rods; the relation between the lock and the holder being such that it is necessary to slightly lower the globe before the lock can be released.

15. In a globe-holder for an arc-lamp, the combination of a screw-threaded stud, a holder mounted thereon and arranged to be vertically adjustable, means for preventing the holder from being removed from the stud during the normal act of recarboning the lamp, and a loosely-mounted cup-shaped ring for supporting the outer globe, which is so arranged that the holder may be rotated without moving the globe.

16. In an electric-arc lamp, the combination of a cylinder surrounding the carbons, a cap for restricting the passage of air into the cylinder, a frame located above the cap and arranged to hold the cap in substantially its normal position when the globe is removed, and means thereon for holding the cap at one side of its normal position while the lamp is being trimmed.

17. In an electric-arc lamp, the combination of a cylinder surrounding the carbons, a cap which normally rests on the top of the cylinder for restricting the passage of air into the cylinder, a frame for holding the cap after the cylinder has been removed in substantially its normal operating position, and a hook on the frame for sustaining the cap in a downward position and at one side of the carbons while the lamp is being retrimmed.

18. As an article of manufacture, a combined support for a cylinder-cap and the floor of a clutch, comprising a substantially circular plate having an enlarged central opening to receive parts of the clutch, with a pair of upwardly-extending supporting-lugs, and a pair of downwardly-extending cap-retaining lugs.

19. In a carbon-feed electric-arc lamp, the combination of a tube surrounding the carbon, a clutch mounted on the tube, the said clutch comprising two collars in fixed relation to each other having a space between them, and so arranged that the upper carbon can be gripped by hand between them, and clutch members for gripping the carbon which are pivotally secured to one of the collars.

20. In an electric-arc lamp, the combination of a side rod, a yoke having a hole therein through which the rod passes, an insulating-bushing located in the hole between the rod and the yoke, the said bushing comprising a body of insulating material which covers the walls of the hole at all points, and a tubular metal sleeve which extends through the hole and is flanged at its ends to hold the insulation in place, the said sleeve being in direct connection with the side rod.

21. In an electric-arc lamp, the combination of a pair of side rods, a yoke connecting the rods and having holes therein through which the rods pass, an insulating-bushing comprising a body of mica which covers the wall of the hole and also the top and bottom surfaces near the hole, washers which are located above and below the insulation, and a metal sleeve which is riveted over the washers to hold them in place, the said sleeve being in direct contact with a side rod.

22. In an electric-arc lamp, a screw-threaded projection secured to and depending from the lower end of a frame, a holder for supporting the globe from its lower end, which is vertically movable on said projection, and a nut serving to raise and hold the globe and its holder in position.

23. In an electric-arc lamp, the combination of a pair of vertical side tubes forming a support for the lower-carbon holder, rods mounted for vertical movement within the side tubes and arranged to raise and lower the globe, a screw-threaded extension on the piece connecting the rods, a vertically-adjustable globe-supporting device mounted on the extension, means for securing the globe in its raised position, and a lock for said means.

In witness whereof I have hereunto set my hand this 18th day of July, 1898.

CHARLES E. HARTHAN.

Witnesses:
DUGALD MCKILLOP,
HENRY O. WESTENDARP.