No. 659,658. Patented Oct. 16, 1900.

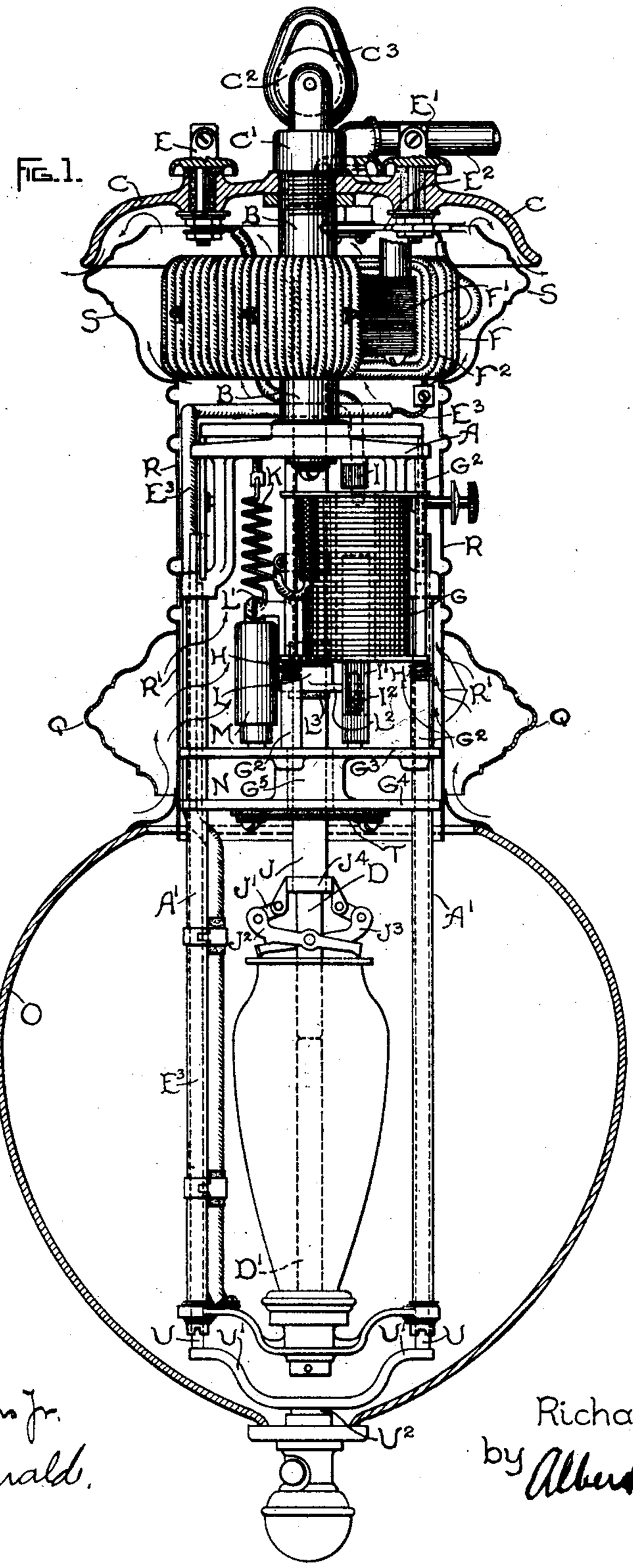
R. FLEMING.

ELECTRIC ARC LAMP.

(Application filed Apr. 4, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.



WITNESSES.
Edw. Williams Jr.
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INVENTOR.
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by Albert G. Davis
Atty.

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FIG. 2.

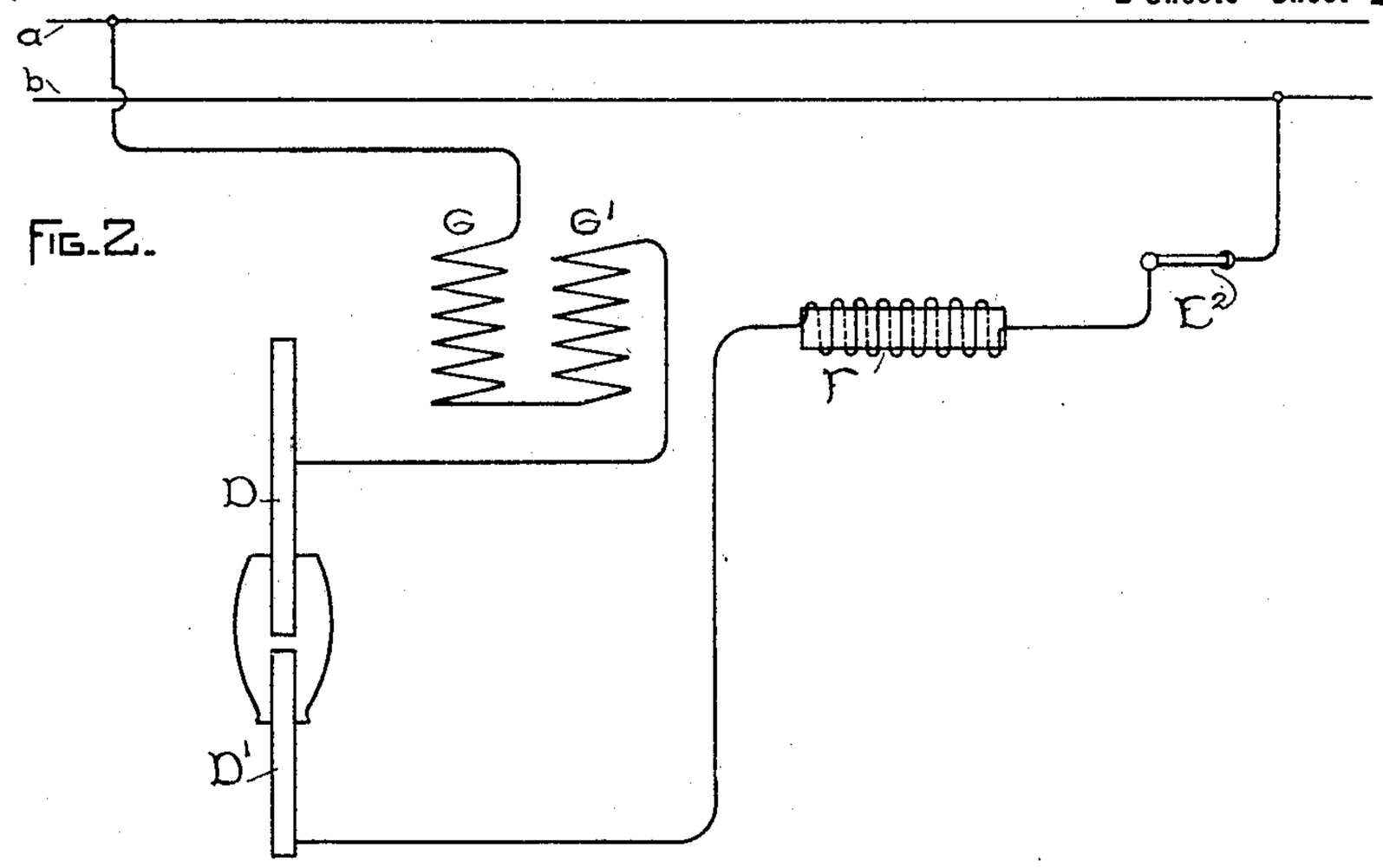


FIG. 3.

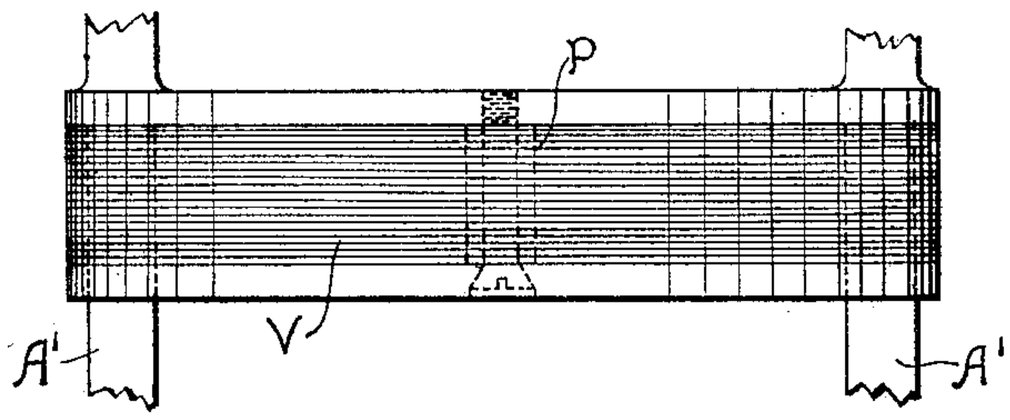


FIG 4

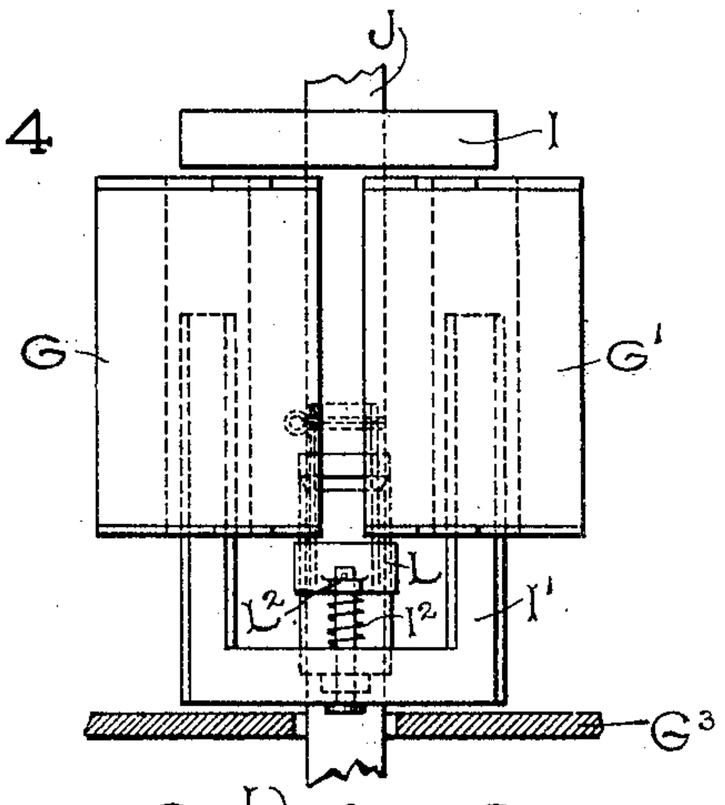
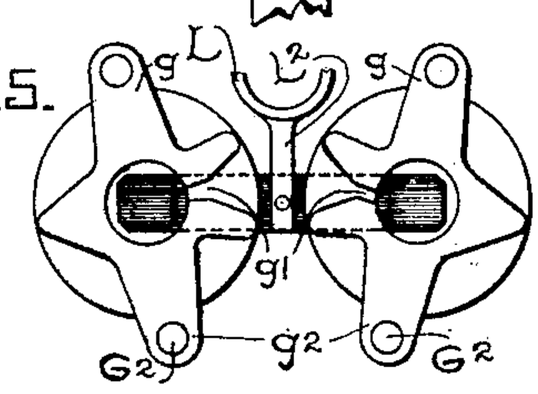


FIG. 5.



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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. 659,658, dated October 16, 1900.

Application filed April 4, 1898. Serial No. 676,332. (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, State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps, (Case No. 791,) of which the following is a specification.

The present invention relates to arc-lamps, and particularly those designed for use on alternating-current circuits, wherein the arc is confined in a small chamber, and has for its object to improve the construction and arrangement of the lamp mechanism.

In the accompanying drawings, Figure 1 is a side elevation of my improved lamp with certain portions indicated in section. Fig. 2 is a diagram of the circuit connections. Fig. 3 is a modification of the means employed for ventilating, and Figs. 4 and 5 are details of the actuating-magnets.

The main body of the lamp comprises a rectangular cast-metal frame A, to which is screw-threaded at its upper end a tube B. This tube furnishes a support for the metal top C and at the same time surrounds and protects the upper-carbon pencil D. On the upper end of the tube is mounted a cap C′, which is provided with an insulating-spool C^2 for insulating the suspension-ring C^3 from the body of the lamp. Mounted in the metal top are binding-posts E and E′. These posts are insulated from each other and the top by insulating bushing and collars in the ordinary manner. The circuit through the lamp is controlled by means of switch E^2, which is mounted on the top of the lamp and is insulated therefrom.

Situated directly under the cover and secured thereto by screws is a reactance-coil F, comprising a circular laminated core F′, that is surrounded by a number of turns of insulated wire F^2. One end of the reactance-coil is connected to switch E^2, and the other end is connected by the insulated wire E^3, which extends down the side rod of the lamp, with the lower-carbon holder and carbon.

The action of the lamp is controlled by a pair of series-wound magnets G and G′. These magnets are mounted on four vertically-extending guide-rods G^2, which are secured to the frame-casting at their upper ends and to head G^3 at their lower ends. To reduce the vibration and humming due to the alternations of the current, each coil rests on a pair of coiled springs H, which surround the guide-rods G^2. These springs are slightly compressed as the coils are energized and the carbons separated.

Extending across the top of the coils and secured to the upper part of the frame is a stationary laminated core I, as shown in Figs. 1 and 4. Mounted for movement within the coils G and G′ is a U-shaped laminated magnet I′, so arranged that when no current is flowing in the coils it rests on the head G^3; but as the coils become energized it moves upward toward the stationary core I. As the pull on core I becomes greater as the moving and stationary parts of the core approach each other, a compensating support is provided for the moving core, which is so arranged that as the pull of the magnets increases its supporting effect decreases. By this arrangement the magnets are made to exert a practically-uniform pull throughout the range of movement. To accomplish this, a tension-spring K is provided, which is attached at its upper end to the frame of the lamp and at its lower end to a support L, which is secured to the tube J, suitable means being provided for adjusting the tension of the spring.

In electromagnets designed for alternating-current work I have found that if a piece of metal forming a closed circuit is placed within the field induced by the coils eddy-currents more or less great will be induced in the metal. This gives rise to undue heating, and to prevent this the portions of the metal support which are located in the magnetic field are slotted, as shown in Fig. 5. The wire forming the coils is wound on spools in the ordinary manner, and the heads g of the spools are split at g'. In order to properly support the wire on the spools, the heads are provided with projections g^2, which extend to the outer edges of the coil. Each coil is provided with top and bottom slotted heads, and extending through these heads are the guide-rods G^2, which permit the coils to move slightly in a vertical direction on

their spring-supports, but prevent them from twisting out of parallelism.

The support L for moving the upper carbon comprises a split metal ring which surrounds the tube J and is insulated therefrom by an insulating-bushing L^3 and is provided with an upwardly-extending hooked arm L′ and a projection L^2, which supports the core. To damp the action of the support, a dash-pot M is provided, the cylinder being carried by the moving support L and the piston by the head G^3. Between the projection L^2 of the support and the core I is a compression-spring I^2 to soften the action of the magnet on the carbon D. The tube J surrounds the upper-carbon pencil D, and supported by the tube is a clutch J′, which works directly on the carbon pencil. The clutch may be of any desired construction, the one shown being made of two jaws J^2 and J^3, which are pivotally secured together and suspended by links from the collar J^4. Situated underneath the head G^4 and insulated therefrom is a metal plate T, which centers the tube J. This plate may readily be removed when worn and a new one substituted. In addition to centering the tube the plate and insulation act as a check to prevent the passage of gas and hot air up through the lamp mechanism.

The action of the lamp is as follows: When the current enters, it energizes the coils G and G′. This causes them to attract their core I, and as the power of the magnets increases the power of the spring K decreases, so that a uniform pull is maintained on the tube J. As soon as the tube has moved a certain distance the clutch will grip and raise the carbon and draw the arc. So long as the proper circuit relations exist the carbon will continue to burn in its normal manner; but as soon as the arc gets abnormally long the magnets will become weaker and the core will be lowered, so that the arms of the clutch will strike the cap of the inclosing globe and permit the carbon pencil D to feed by gravity. As the core I is lowered the tension on the spring K becomes greater, and it assists the magnets to a greater degree, the dash-pot M preventing the too-rapid movement of the parts.

In certain types of lamps, particularly those in which the inclosing casing rests directly on the globe, the heat and gas produced by the arc will, if unrestrained, pass upward through the lamp mechanism, change or destroy the adjustment, and corrode the parts. To prevent this, heads G^3 and G^4 are provided, situated between the lamp parts and the globe O, so placed as to afford a dead-air space or chamber N. Instead of leaving the chamber empty it may be filled with asbestos or other similar material, as shown in Fig. 3. In this figure the construction of the heads is slightly modified, and instead of being formed integrally with a hub between them, as in Fig. 1, they are made separately and held together by screws, suitable space-blocks P being provided between them. With this construction one of the heads G^3 G^4 is secured to the side rods to hold the whole in place. The asbestos or other resisting material V may be made in layers, as shown, or it may be molded into a solid mass. This arrangement presents certain advantages over the one shown in Fig. 1, for the central hub G^5, which is a good conductor of heat, is dispensed with and small space-blocks substituted, which are located at some distance from the carbon pencil and have a small heat-carrying capacity.

Surrounding the lamp mechanism is a straight-sided cylindrical casing R. (Shown in section in Fig. 1.) This casing fits very closely around the heads G^3 and G^4, so that the gas and heat have no direct passage through the lamp.

Surrounding the lower part of the casing is a cornice Q, which is rigidly attached to the casing at its upper end, but at the lower end is open to permit the passage of air through the lamp mechanism. At a point above the dead-air space the casing is provided with a series of holes R′, communicating with the chamber formed by the cornice, and air entering this chamber will pass upward through the lamp, as indicated by the arrows, and out at the space between the upper cornice S and the top C, thus tending to cool the lamp.

The sides of the frame A are made of tubes A′, and within these tubes are rods U, which form a support for the lower globe-holder. Secured to the under side of the cross-piece U′, which connects the rods U, is a stud U^2, to which the globe-holder is secured.

In Fig. 2 are indicated the circuit connections. *a b* represent the mains of an alternating-current system; G G′, the coils of the lamp; D D′, the upper and lower carbons; F, the reactance, and E^2 the switch for opening and closing the circuit of 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 with parallel supporting-rods, upon which the magnet is free to move in a vertical direction.

2. In an electric-arc lamp, the combination of the actuating-magnets, parallel supporting-rods, upon which the magnet is free to move in a vertical direction, and a spring for cushioning the movement of the magnet.

3. In an electric-arc lamp, the combination of a pair of actuating-magnets capable of vertical movement, parallel rods for supporting and maintaining the magnets in proper relation, and coiled springs surrounding the rods for cushioning the movement of the magnets.

4. In an electric-arc lamp, the combination of a pair of actuating-magnets, capable of a limited amount of vertical movement jointly or separately, vertically-extending rods for

supporting the magnets, and maintaining them in parallel relation, and springs surrounding the rods, and set under the magnets, so that they are compressed when the magnets are energized.

5. In an alternating-current arc-lamp, the combination of a pair of actuating solenoid-magnets, spring-supports for the magnets, a U-shaped core movable within the magnets, a clutch mechanism, a spring connection between the core and the clutch, and a core which is supported by the lamp-frame for completing the magnetic circuit of the movable core.

6. In an electric-arc lamp, the combination of an actuating-magnet, a two-part core, the parts of which are movable with respect to each other, a clutch mechanism, a connection between one of the parts of the core and the clutch, and a compensating support for the said core and clutch, which is so arranged that as the power of the magnet increases its supporting effect on the core and clutch decreases.

7. In an electric-arc lamp, the combination of an actuating-magnet, a two-part core, the parts of which are movable with respect to each other, and a compensating support for one portion of the core, comprising an extension-spring which is supported by a fixed part of the lamp whereby the supporting effect of the spring decreases as the parts of the core approach.

8. In an electric-arc lamp, the combination of an arc-regulating magnet, an armature, and a compensating device by which the armature is suspended, the compensating device and armature being so arranged that as the pull on the armature increases, due to the decrease in the air-gap, the effect of the compensating device is decreased.

9. The combination of a pair of actuating solenoid-magnets, a core comprising a stationary and movable part, the moving part being arranged to work within the magnets, a compensating spring-support for the moving part of the core, so arranged that as the power of the magnets increases its supporting effect decreases, and a dash-pot for checking the too-rapid movement of the core.

10. In an electric-arc lamp, the combination of a tube surrounding the carbon pencil, an actuating-magnet and core therefor, a support secured to the tube, a projection on the support to which the magnet-core is secured, a second projection or extension of the support, and a compensating spring which is secured to the second projection.

11. In an electric-arc lamp, the combination of an actuating-magnet, a spring-support therefor, a core for the magnet, a clutch mechanism, a spring connection between the clutch and the core, and a compensating spring-support connected to the core and stationary part of the lamp.

12. In an electric-arc lamp, the combination of a pair of metal pieces which are separated to form a dead-air space, a tubular casing which surrounds the pieces and practically prevents the air in the space from changing, and also forms the mechanism-chamber, the said casing being provided with ventilating-openings located above said pieces, and a cornice or ring which surrounds the casing and covers the ventilating-openings in that part of the casing which incloses the mechanism.

13. In an electric-arc lamp, the combination of two metal pieces which are separated to form an air-space, a casing which closely surrounds the pieces to prevent free changing of air in the space, and also incloses the lamp mechanism, the said casing being provided with ventilating-openings located above the metal pieces, a globe, a flange secured to the casing which rests upon the globe and prevents the free entrance and exit of air to the globe, and a cornice which is secured to the casing at its upper end and surrounds the ventilating-openings in said casing and has free communication with the external air at its lower end.

14. In an electric-arc lamp, the combination with the actuating-magnet and the armature thereof of a gravity-feeding carbon, a yoke or support, a clutch mechanism mechanically connected to the yoke or support, a device for retarding the upward movement of the clutch mechanism which is also connected to the yoke, and a resilient device interposed between the yoke or support and the armature of the magnet.

In witness whereof I have hereunto set my hand this 31st day of March, 1898.

RICHARD FLEMING.

Witnesses:
JOHN MCMANUS,
DUGALD MCKILLOP.