No. 661,125. Patented Nov. 6, 1900.

J. A. HEANY.

ELECTRIC ARC LAMP.

(Application filed Feb. 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

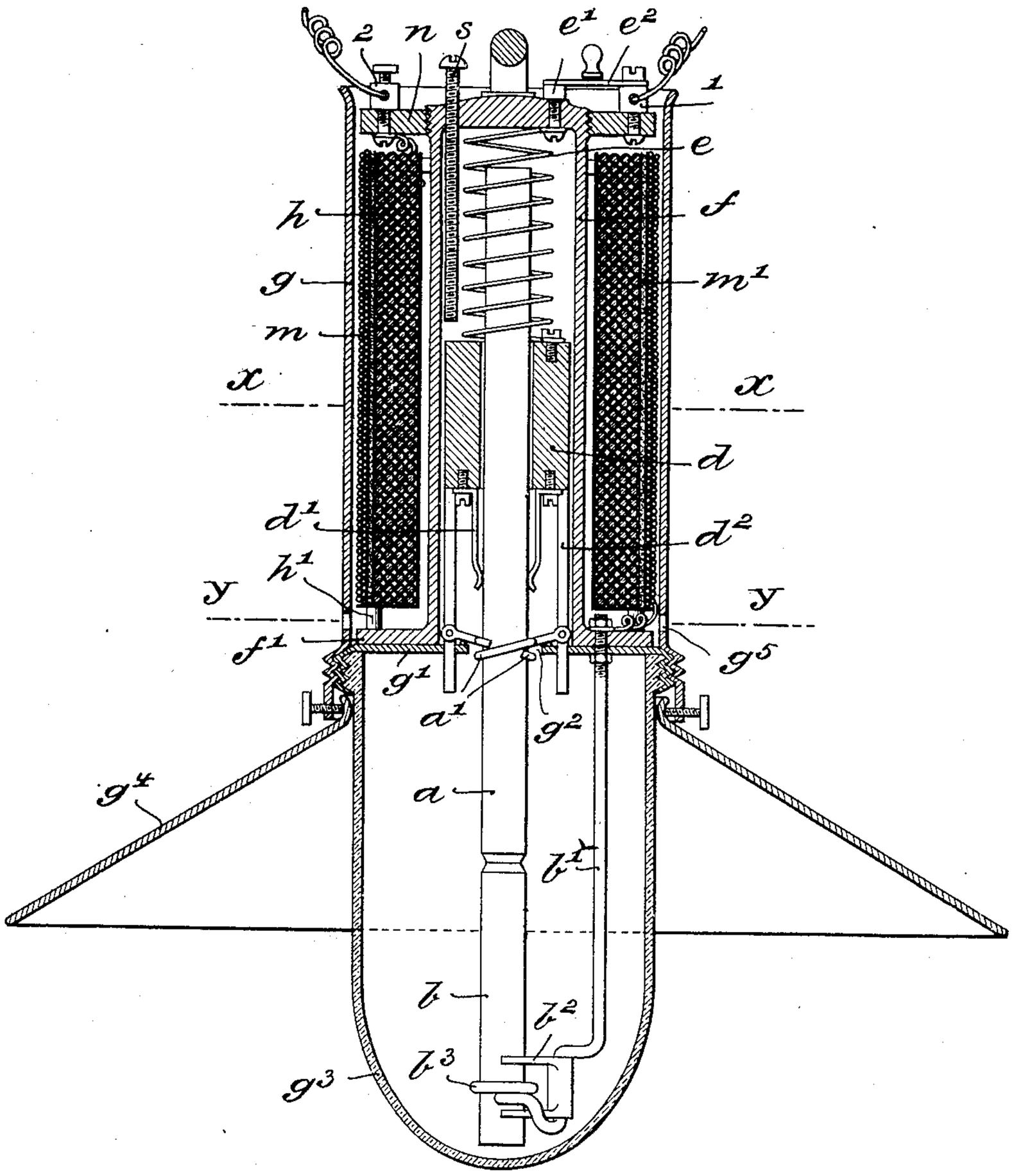

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Fig. 2.

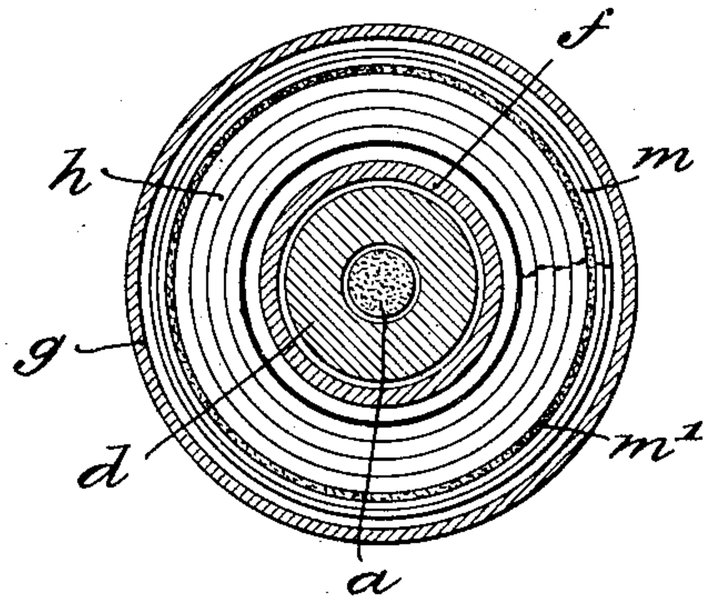


Fig. 3.

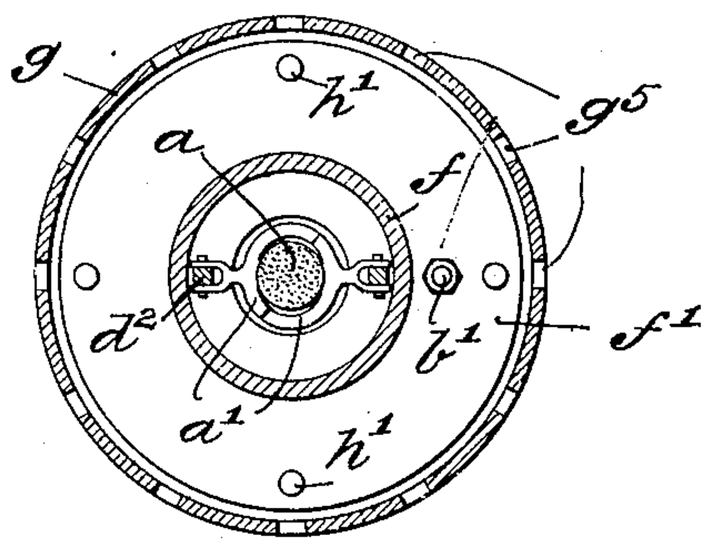


Fig. 4.

Fig. 5.

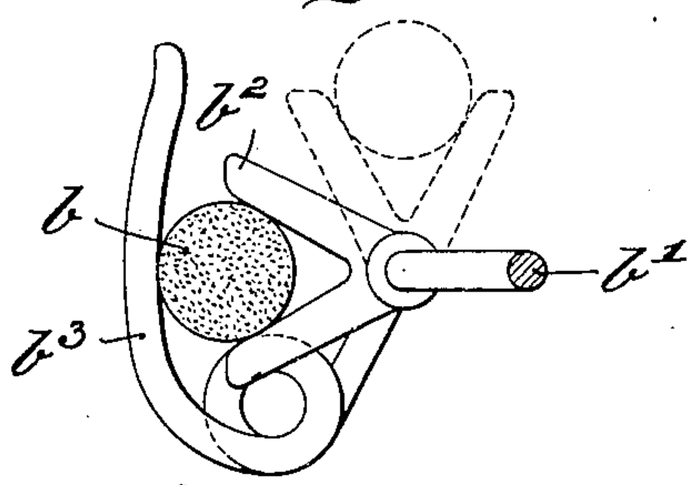
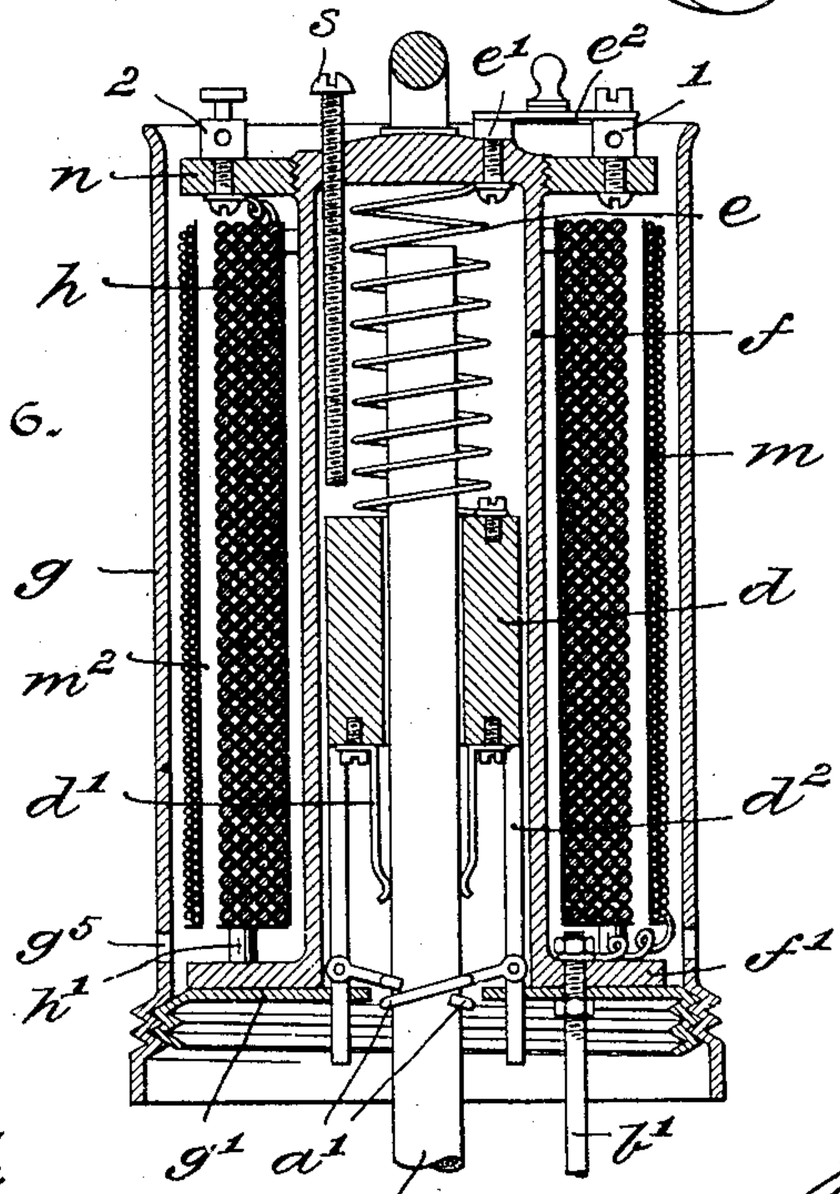


Fig. 6.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 661,125, dated November 6, 1900.

Application filed February 27, 1900. Serial No. 6,658. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. HEANY, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention has relation to an electric-arc lamp, and in such connection it relates to the construction and arrangement of such an arc-lamp.

The principal objects of my invention are, first, to provide an electric-arc lamp in which the carbons and the auxiliary working parts are all inclosed in an air-tight receptacle or compartment, whereby the life of the carbons is prolonged and the pressure of gases arising during the consumption of the carbons is evenly distributed upon all the working parts; second, to provide an electric-arc lamp in which a resistance-coil is wrapped around the solenoid-coil, to thereby utilize the magnetic lines of force generated by said resistance to assist the solenoid-coil in the attraction of its core; third, to provide an arc-lamp in which the solenoid-core is arranged around and on the upper carbon and is inclosed in an air-tight receptacle, the walls of which are formed of a heat-insulating material, the solenoid-coil of said core being arranged around the outside of said receptacle, and thereby separated from its core by the insulating material; fourth, in providing in an arc-lamp an inner air-tight receptacle wherein the carbons and working parts of the lamp are sealed, and an outer shell or casing having air-inlets at its lower and upper ends, said outer casing inclosing the solenoid, and, fifth, to provide in an arc-lamp carbon-holders of improved construction.

My invention, stated in general terms, consists of an electric-arc lamp constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical central sectional view of an electric-arc lamp embodying main features of my invention. Fig. 2 is a cross-sectional view on the line $x\,x$ of Fig. 1. Fig. 3 is a cross-sectional view on the line $y\,y$ of Fig. 1. Fig. 4 is a top or plan view, enlarged, of one of the feeding-clutches for the upper carbon. Fig. 5 is a top or plan view, enlarged, of the lower-carbon support or holder; and Fig. 6 is a vertical central sectional view of the upper part of a lamp embodying my invention in modified form.

Referring to the drawings, a represents the upper, and b the lower, carbon of the lamp. Around the upper carbon a is located an iron solenoid-core d, from the base of which project the spring-contact fingers d', which serve also as supports for the carbon a. Also projecting from the base of core d are the rods d^2, carrying the clutch or feeding mechanism for the upper carbon a. The upper end of carbon a projects beyond the core d, and around this portion of the carbon a is wound or coiled a wire e, one end of which is secured to the core d and the other end to a binding-screw e'. This wire e forms a means of connection between the core d and one pole of the source of electric energy, and by forming it into a coil it serves also as a spring or balance for the core d and carbon a. Surrounding the wire e, core d, its accessories, and the carbon a is a box or receptacle f, having a flaring or flanged base f' and formed of a heat-insulating material. Surrounding this box f is a casing g, the lower end of which is screw-threaded to receive a screw-threaded cap g', which fits with an air-tight joint against the base f' of the receptacle f and has a central opening g^2, through which the upper carbon a is permitted to move. Into the interior of cap g' is adapted to be screwed a globe g^3 to form, in conjunction with the receptacle f and cap g', an air-tight compartment inclosing both carbons and their auxiliary working parts. Around the upper end of globe g^3 may, if desired, be suspended a shade g^4.

Within the space between the outer walls of the receptacle f and the inner walls of casing g is placed the solenoid-coil h, adapted to

actuate the core d, although separated therefrom both by an air-space and the wall of the receptacle f, which wall is of heat-insulating material. The solenoid-coil h is supported a slight distance above the flange f' of the receptacle f by resting upon the projections of pins h', formed on said base, and it is likewise supported some distance from the walls of said receptacle by resting upon radially-disposed pins h^2, formed on the outer periphery of the receptacle f. Around the solenoid-coil h is wrapped or coiled the resistance m, which, as shown in Fig. 1, is separated from the solenoid-coil h by a layer of asbestos m' or, as shown in Fig. 6, by an air-space m^2.

Upon the closed upper end of the receptacle f is screwed or otherwise detachably secured a ring n of non-conducting material, and to this ring n are secured the binding-posts 1 and 2 of the lamp. The binding-post 1 is adapted to be brought into electrical connection with the binding-screw e' of wire e by means of a switch e^2 or equivalent device, and the binding-post 2 is connected directly with the solenoid-coil h, as shown in Figs 1 and 6.

The lower carbon b is supported in position by means of a holder or support of improved construction, arranged as follows: Depending from the cap g' and flange f' is a rod b', which traverses the interior of the globe g^3. On the lower end of this rod is pivotally secured a V-shaped or forked arm b^2. In the fork b^2 the carbon b is adapted to be placed. To secure the carbon b in said forked arm, the rod b' is formed at the lower end into a spring retaining-arm b^3.

The operation of the holder will be readily understood upon referring to Fig. 5, and is as follows: The forked arm b^2 is first turned on the rod b to a position indicated in dotted lines. The carbon d is then inserted and both carbon and forked arm are turned until the carbon rests between the retaining-arm b^3 and the fork b^2, as indicated in full lines. If the carbon is to be raised or lowered in the arm b^2, the spring-arm is slightly withdrawn to relieve the clamping action of its spring and the carbon manipulated to attain the required position, when the spring-arm is released and securely clamps the carbon to the forked arm b^2. The rod b' forms a means of electric connection between the carbon b and the resistance m of the solenoid-coil h.

The clutch or feeding mechanism for the upper carbon a is preferably constructed and arranged as follows: To each of the depending rods d^2 is pivotally screwed a substantially semicircular ring-shaped arm a', each of which when in an inclined position, as illustrated in Figs. 1 and 6, is adapted to partly surround and to loosely fit around the carbon a. In such position the carbon a may slide through the arms a'; but when the rods d^2 are raised and the ring-arms a' elevated to substantially horizontal position both arms a' will bite into the carbon a and securely hold the same. The outer casing g has at its base a series of perforations or openings g^5 and is open at its top to thereby permit of a free circulation of air through the space occupied by solenoid-coil h and its resistance-coil m. The extent of movement in one direction of the core d is regulated by an adjusting-screw s, passing through the top or roof of the receptacle f.

The operation of the lamp is as follows: The current from one pole of the source enters the binding-post 1, and when the switch e^2 is closed passes to the binding-screw e', wire e, solenoid-core d, and to the upper carbon a. When the two carbons are in contact, the current will then pass into the carbon b, thence by the rod b' to the resistance-coil m, and will actuate the solenoid-coil h. The magnetic influence thus set up in the coil h will serve to raise the core d, thus causing the carbons a and b to separate sufficiently to cause an arc to be formed between their contiguous ends. So long as this arc is of sufficient length to form a resistance, in addition to the resistance m, of not too great intensity to break the current through the solenoid-coil h the core d will be maintained in its elevated position by the solenoid-coil. When, however, the current is broken by either the arc becoming too great between the carbons or the strength of the current increasing sufficiently in the solenoid-coil to still further elevate the core d and carbon a, the passage of the current through the solenoid-coil h is cut off and the magnetic influence ceases. The core d now drops and feeds the carbon a downward in its holder a' sufficiently to establish the arc.

It will be understood that the two carbons a and b always burn in a hermetically-sealed compartment, and hence the gases of combustion cannot escape upward or downward, but remain in the compartment. All the working parts are therefore under the pressure of the gases exerted equally in all directions. The interior of the air-tight compartment becomes rapidly heated, and this assists or increases the luminosity of the arc. No cold air or fresh oxygen can enter the compartment, and hence the life of the carbon, as well as the intensity of the incandescence, is increased. The solenoid-coil and its resistance m are arranged concentrically, and hence the lamp is more compact. The solenoid-coil and its resistance are both separated from the hot compartment in which the carbons burn by a wall of insulating material, and hence the insulation of the coil is not impaired by the heat of the lamp. Again, the solenoid-coil is insulated from its resistance by a heat-non-conducting medium, and hence the heat which may arise in the resistance will not be communicated to the solenoid. By arranging both solenoid-coil and resistance in a chamber formed by the outer casing and the inner receptacle and providing means for permitting

air to freely circulate in said chamber the solenoid-coil and its resistance are always cooled by the atmospheric air.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-arc lamp, an air-tight receptacle having walls of insulating material, a solenoid-core inclosed in said receptacle, means for connecting said core directly with the source of electric energy, an upper carbon inclosed in said receptacle and surrounded by said core and in electrical contact therewith, means carried by said core for feeding said carbon, and a solenoid-coil located outside the walls of the receptacle and adapted to magnetically actuate the core during the feeding of said carbon, substantially as and for the purposes described.

2. In an electric-arc lamp, an air-tight receptacle having walls of insulating material, an upper carbon adapted to move in said receptacle, a solenoid-core surrounding and serving to guide said carbon, means carried by said core adapted to feed the carbon and to supply current directly from the core to said carbon, said core and means inclosed in said receptacle, and a solenoid-coil located outside the walls of said receptacle and adapted to actuate the core therein, substantially as and for the purposes described.

3. In an electric-arc lamp, a carbon-holder comprising a rod, a spring clamping-arm formed at its lower end, and a forked arm pivotally secured to said rod and adapted in conjunction with the clamping-arm to hold the carbon, substantially as and for the purposes described.

4. In an electric-arc lamp, an upper carbon and a solenoid-core surrounding said carbon, and serving to guide the same, said core being directly connected with the source of electric energy and also in electrical contact with the carbon, substantially as and for the purposes described.

5. In an electric-arc lamp, an upper carbon, a solenoid-core surrounding said carbon, contact-fingers depending from said core and bearing against said carbon, and a wire coiled around the upper end of said carbon and connecting the solenoid-core with one pole of the source of electric energy, substantially as and for the purposes described.

6. In an electric-arc lamp, an upper carbon, a solenoid-core surrounding said carbon, a receptacle inclosing said carbon and core, and an adjusting-screw traversing said receptacle and adapted to limit the upward movement of the core in said receptacle, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOHN A. HEANY.

Witnesses:
J. WALTER DOUGLASS,
THOMAS M. SMITH.