L. W. PULLEN.

ARC LAMP.

APPLICATION FILED MAY 24, 1906.

958,828. Patented May 24, 1910.

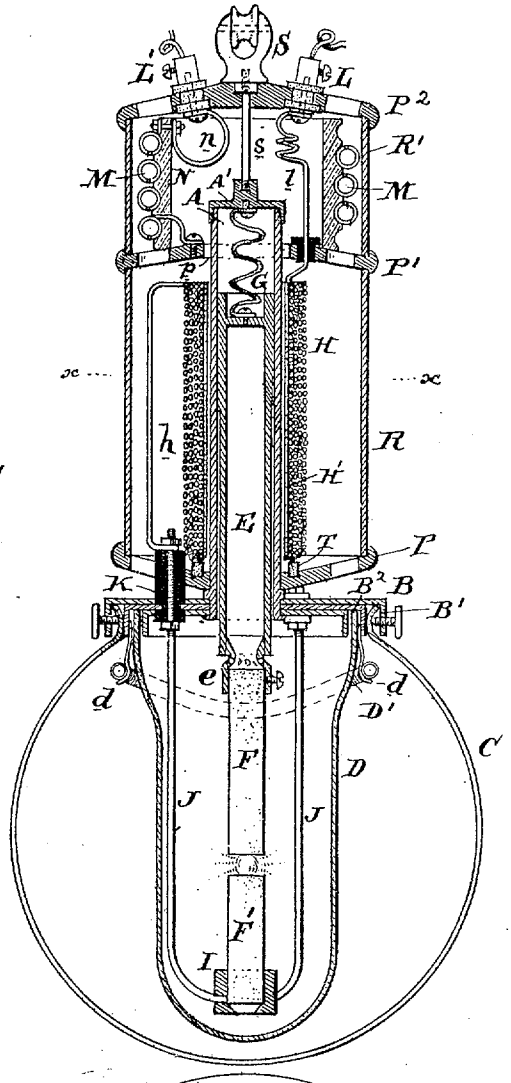

FIG. 1

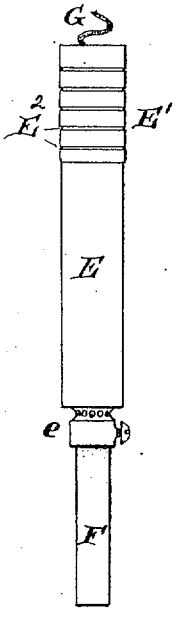

FIG. 3

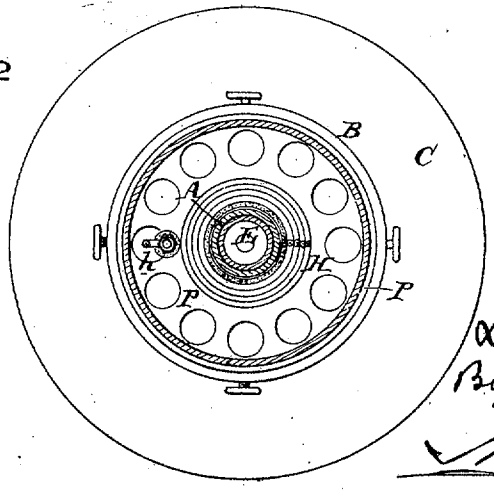

FIG. 2

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By his atty
[signature]

UNITED STATES PATENT OFFICE.

LEON W. PULLEN, OF CAMDEN, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WALDRON CLARK MANUFACTURING COMPANY, A CORPORATION OF NEW YORK.

ARC-LAMP.

958,828. Specification of Letters Patent. Patented May 24, 1910.

Application filed May 24, 1906. Serial No. 318,445.

To all whom it may concern:

Be it known that I, LEON W. PULLEN, of the city and county of Camden and State of New Jersey, have invented an Improvement in Arc-Lamps, of which the following is a specification.

My invention has reference to arc lamps and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

The object of my invention is to produce an arc lamp which shall be simple in construction, inexpensive to make, compact and small in size and efficient and steady in action.

My invention consists of certain features of construction which are set out in the specification and more particularly defined in the claims.

More specifically referring to the details of construction and with reference to the drawings:—Figure 1 is a sectional elevation of an arc lamp embodying my improvements; Fig. 2 is a sectional plan view of the same on line *x*—*x* of Fig. 1; and Fig. 3 is an elevation of the carbon holder and plunger.

A is a tube preferably of nonmagnetic material and is closed at the top by a cap A′. The lower end of the tube A is secured to the globe holder B which comprises three flanged disks of different diameters placed one upon the other so as to form two concentric annular channels B′ B² between their flanges. The outer globe C is clamped in the outer annular channel B′ by suitable clamping screws. The inner globe D has the top enlarged in diameter and its upper edge ground and fitted into the inner annular channel B². This globe D is held in position by any suitable means, that shown comprising a band of coiled wire constituting an endless coil spring D′ which presses upward against the enlargement of the globe and is hooked over two hooks *d d* depending from the head B. It will be evident that this construction forms of the globe and the tube A a practically air tight chamber.

E is a plunger or piston adapted to reciprocate in the tube A and is provided at the bottom with a carbon holder or clamp *e* in which the upper carbon F is carried. This plunger is made of iron so as to be magnetically influenced by the solenoid H surrounding the tube A. The lower carbon F′ is carried in a holder I near the bottom of the inner globe, and this holder is held by three wire brackets J which are united at the bottom by the holder and secured at their tops to the globe holder plate by insulation and clamping devices, the insulation K of one of these being extended sufficiently high to bring the terminal of the wire J well up within the case R where it is connected by a wire *h* with the solenoid H.

P is a lower head of iron and is sleeved upon the tube A and rests close to the globe holder B. This head P is perforated for ventilating purposes and carries slate studs T upon which the solenoid H rests to insure perfect insulation. The coils of the solenoid H are wound upon an asbestos tube H′ to thoroughly insulate it from the tube A. In this way the solenoid has no supporting parts which can burn or char and consequently short circuiting is guarded against.

Supported upon the lower head P is the cylinder R of the case and this is made of iron also. Resting upon this cylinder R is an upper head P′ of iron and the center of this is bored out sufficiently so as to surround but not touch the tube A. This forms an annular air gap *p* between the parts A and P′ for purposes to be referred to later on.

R′ is a cylinder arranged above the head P′ and also constituting part of the case. The cylinder R′ may be of brass or non magnetic material. P² is the top cap of the case and rests upon the cylinder R′.

All of the parts P R P′ R′ and P² are held together by the tube A, a stud *s* extending through the cap P² and a nut S screwed upon the stud. Any other suitable manner of uniting the several parts may be employed if so desired.

The solenoid has one of its terminals connected by a wire *z* with the binding post L above the cap P².

The plunger E is connected by a flexible conductor G with the cap of the tube A so that electric current may be conveyed to the plunger from the cap P through a stud *s* cap A′ and conductor G.

Arranged within the cylinder R′ and between the cap P² and head P′ is the resistance M and this consists of the usual coils

of wire wound in spiral form upon a cylinder N of fire clay or other heat resisting material having insulating qualities. One terminal of this resistance M is connected by a wire n with the remaining binding post L′ of the lamp, and the other terminal is connected with the head P′. It is now evident that the current entering the lamp by binding post L′ first traverses the resistance M, thence by parts P′ R′ P² of the case it passes to the plunger E and carbon F.

The plunger E may be of uniform diameter but I prefer to make the upper part E′ very slightly larger in diameter than the lower portion and also to provide fine grooves E² in the upper part as shown in Fig. 3. The object of this construction is to reduce the friction and to allow any fine particles which might get into the tube to pass into the grooves and thereby be removed from obstructing position.

The plunger E cannot move quickly in the tube A because of the compressed air above it, if it attempts to rise and because of the suction, if it attempts to descend by gravity.

The operation is very gradual and the arc is extremely steady. The magnetic action of the solenoid is enhanced by having the parts P R and P′ formed of iron so as to have, with the plunger E, a substantially closed magnetic circuit inclosing the solenoid.

The purpose for leaving the air gap at p between the head P′ and tube A is to reduce the magnetic attraction upon the plunger E when it is fully raised, because at that time it is surrounded by the solenoid and too strong magnetic attraction above the solenoid would raise the plunger E to an undesirable degree. In this way I obtain a substantially uniform length of arc from start to finish.

It will be observed that all gases, to a great extent, are retained in the globe D or lamp and prevent air from entering. This causes a great saving in consumption of the carbons. The manner of holding the inner globe in position dispenses with depending parts and prevents shadows.

The lower carbon holder structure is of such construction that there are no heavy standards or frames to cast shadows; the small wire brackets J being similarly disposed about the lower carbon causes equal expansion and the carbons are thereby kept in perfect alinement.

While in the case of the use of continuous current it is self-evident that the tube A may be of metal, it is desirable in employing the lamp with alternating current that the tube A shall be of porcelain, glass or other non-metallic substance.

While I have shown my improved lamp in a form which I have found most excellent for commercial use, I do not restrict myself to the details of construction as they may be modified in various ways without departing from the spirit of the invention.

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

1. In an arc lamp, the combination of a central tube of non magnetic material, a solenoid surrounding the tube, a lower head P of magnetic material fitted upon the tube below the solenoid, an upper head P′ also of magnetic material arranged above the solenoid and having a central opening through which the non magnetic tube extends, an outer case R of magnetic material connecting with and arranged between the heads P and P′ which with the said heads form a magnetic yoke around the solenoid, means for securing the heads P and P′ upon the case R, and a magnetic plunger within the tube for operating the movable carbon and completing with the said heads and case a magnetic circuit around the solenoid.

2. In an arc lamp, a frame structure consisting of the combination of a central tubular part open at the bottom, a lower head surrounding the lower end of the tube and supported thereby, a cylindrical case of larger diameter than the tube and resting upon the lower head, an upper head resting upon the top of the cylindrical case, a second cylindrical case resting upon the upper head, a cap resting upon the top of the second cylindrical case, and a bolt for drawing the cap and central tubular part toward each other for clamping the several parts together.

3. In an arc lamp, the combination of a central tube of non magnetic material, a solenoid surrounding the tube, a lower head P of magnetic material fitted upon the tube below the solenoid and having ventilating apertures, an upper head P′ also of magnetic material arranged above the solenoid having ventilating apertures and arranged substantially concentric with the axis of the tube and lower head, an outer case R of magnetic material connecting with and arranged between the heads P and P′ which with the said heads form a magnetic yoke around the solenoid, means for securing the heads P and P′ upon the case R and to the tube, and a magnetic plunger within the tube for operating the movable carbon and completing with the said heads and case a magnetic circuit around the solenoid.

4. In an arc lamp, the combination of a central tube of non magnetic material closed at the top, a solenoid surrounding the tube, a lower head P of magnetic material fitted upon the tube below the solenoid, an upper head P′ also of magnetic material arranged above the solenoid, an outer case R of magnetic material connecting with and arranged between the heads P and P′ which with the

said heads form a magnetic yoke around the solenoid, means for securing the heads P and P′ upon the case R and to the tube, a tubular magnetic plunger closed at the top and arranged to make a snug sliding fit within the non magnetic tube for operating the movable carbon and completing with the said heads and case a magnetic circuit around the solenoid, and a flexible electric conductor between the non magnetic tube and the tubular magnetic plunger for supplying electricity to the carbon carried by the plunger.

5. In an arc lamp, the combination of a tube of non-magnetic material open at the bottom, a solenoid surrounding the tube at a distance above its lower end, a case, made with top and bottom heads and formed of magnetic material secured to the non magnetic tube and surrounding the solenoid and also provided with ventilating apertures through its bottom and top heads, a globe holder receiving the lower open end of the nonmagnetic tube at a distance below the lower head of the magnetic case to form an annular air space between them leading to the ventilating apertures in the said lower head of the case, and a magnetic plunger within the non magnetic tube for operating the movable carbon.

6. In an arc lamp, a tube of non magnetic material open at the bottom and closed at the top, combined with a solenoid surrounding the middle part of the tube, a carbon, a plunger within the tube directly carrying the carbon for operating it, a magnetic inclosing yoke surrounding the solenoid and extending close to the tube and plunger below the solenoid and also extending inward toward the tube and plunger above the solenoid but at a normally greater distance from the plunger to provide a magnetic field extending into the upper portion of the tube to regulate the magnetic pull upon the plunger within the tube.

In testimony of which invention, I hereunto set my hand.

LEON W. PULLEN.

Witnesses:
R. M. HUNTER,
R. M. KELLY.