(No Model.) 2 Sheets—Sheet 1.

H. ALEXANDER.

ELECTRIC ARC LAMP.

No. 498,604. Patented May 30, 1893.

Fig: 1.

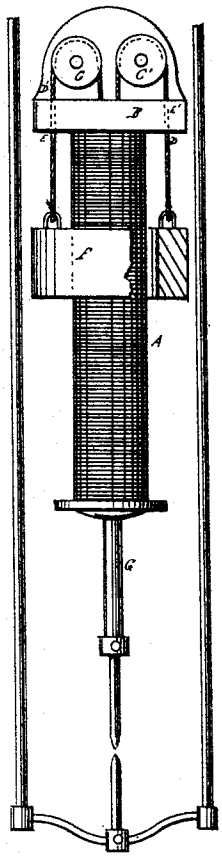


Fig: 2.

WITNESSES:
C. C. Alexander
Wm. Ladd

Hugh Alexander
INVENTOR:

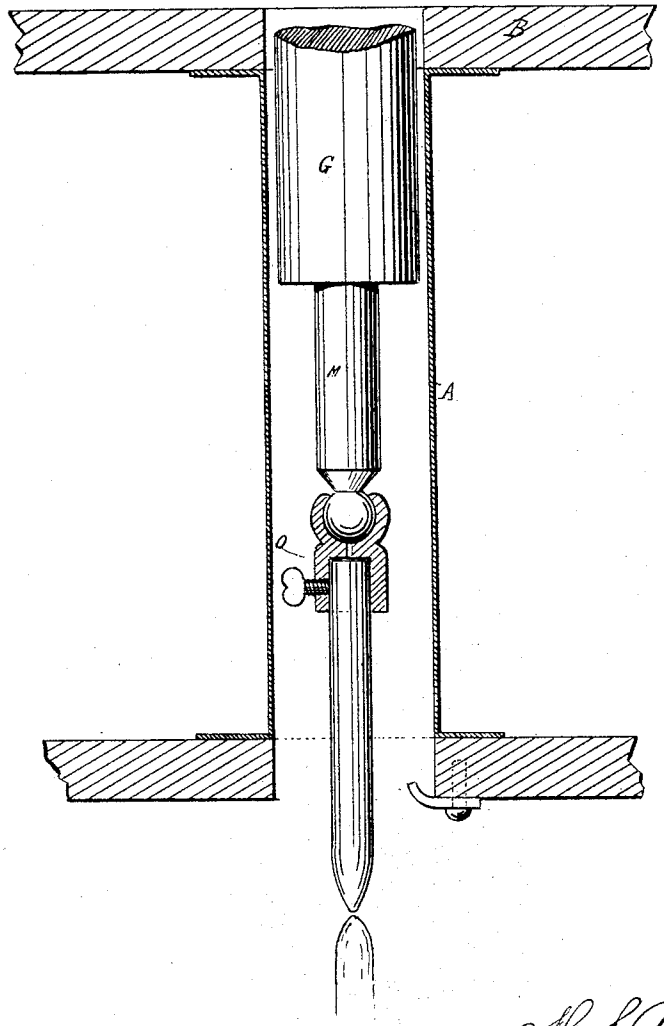
(No Model.) 2 Sheets—Sheet 2.

H. ALEXANDER.

ELECTRIC ARC LAMP.

No. 498,604. Patented May 30, 1893.

Fig: 3.



WITNESSES:
C. E. Alexander
Wm. Ladd

INVENTOR:
Hugh Alexander

UNITED STATES PATENT OFFICE.

HUGH ALEXANDER, OF BROOKLYN, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 498,604, dated May 30, 1893.

Application filed April 19, 1890. Renewed November 4, 1892. Serial No. 450,927. (No model.)

To all whom it may concern:

Be it known that I, HUGH ALEXANDER, a citizen of the United States, and a resident of Brooklyn, State of New York, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

The object of my invention is to provide an electric lamp which will automatically adjust and control the electro-magnetic force applied to the carbon holding rod, and a further object is to provide a construction to decrease the length of such lamp.

In the accompanying drawings Figure 1 is a side view of my improved lamp. Figs. 2 and 3 are diagrammatic vertical sections showing the arrangement of the helices and rods.

Similar letters of reference indicate corresponding parts.

As represented by Fig. 1, a solenoid is constructed with a tube A of proper shape and length; the rod G is inserted within the tube A to move freely within it and is the core of the solenoid. The core rod G may be solid, hollow, or laminated and of the full length of the tube A, or, where a shorter lamp is desired, as shown in Fig. 3. As shown by Fig. 2 successive layers of insulated wire are wound over said tube A to the desired ampères. The coils are divided into sections and may consist of a permanent and temporary, or auxiliary helices, or all the sections may be auxiliaries only. The coil H is here shown as a permanent helix and is wound to the desired ampères; its negative end is carried from the binding post I in the lamp frame; its positive end is connected directly with the metal tube A bringing said tube into circuit and thus carrying the current to the feed and core rod G and to the upper carbon. Below or above coil H, are wound one or more helices, auxiliaries J and J′, their negative ends being connected with the negative wire of coil H, and the positive ends carried separately through apertures K and K′, cut through the casing of the tube A, and so brought into contact by bared ends with the rod G freely passing such apertures, thus carrying the current from each auxiliary helix directly to said rod G and the upper carbon. All the coils or sections wound upon the tube A may be temporary or auxiliaries and when this is desired the positive end of coil H is carried through apertures similar to K and K′, instead of in connection with tube A, which is now left out of circuit, and thus carries its force and current like the others, to the feed rod G and upper carbon. The core rod G, holding the upper carbon, when fully within the tube A receives the full electro-magnetic force of all the helices; upon consumption of carbon and the consequent lengthening of the arc, the helices become partially demagnetized, and permit rod G to move downward through the tube A and below the apertures K and K′ which are the points of contact between the auxiliary helices J and J′ and the rod G, thus cutting such helices in their turn out of circuit and reducing the electro-magnetic force in proportion. The reduction in length of the upper carbon and the consequent decrease in load of rod G are thus equalized by the diminution of the force in the solenoid. Upon lighting a lamp it is presumed that the carbons are of full length, the rod G is at the top of the tube A and it is calculated that the force of all the helices is necessary to make and maintain a proper arc; as the carbons consume, the cutting out of the auxiliary helices J and J′ decreases the magnetic force in due proportion and the coil H to be of sufficient strength to sustain the arc between the shortening carbons. The current passing into the helix or helices magnetizes them and the carbon pencils resting point to point are separated sufficiently to form an arc; as the arc increases in length it consumes the greater amount of the current, thus partially demagnetizing the helix or helices; when this occurs the core rod G moves downward and shortens the arc to the desired length. This action is automatic and while maintaining a uniform arc, is so regular and slight as to be almost imperceptible. For example when the core rod G is in its highest or first position in the tube A the force of all the helices is applied, all being in circuit. The current arising at the negative pole I passes through the negative wire into the coil H and from the positive end of H into the tube A to which it is connected and in circuit, and magnetizes the core rod G and makes the arc so long as the carbon lasts, when an automatic cut out of any approved construction

(not shown) extinguishes the lamp. Passing up the negative wire the current passes through same in turn of the coils J and J′ and passes from the same through the positive ends of said coils projecting through the apertures K and K′ cut through casing of the tube A and in contact with rod G, the current thus passing into rod G and to the carbon up to the positive binding post and thence to the line wire. If it is desired to use all the helices as temporary auxiliaries and cut outs, the positive end of coil H is not connected with tube A, which is then not brought into circuit, but its positive end is brought into contact with rod G through apertures like K and K′ and all the helices form a series of auxiliaries. It is clearly shown that the helices are only in circuit, in this arrangement when the rod G is above the contact points, and as each contact point is passed a helix is cut out and as the last contact point is passed the circuit is broken and lamp extinguished. As the rod G descends below a contact point that helix is cut out and the current passes from the binding post I through the negative end of next coil, through the same to its positive end and directly to the rod G. Fig. 3 represents an arrangement for shortening such lamp, making it available where the ordinary arc lamp is not. The tube A is made of greater diameter and the core rod G is shortened and broadened and is contained wholly within the tube A when the lamp is in action, but is easily removed for cleaning. To offset consumption of carbon, and to fall sufficiently to follow the lower carbon, a short metallic tube or rod M is attached to the rod G. The carbon holder O is clamped to rod M. When the upper carbon is attached, the rod G is drawn to the top of the tube A and the connecting tube M, the clamp O and most of the upper carbon are within the bore of tube A. The lower carbon being placed and current on, the same electric action occurs as has been described. The arc is thus struck at a point much nearer the base of the lamp or helix than in other lamps. The length of rod and carbon usually falling below the lamp base, in this construction, is almost entirely put within the tube A, and the lamp thus shortened twelve inches or more.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric lamp the combination with a solenoid formed of one or more helices of insulated wire wound upon a tube, of a movable core magnet rod or tube contained wholly within the solenoid tube, and carrying with it into the said tube a connecting feed rod or tube, a carbon clamp and the upper carbon, for the purpose of shortening the lamp by bringing the contact point of the two carbons and striking an arc near the helix, substantially as described.

2. In an electric lamp the combination of a movable core and carbon holding rod or tube within a tube of a solenoid, formed of a main helix and one or more auxiliary helices of insulated wire, all surrounding the tube of the solenoid and one helix being above another; the negative ends of the auxiliary helix or helices being connected with the negative wire of the main helix, and the positive ends of the auxiliary helix or helices projecting through an aperture or apertures in the tube of the solenoid to come into contact with the core of the solenoid, so as to close and break the current, as consumption of carbons may require; substantially as described.

3. In an electric lamp the combination with a tube of a series of helices one above another, formed by winding insulated wire upon said tube; the negative ends of the several helices being connected with each other, and the positive ends of the helices serving to form electrical conductors to the core of the solenoid, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 1st day of March, 1890.

HUGH ALEXANDER.

Witnesses:
C. E. ALEXANDER,
WM. LADD.