

(No Model.)

J. A. MOSHER.
ELECTRIC ARC INCANDESCENT LAMP.

No. 552,498.

Patented Dec. 31, 1895.

Fig. 1.

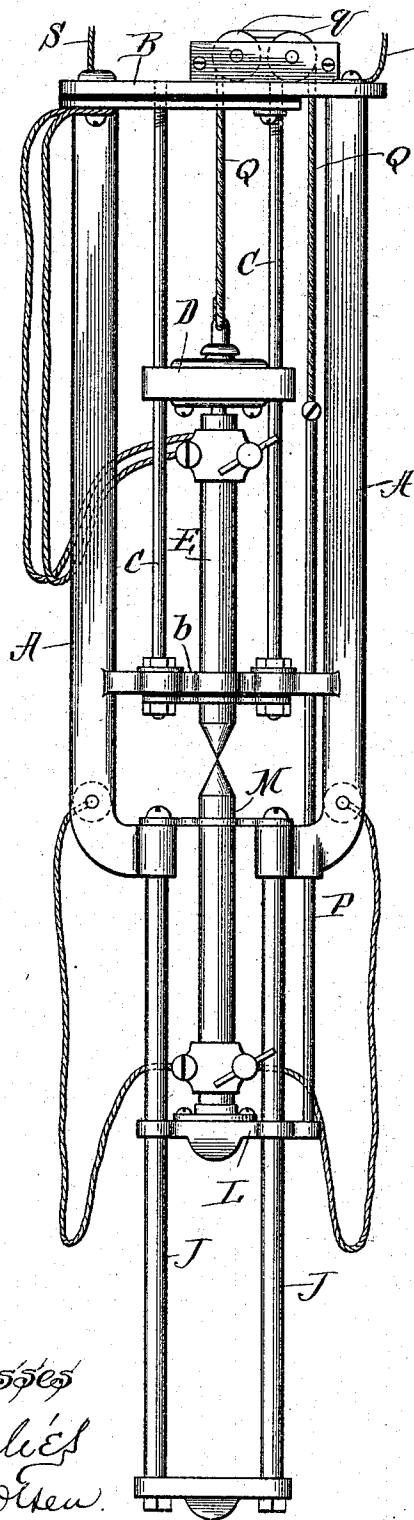


Fig. 2.

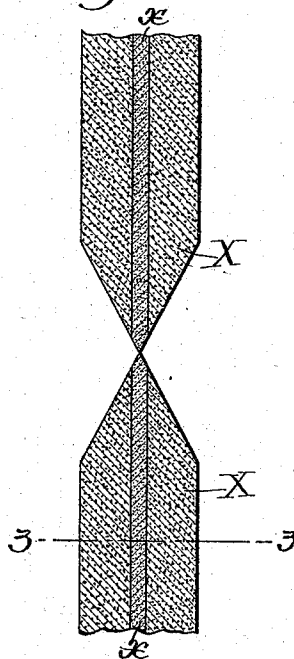
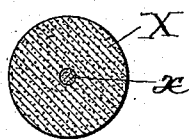


Fig. 3.



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ELECTRIC-ARC INCANDESCENT LAMP.

SPECIFICATION forming part of Letters Patent No. 552,498, dated December 31, 1895.

Application filed September 23, 1895. Serial No. 563,334. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. MOSHER, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a full and exact description, and which is fully illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is an elevation of the lamp; Fig. 2, a longitudinal section of the carbons used in connection with it, and Fig. 3 is a cross-section on the line 3 3 of Fig. 2. Figs. 2 and 3 are made on an enlarged scale.

This invention relates to improvements in that class of arc lamps in which the electrodes are maintained in continuous contact, the arc being formed around the contact-point. In lamps of this type the arc is formed by the use of a current of such quantity that the fine contact-points of the carbons will not provide for it an adequate path, and it is forced to leap across the space between their body portions. Several conditions are found to be essential to the best results—viz., a current of large quantity and small electromotive force, a good conductor to the tips of the carbons, high resistance at the immediate point of contact of the carbons, and the volatilization of the body of the carbon more rapidly than of the contact-points. Not only does a low voltage result in a better light, but it is necessary to the commercial value of the lamp in view of the high ampèreage used. The employment of such a current is possible only when a carbon is used which will conduct the current to its tip with slight resistance. A metallic coating for the carbon has been employed to serve as a conductor, but is impracticable for the reason that if there is sufficient metal to accomplish the desired result it will not, especially at so great distance from the arc, yield to the influence of the heat with sufficient rapidity, and consequently the consumption of the carbons soon leaves a metal casing projecting beyond their ends and inclosing the arc. Effort has been made to solve the problems of such lamps by the use of various light-giving metals intermixed with the carbon, so that the current might be reduced in quantity without lessening the illumination, also by inclosing the arc within a partial

vacuum, so as to retard the consumption of the soft carbon by the exclusion of oxygen. Such efforts I have found to be largely unavailing.

Essential to the formation of the arc is the development of gas which serves as a medium for the transmission of the major part of the current, without the employment of a high electromotive force to drive it. This gas results only from combustion, and the high temperature necessary to develop it is secured only by the employment of resistance at the contact-points. In order that this high temperature may not result in the too-speedy destruction of the material at the point of contact, and the consequent formation of a crater at the center, instead of the continual development of the tapering form at the end of the carbon, it is essential that the material subjected to the high temperature at the point of contact be more highly refractory than that which carries the larger part of the current, otherwise the carbon ends will assume a blunt form; there will be not only a large area of contact, but contact of the portions of the carbon of low resistance, and the current will freely flow without forming an arc. On the other hand, if the contact-points are too highly refractory, the body of the carbons will be volatilized more rapidly than the points, and will soon be so widely separated that the current will refuse to leap across and the light will be extinguished until the points have been burned away sufficiently to bring the bodies of the carbons again into such proximity that the arc will be formed as before.

Obviously the lamp is in a measure self-regulating, for the lengthening of the arc will by the increased resistance divert a larger quantity of the current to the points, resulting in the development of a still higher temperature and a consequent more rapid destruction of the material and a quick readjustment of the distances. The nicer the adjustment, however, between the conductivity and combustibility of the different portions of the carbon the less will be the waste of current in accomplishing the regulation referred to. This adjustment is of course a matter of test, both as to quantity and character of material. The present invention consists in forming the carbons employed in a lamp constructed to maintain them continuously in contact each with

a core of relatively-high electric resistance and low combustibility, and a body portion of relatively low resistance and high combustibility.

5 While I do not limit myself to the use of carbon resulting from any particular material, I find that pulverized coke is suitable for both the core and body portion, the latter being but lightly compressed and having mixed
10 with it a quantity of material, such as a metal in powdered form, which will lessen its resistance, it being quite practicable to select a metal whose combustion will improve the character and intensity of the light, while
15 the former is more firmly compressed and is without other admixture than the binding agent. Pure carbon should be used in the core for the reason that it is desirable to keep its size as small as practicable, and hence it
20 should contain no material which is not a conductor of electricity, for it is the purpose of these contact-points to conduct, not to stop the current, and for the further reason that the material, while more highly refractory
25 than is that of which the body of the carbon is formed, should nevertheless be completely combustible, so that there will be no troublesome slag formed.

30 In the drawings I show at A A the posts of the lamp-frame, at B the top plate from which the posts depend.

The lamp is especially serviceable in connection with an alternating current, and the frame shown is arranged with view to the localization of the arc. The posts terminate
35 immediately below the position of the arc, their ends being turned inwardly. A pair of guide-rods C C are set between the posts A A, extending from the plate B to a cross-bar b, uniting the posts a little above the arc. A
40 similar pair of guide-rods J J depend from the inturned ends of the posts. A traveler D, for carrying the upper carbon E, runs on the rods C C and a traveler L, for carrying
45 the lower carbon M, runs upon the rods J J. A cable Q or other flexible agent connects the two travelers, passing over suitable sheaves q q, mounted above the plate B, and being attached to the lower traveler L by means of
50 a rod P extending upwardly therefrom and through suitable apertures in the bent end of one of the posts A and in the cross-bar b.

The current reaches the lamp-frame through the cables S T, which lead the one to the upper carbon and the other to the lower carbon.
55

The carbons E M are alike, and comprise the central core x of a material of a highly-refractory character and of high electric resistance, and the body portion X enveloping
60 the core and composed of material of relatively-higher combustibility than that employed in the core, and of low electric resistance.

65 In use the carbons are continuously in contact. Gravity is depended upon for feed. The traveler D is heavier than the traveler L, and as the carbons are consumed it carries

the one carbon down and correspondingly raises the other. The difference in weight between the two travelers is merely sufficient
70 to maintain a gentle pressure of the carbon-tips, each against the other. The current is carried by the body portion X of the carbons to the tips. When the current is turned on it finds its best path between the carbons
75 through their immediate points of contact, but the resistance here is sufficient at once to develop a sufficiently-high temperature to commence the transformation of the material into vapor. The gases thus generated provide a medium for carrying the remainder of
80 the current in the form of an arc. This arc consumes the material of which the body X of the carbon is composed, so that the pointed form is maintained. The core assumes, if
85 not already so shaped, and maintains a finely-pointed form, for the reason that the combustion takes place at its surface and the extreme tip is always the point which has been for the longest time subject to its action.
90

Should the pencils be comparatively blunt when the current is turned on, they will quickly assume the pointed form, as the more combustible body portion will be rapidly consumed if thus brought directly under the influence of the high temperature developed at
95 the point of contact. The development of the conducting-gases by the combustion of the carbon-tips, thereby supplying a comparatively-easy path for the electricity, and the
100 employment of a current of very large volume results in the formation of an annular arc, the current springing from all parts of the ring surrounding the points. This form of arc in turn prolongs the life of the carbon,
105 retarding the combustion of the tips by measurably cutting off the oxygen from them.

I claim—

1. In a composite carbon for electric arc lamps all portions of which are combustible
110 and electrically conductive, the combination with a core, of a body portion super-imposed thereon and being, relatively as to the core, of high combustibility and low electric resistance, substantially as described and for the
115 purpose set forth.

2. In an arc lamp, the combination with a frame, of a pair of composite carbon electrodes all portions of which are combustible
120 and electrically conductive and each of which comprises a core and a body portion super-imposed thereon and being, relatively as to the core, of high combustibility and low electric resistance, and of means for maintaining the electrodes continuously in contact, substantially as described and for the purpose
125 set forth.

In testimony whereof I have affixed my signature hereto in the presence of two witnesses.

JOHN A. MOSHER.

Witnesses:

WM. S. BARTHOLOMEW,
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