(No Model.) 2 Sheets—Sheet 1.

C. K. MacFADDEN.

ELECTRIC ARC LAMP.

No. 492,815. Patented Mar. 7, 1893.

Fig. 1.

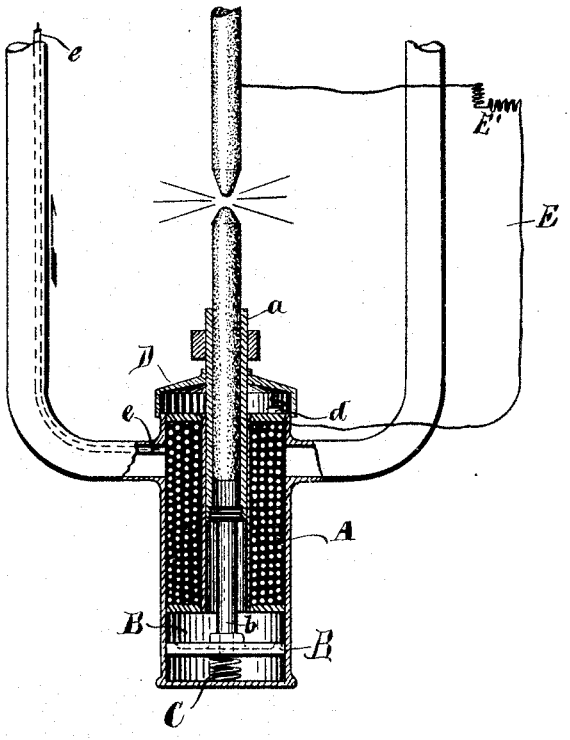
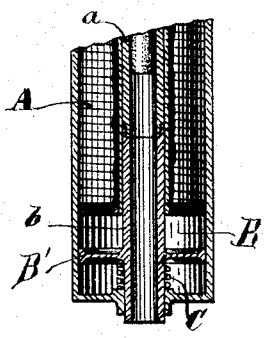


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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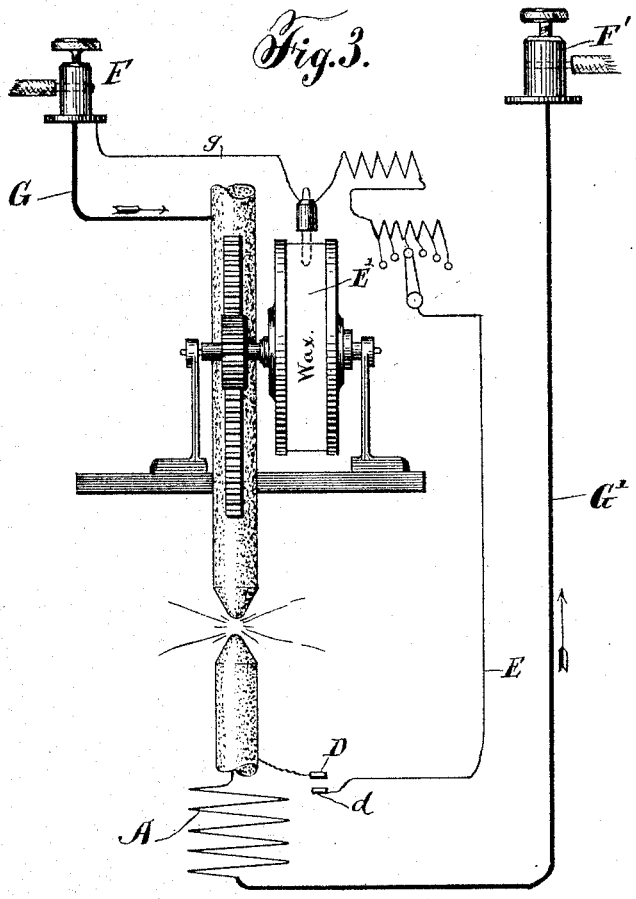
ELECTRIC ARC LAMP.

No. 492,815. Patented Mar. 7, 1893.

Fig. 3.



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UNITED STATES PATENT OFFICE.

CARL K. MACFADDEN, OF CHICAGO, ILLINOIS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 492,815, dated March 7, 1893.

Application filed August 12, 1892. Serial No. 442,888. (No model.)

To all whom it may concern:

Be it known that I, CARL K. MACFADDEN, a citizen of the United States, residing in Chicago, Illinois, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The object of my invention is to furnish arc lamps, when placed in constant potential circuits between the mains, with a device by which the flow of current through the varying resistance of the arc may be kept constant, which result, in general terms, is accomplished by the use of an arc drawing magnet separate and distinct from the device for feeding the carbons forward, and having a movement of its own capable of slowly, steadily and constantly varying the length of the arc according to variations in the current passing through the lamps and independently of the feeding mechanism of the lamp; and my invention consists in the features and combinations hereinafter described and claimed.

I will here say, before entering upon a detailed description of my improvement, that it is particularly intended for use with an arc lamp having a feeding device similar to that illustrated and described in Patent No. 420,955, issued February 11, 1890, to Samuel E. Nutting. As I propose to make use of the feeding mechanism of this lamp, I do not deem it necessary to illustrate or to describe the same, but refer to such patent for a minute and detailed illustration and description of the feeding mechanism by which the upper carbon is intended to be fed in the use of the lamp. Heretofore it has been found difficult to keep the current constant through arc lamps on constant potential circuits, on account of the varying resistance of the arcs. This is especially the case with lamps whose feeding mechanism is operated by other means than by electro-magnets, as is the feeding mechanism illustrated and described in the Nutting patent above referred to. My device is designed to obviate this difficulty, and compensate for sudden variations in the resistance of the arc by automatically varying its length, and, consequently, its resistance, thereby maintaining the current constant.

In the drawings, Figure 1 is a side elevation partly in section of portions of an arc lamp, and showing my improvements. Fig. 2 is a vertical section of the mechanism for holding the lower carbon, modified and Fig. 3 is a diagrammatic view, showing the circuits and mechanism for feeding the carbons.

I will describe my improvements in connection with an arc lamp, in which a magnet A is used with the lower carbon to regulate the space or distance between the points of the two carbons. In the use of arc lamps of this construction, there is a tendency, when the current becomes strong, for the magnet to so act upon the soft iron carbon holder or core *a*, as to draw the same down so rapidly or suddenly and to such an extent as to separate the points of the carbons too much, and thus break the circuit, or, if this does not happen, to impart an unsteady or jiggling motion to the lower carbon so as to make the light unsteady and fluctuating.

In making an arc lamp with my improvements, I arrange in the bottom of the magnet holder a space or chamber B, and place in such chamber a piston head B′, connected, by means of a piston rod *b*, with the soft iron tube *a*, in which the lower carbon is held. I arrange beneath the piston head and the bottom of the chamber or space, a spring C, whose tendency is to hold the piston head, and through it the lower carbon, to their highest positions. When the current is on, the electro-magnetic action exerted on the carbon holder, draws the same down against the resistance of the spring to the desired distance to hold the lower carbon in position for arcing the current for use so that the normal amount of current will pass through. If, now, through any cause, the current should become weakened, so that the electro-magnetic action also became weakened, the tendency of the spring will be to lift the carbon up and bring its point closer to the point of the upper carbon, thus reducing the resistance of the arc and maintaining the current at its normal strength. When the current again becomes strong the electro-magnetic action will be increased and the lower carbon again drawn down to the desired position. The air on each side of the piston head will prevent the action of the spring or of the electro-magnet from being too quick or sudden, and thus regulates or controls the movement of the carbon up and down, so that the same will be slower

and more regular than without the use of the chamber and piston head without the use of means, such as I have shown and described, the action of the electro-magnet spring would be so quick and rapid that there would be a consequent jiggling or fluctuation in the light, while with the use of my improvements, slight variations of the electric pressure would be unappreciable in the arc, so that the light would be constant and steady.

In Fig. 2 I have made the piston rod in the form of a tube, so that the lower carbon can be inserted or removed through the bottom. In other respects, however, the construction and operation are the same as above described.

I provide a shunt circuit through my lamp by means of the wire *g*, through the feeding mechanism E′, and the wire E to the contact pieces D *d*. When the lamp is in circuit, and current is flowing through the same, the pieces D *d* are normally in contact with each other, and current can flow through this shunt circuit operating the feeding mechanism of the lamp. If from any cause the arc of the lamp should be broken, and no means be provided for simultaneously breaking the shunt circuit, the excessive volume of current flowing through the shunt circuit would fuse the wires or destroy the feeding mechanism. To obviate this difficulty and provide means by which the shunt circuit is broken simultaneously with that of the arc is one of the objects of my invention. If the main circuit through the lamp from any cause should be broken, the electro-magnetic action would be destroyed and the metallic cap would be pushed out of contact with the contact piece *d*, thus breaking the shunt circuit. To complete the main circuit through the lamps I have provided a wire *e*, which may be carried through the hollow frame work of the lamp and connected with the negative binding post of the lamp, but as to this matter I do not consider that I need go into minute details of description.

In Fig. 3 I have shown a diagrammatic view of the circuits and feeding mechanism used in connection with my improvements. F F′ are the binding posts for connecting the terminals of the main line; G G′ is the main circuit, *g* is a shunt or derived circuit which operates the feeding mechanism in the lamp; A is the electro magnet for controlling the distance of the arc in the lower carbon; D is a metallic contact piece attached to the lower carbon, *d* is a metallic contact piece through which a shunt circuit is derived from the lower carbon and magnet as hereinbefore explained. The direction of the current is indicated by the arrows.

What I regard as new, and desire to secure by Letters Patent, is—

1. In arc lamps, a solenoid having a movable core in line with and concentric with the lower carbon, and a dash pot whose piston is attached directly to the movable core of the solenoid, and concentric with the carbon and core, substantially as described.

2. In arc lamps, the combination of an arc drawing magnet, and a shunt circuit around the arc adapted to be opened and closed by the movement of the core of the arc drawing magnet simultaneously and correspondingly to the opening and closing of the arc, substantially as described.

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