(No Model.) 2 Sheets—Sheet 1.

# E. A. SPERRY.

## ELECTRIC ARC LAMP.

No. 405,440. Patented June 18, 1889.

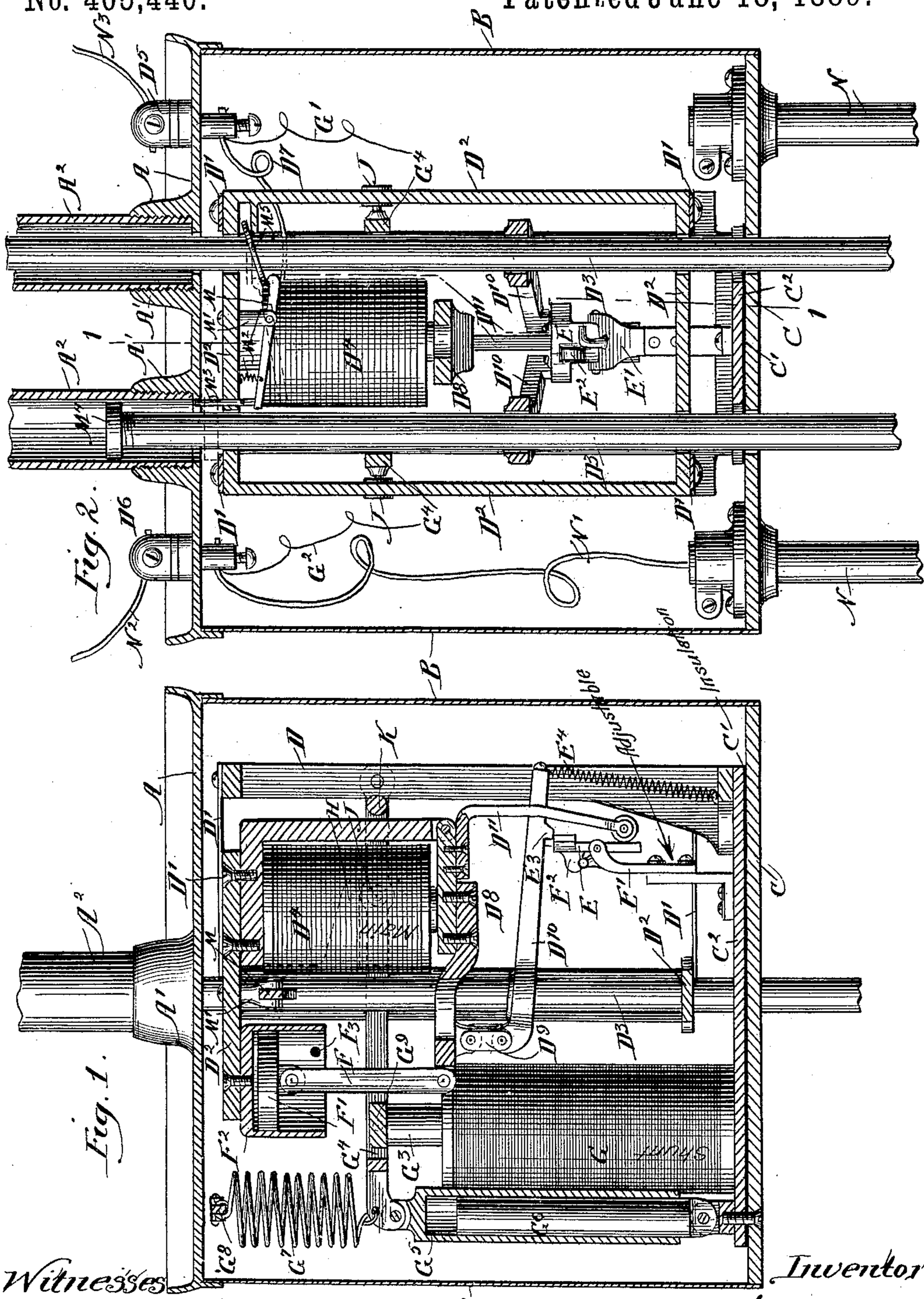

Fig. 1.

Fig. 2.

Witnesses
Celeste P. Chapman
Francis M. Ireland

Inventor:
Elmer A. Sperry
By Francis W. Parker,
Attorney.

(No Model.) 2 Sheets—Sheet 2.

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## ELECTRIC ARC LAMP.

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Fig. 3.

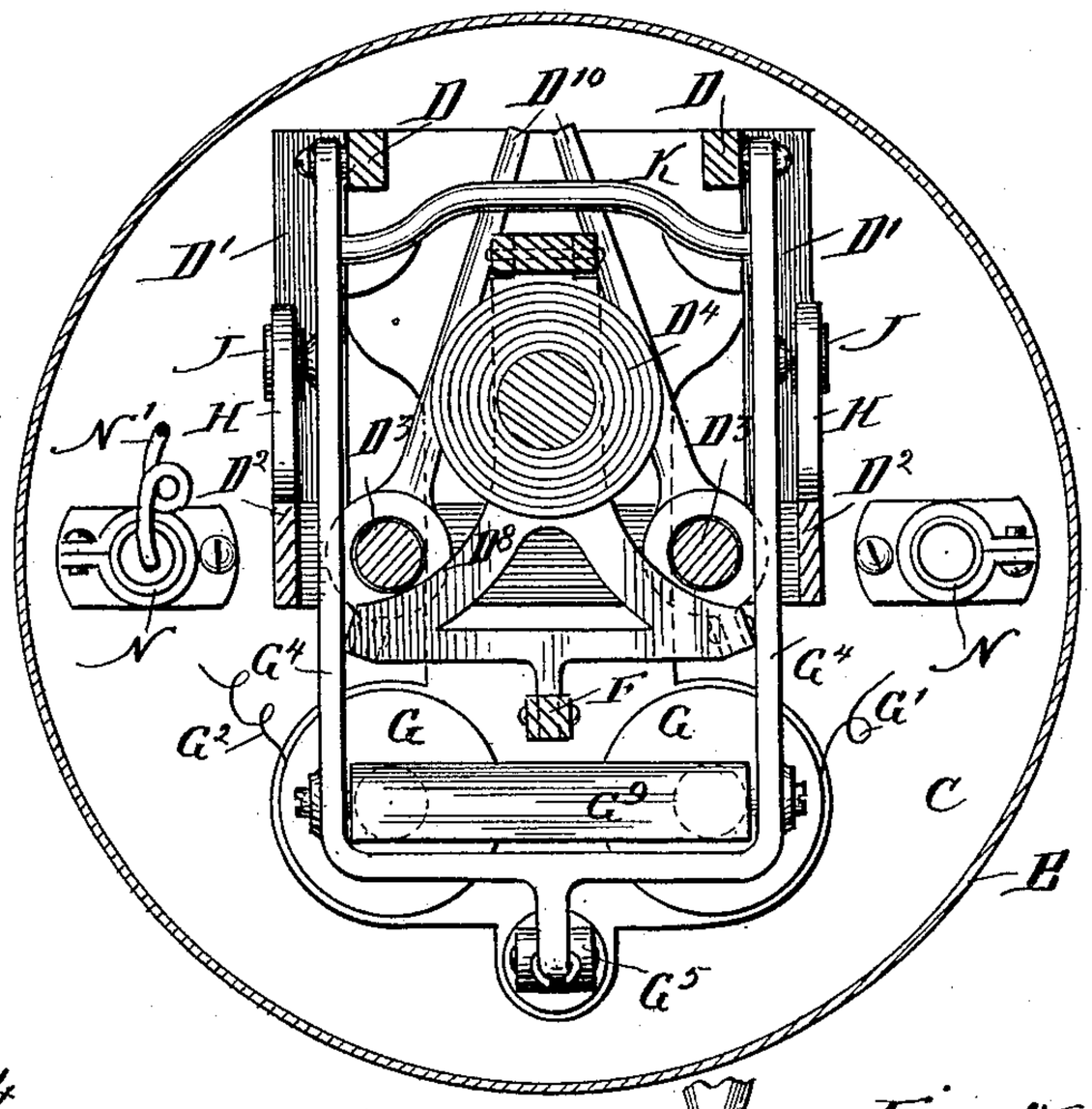



Fig. 4

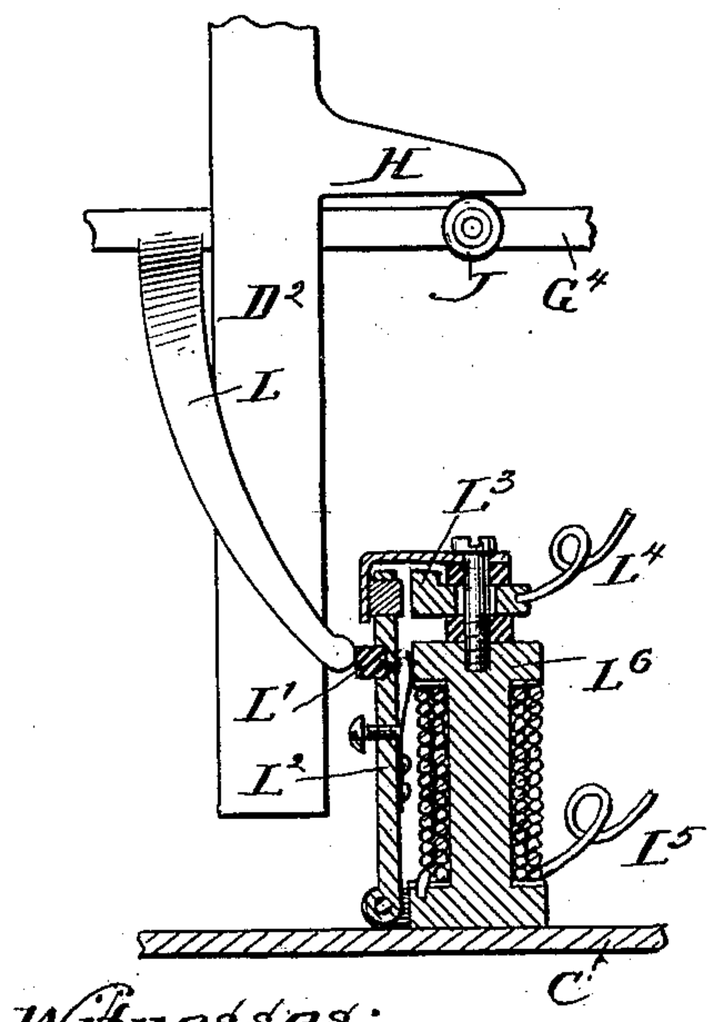
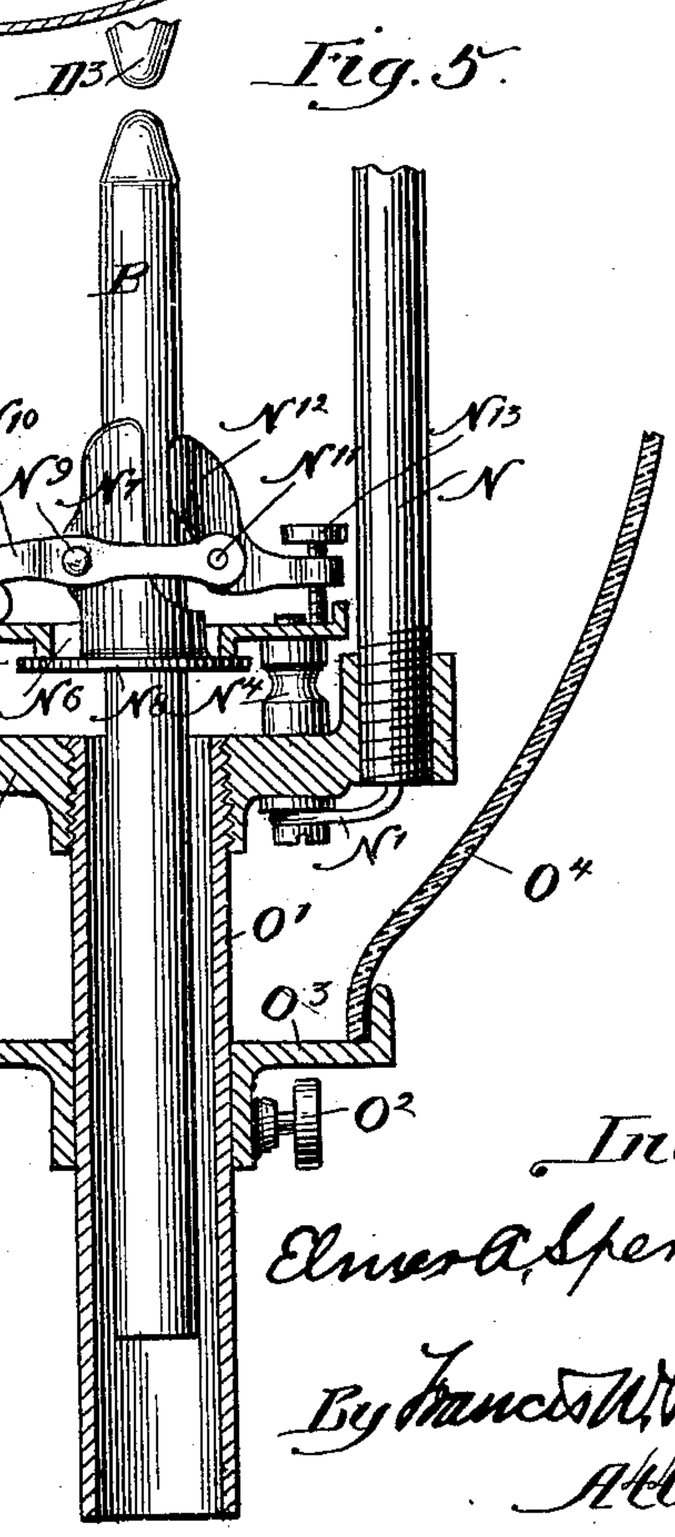



Fig. 5.




Witnesses:

Celeste P. Chapman

Francis M. Ireland

Inventor:

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By Francis W. Parker

Attorney.

# UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CHICAGO, ILLINOIS.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 405,440, dated June 18, 1889.

Application filed October 22, 1888. Serial No. 288,813. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER A. SPERRY, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Arc Lamp, of which the following is a specification.

My invention relates to arc lamps, and has for its object to provide a cheap, simple, and effective lamp.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a vertical section. Fig. 2 is a vertical section at right angles to the other. Fig. 3 is a horizontal section. Fig. 4 is a detail of the cut-out magnet. Fig. 5 is a detail of the carbon-clamp.

Like parts are indicated by the same letter in all the figures.

A is the top of the case, B B the sides, and C the bottom. On the case A A are the thimbles A′ A′, into which are secured the carbon-tubes $A^2$ $A^2$.

C′ is a sheet of insulation on the bottom of the case, and upon which is placed the base $C^2$.

D D are standards on the base $C^2$, and projecting from them are the springs D′ D′, which support the frame $D^2$. In the top and bottom of this frame are apertures for the free passage of the carbon rods $D^3$ $D^3$. Secured to the upper part of the frame $D^2$ is the electro-magnet or solenoid $D^4$, which is in the main circuit from binding-post $D^5$ to binding-post $D^6$, the connection being made from binding-post $D^5$ to magnet $D^4$ by the connector $D^7$, and from such magnet to the frame and carbon rods.

$D^8$ is a pivoted armature for the magnet or solenoid $D^4$, and to it is connected by the link $D^9$ the carbon-clamp $D^{10}$, which surrounds the carbon rod, and as its angle is changed clamps or releases the same. Secured to the same armature is the trip $D^{11}$, which engages the lower end of the pivoted variable stop E. This stop is adjustably supported on the standard E′ and carries a weight $E^2$ at its upper end, which causes it to normally incline away from the lug $E^3$ on the clamp $D^{10}$.

$E^4$ is a spring, which opposes the action of the magnet or solenoid on the clamp $D^{10}$ when the same is arrested by the variable stop. Where two carbon rods are used there are two clamps $D^{10}$.

F is a link from the extended end of the armature $D^8$ to the piston F′ in the dash-pot $F^2$, which is secured to the upper portion of the frame $D^2$ and contains the stop $F^3$.

G is a derived or short circuit magnet or solenoid supported on the base-plate $C^2$ and connected with the poles $D^5$ and $D^6$ by the connectors G′ and $G^2$. It contains a movable core $G^3$, pivoted to the lever $G^4$. This latter lever is pivoted to the standard D at one end and at its other end carries the dash-pot $G^5$, which reciprocates over the plunger $G^6$, and is upwardly drawn by the spring $G^7$, which is secured to the adjustable lever $G^8$, so the tension of the spring may be varied. In the form of the device as shown there are two shunt-magnets or solenoids, their cores being connected by the armature $G^9$, and there are two levers $G^4$, each pivoted to one of the standards D and both connected at their ends.

From the vertical sides of the frame $D^2$ project the arms H H, each of which rests upon one of the rollers J J on the levers $G^4$. These levers are connected together near their pivotal points by the cross-rod K. On one of the levers $G^4$ is the arm L, which finds a stop when the lever $G^4$ is greatly depressed against the insulator L′ on the spring-actuated pivoted lever $L^2$. This lever $L^2$, when it finds a rest against the piece $L^3$, serves to make a connection between the connectors $L^4$ and $L^5$, which lead to the binding-post, and thus a current is formed through the electro-magnet $L^6$. The same is wound with a small quantity of heavy wire, so that the entire lamp is cut out.

M is a lever pivoted to the pendant M′, upwardly held by the spring $M^2$, and having at one end the stop $M^3$ in the line of the descent of the cap $M^4$ on the carbon rod $D^3$, and at its other end the carbon-rod-sustaining clamp $M^5$.

N N are the bars which support the lower portion of the lamp N′, a conductor leading to the binding-post $D^6$; and $N^2$ and $N^3$, the line-wires.

O is the base of the lamp, to which is secured the carbon-protecting tube O′, one for each carbon, and to these tubes is secured by the set-screw $O^2$ the bottom $O^3$, on which rests the globe $O^4$. Connector N′, emerging below from the rod, passes through the insulator $N^4$, and thence to the plate $N^5$, which is provided

with apertures $N^6$ for the clamping-piece $N^7$. This clamping-piece has secured to its lower end the annulus $N^8$, and is pivoted at $N^9$ to the arm $N^{10}$. One end of this arm rests on the plate $N^5$. The other end is pivoted at the point $N^{11}$ to the clamping-piece $N^{12}$, which is bell-crank-lever-shaped.

$N^{13}$ is a set-screw passing through the end of this latter clamping-piece and resting upon the plate $N^5$. Duplicate parts wherever necessary will be supplied to make the lamp operate with two carbons, as the elements described are equally operating with one or more carbons.

P is the lower carbon. I have called the stop $E^2$ a "variable" stop because it varies in the position which it occupies, and hence in the effect which it produces upon the clamp or clamps $D^{10}$.

The use and operation of my invention are as follows:

The current passes in through the conductor $N^3$ into the binding-post $D^5$, through conductor $D^7$ to main-circuit magnet or solenoid $D^4$, thence to the metallic parts of the inner frame, thence to the carbon rods, through the carbons, through conductor $N'$ to binding-post $D^6$, thence on to line-wire $N^2$. This operation takes place when first a current is turned into the line. The immediate effect thereof is to draw up the armature $D^8$ from its normally-depressed position, thus raising the link F and piston F′ in the dash-pot $F^2$ from the stop $F^3$, at the same time lifting the clamp $D^{10}$ bodily and separating the carbons to establish the arc, and then, finally, by the action of the arm $D^{11}$ against the lower end of the stop E, throwing the latter into the upright position, where its end engages the lug $E^3$ rather than the main body of the clamp $D^{10}$. In short, the immediate action of such current is to bring the parts into the position shown in Fig. 1, whereby the arc is established. Now a portion of the current begins to flow from binding-post $D^5$, through conductor G′, to the derived-current electro-magnets or solenoids G G, thence through conductor $G^2$ to binding-post $D^6$. The quantity of current passing through the magnets G G varies, of course, with the variation of the resistance in the main circuit within the lamp, and thus by the movement of the cores $G^3$ $G^3$ in opposition to the spring $G^7$ the levers $G^4$ are jointly rocked, thus imparting the reciprocating motion to the frame which supports the main-circuit electro-magnet or solenoid and clamps, and which I have denominated the "carbon-separating device." The motion of this device feeds the carbons, the clamp $D^{10}$ being caused to operate by the stop E′ receiving the lug $E^3$ thereon. The spring-frame will have an approximately parallel movement. The stop must be variable, as indicated, for the clamp must operate in different planes and at different positions along the line of the movement of the carbon rod. Thus when the clamp is raised in the first instance to separate the carbons it must clamp the rod at a position nearer the base of the case than when it clamps the rod for feeding purposes; or, in other words, the point at which the clamp releases the rod during the process of feeding is higher up than the point at which it clamps the rod for separating the carbons, and if the stop remain constant in its inclined position, engaging the clamp on its main surface and not on its lug, the carbon rod would instantly clamp, and the feeding could not be accomplished; hence the arrangement of the variable stop. The carbon-rod clamp when out of action normally rests its main surface upon the end of the inclined or tilting stop. The armature $D^8$ is supported at a distance from its core by the stop $F^3$, and the carbon rod can freely move vertically. As soon as the magnet or solenoid $D^4$ is energized, the armature is drawn up and the clamp seizes the rod at such a distance from the base-plate $C^2$ as would permit the separation of the carbons by the continued motion of the armature $D^8$ toward its magnet. The clamp is lifted bodily, so that, in order to release the carbon rod as necessary in the process of feeding, it must have a new or elevated stop. When the levers $G^4$ are caused to descend greatly, as would be the case in the event of an abnormal resistance in the main circuit within the lamp, the arm L would cause the switch or pivoted piece $L^2$ to close the circuit through conductors $L^4$ and $L^5$, and thus cut out the entire lamp. When the lower carbon is being placed in position, it is inserted through the clamping-piece $N^7$ and the parts brought into the position shown in Fig. 5. If, now, the thumb-screw $N^{13}$ be rotated, it will have the effect of raising the end of the arm $N^{10}$, thus bringing the two clamping-pieces $N^7$ and $N^{12}$ together to clamp the carbon, and at the same time forcing the plate $N^8$ against the plate $N^5$ and securely locking the carbon in the position in which it is placed.

The stop above described as a "variable" stop may also be called a "double-acting" stop. The entire device consisting of the parallel moving frame supported on elastic bars and containing the main-circuit electro-magnet or solenoid and carbon-rod clamp is described as a carbon-separating device, since its office is to seize and separate the carbons in the first instance. The entire frame is then bodily moved by means of the derived-circuit electro-magnet or solenoid for the purpose of feeding the carbons.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is as follows:

1. In an arc lamp, the combination of a main-circuit electro-magnet or solenoid with a moving frame on which it is supported, a carbon-rod-clamping device moved by said electro-magnet or solenoid, and a shunt-magnet or solenoid adapted to move said frame.

2. In an arc lamp, the combination of a main-circuit electro-magnet or solenoid with

a moving frame on which it is supported, a carbon-rod-clamping device moved by said electro-magnet or solenoid, and a shunt-magnet or solenoid adapted to move said frame, said moving frame suspended on spring-bars.

3. In an arc lamp, the combination of a main-circuit electro-magnet or solenoid with a moving frame on which it is supported, a carbon-rod-controlling device moved by said electro-magnet or solenoid, and a derived-circuit electro-magnet or solenoid adapted to move said frame.

4. In an arc lamp, the combination of a moving frame with a main-circuit electro-magnet or solenoid supported on such frame, a carbon-rod clamp actuated thereby, and a lever pivoted at one end and attached toward its other end to an armature of the derived-circuit electro-magnet or solenoid and connected with such frame, so that the movement of the latter is affected by the derived-circuit electro-magnet or solenoid.

5. In an arc lamp, the combination of the moving frame with a main-circuit electro-magnet or solenoid supported thereon, a carbon-rod clamp actuated thereby, and a lever fulcrumed on a rigid support attached to the armature of the derived-circuit electro-magnet or solenoid, and connected with such frame, so that the motion of the frame is affected by the derived-circuit electro-magnet or solenoid.

6. In an arc lamp, the combination of a moving frame with a main-circuit electro-magnet or solenoid supported thereon, a carbon-rod clamp actuated thereby, and a lever fulcrumed at one end and attached toward its other end to the armature of the derived-circuit electro-magnet or solenoid, an elastic support for such lever opposing the derived-circuit electro-magnet or solenoid, said frame resting upon said lever.

7. In an arc lamp, the combination of a moving frame with a main-circuit electro-magnet or solenoid supported thereon, a carbon-rod clamp actuated thereby, and a derived-circuit electro-magnet or solenoid, a lever rigidly supported at one point and elastically supported at another and connected with the frame and the derived-circuit electro-magnet or solenoid, so that the latter affects the movement of the former.

8. In an arc lamp, the combination of a carbon-separating electro-magnet or solenoid with a carbon-clamp connected therewith and operated thereby, a derived-circuit electro-magnet or solenoid, and an armature operated by the latter and connected with the former, so as to move the said carbon-separating magnet or solenoid.

9. In an arc lamp, the combination of a moving carbon-separating device containing a main-circuit electro-magnet or solenoid and a carbon-rod clamp controlled thereby to separate the carbons, with a derived-circuit electro-magnet or solenoid, and an armature connected therewith and operated thereby, and connected also with the moving carbon-separating device.

10. In an arc lamp, the combination of a moving main-circuit carbon-separating electro-magnet or solenoid with a carbon-clamp connected therewith and operated thereby, a derived-circuit electro-magnet or solenoid, and a lever connected with said carbon-separating device and operated by the derived-circuit electro-magnet and solenoid, said lever supported fixedly at one end and elastically at the other.

11. In an arc lamp, the combination of a carbon-separating device, consisting of a parallel moving frame, a main-circuit electro-magnet or solenoid supported thereon, a carbon-rod clamp supported by such electro-magnet or solenoid, with a derived-circuit electro-magnet or solenoid, and an armature extending between the latter magnet and the frame, so that it affects the motion of said frame.

12. In an arc lamp, a moving carbon-separating device containing the main-circuit electro-magnet or solenoid and the carbon-rod clamp, in combination with a double-acting stop for the clamp, both clamp and stop controlled by said magnet.

13. In an arc lamp, an electro-magnet mounted on a movable frame, in combination with a carbon-rod-clamping device and a double-acting stop for such clamp, both carbon-rod clamp and the stop therefor actuated by said electro-magnet.

14. In an arc lamp, an electro-magnet mounted on a moving frame, a carbon-rod clamp, a double-acting stop for such carbon-clamp, and a derived-circuit electro-magnet, an armature therefor connected with the clamp, both clamp and stop being actuated by the first-mentioned magnet or solenoid, and the clamp by the second-mentioned electro-magnet or solenoid.

15. In an arc lamp, an electro-magnet mounted on a movable frame, in combination with a carbon-rod-clamping device, a double-acting stop for such clamp, connections from the electro-magnet or solenoid to the clamp and stop, and a derived-circuit electro-magnet or solenoid, and an armature actuated thereby and connected with the carbon-separating device.

16. In an arc lamp, the combination of a moving elastically-supported carbon-separating device, which contains a main-circuit electro-magnet or solenoid and a carbon-rod clamp, a double-acting stop for said clamp, a derived-circuit electro-magnet or solenoid, and an armature actuated by the last-mentioned electro-magnet or solenoid and connected with so as to move the carbon-separating device.

17. In a carbon-clamp for arc lamps, the combination of two opposed carbon-clamping pieces, one shaped like a bell-crank lever, an

arm on which both are pivoted, the one at its angle, and means for moving said latter piece to control the carbon.

18. In a carbon-clamp for arc lamps, the combination of two opposed carbon-clamping pieces, one shaped like a bell-crank lever, an arm on which both are pivoted, one at its angle, and means for simultaneously moving the pivoted end of said arm and swinging the angular piece on such pivot to cause the pieces to clamp or release the carbon.

ELMER A. SPERRY.

Witnesses:
FRANCIS W. PARKER,
CELESTE P. CHAPMAN.