(No Model.)

2 Sheets—Sheet 1.

R. H. MATHER.

ELECTRIC ARC LAMP.

No. 268,254. Patented Nov. 28, 1882.

Fig. 1.

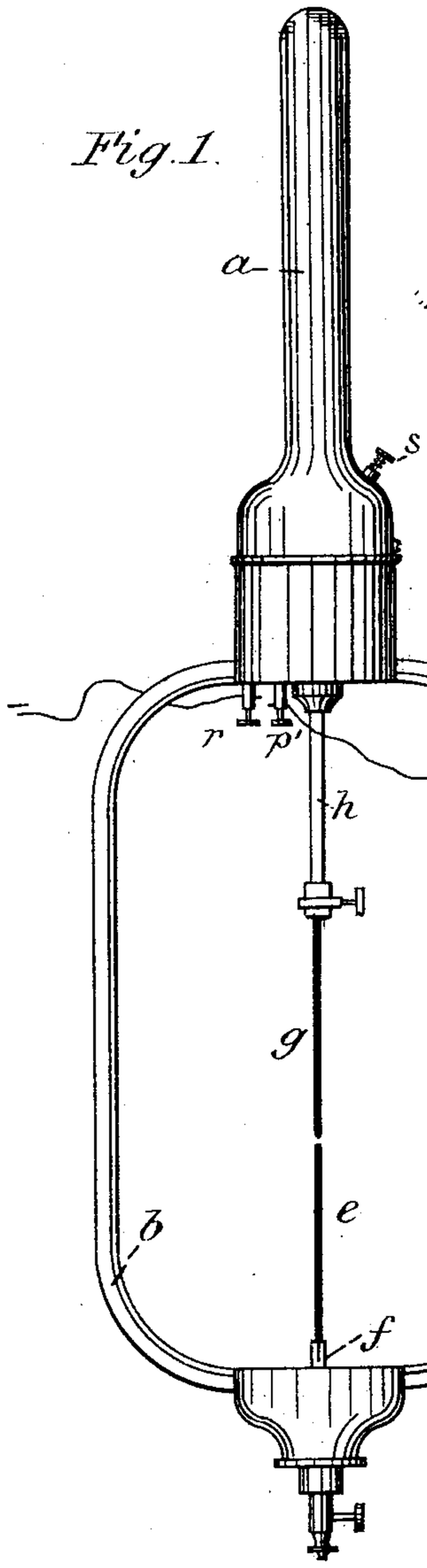


Fig. 3.

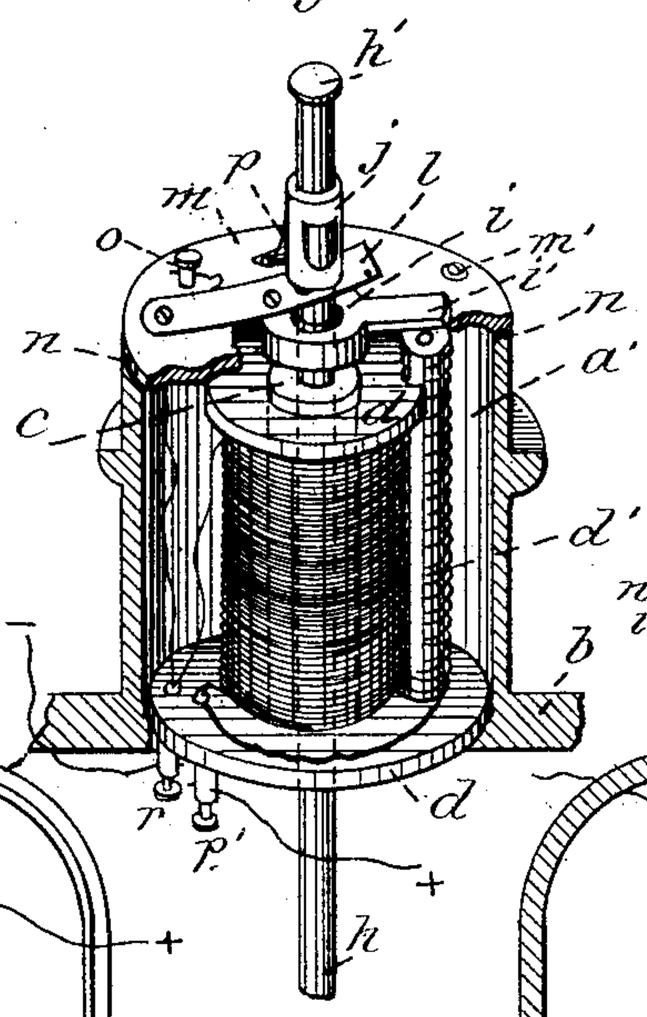


Fig. 2.

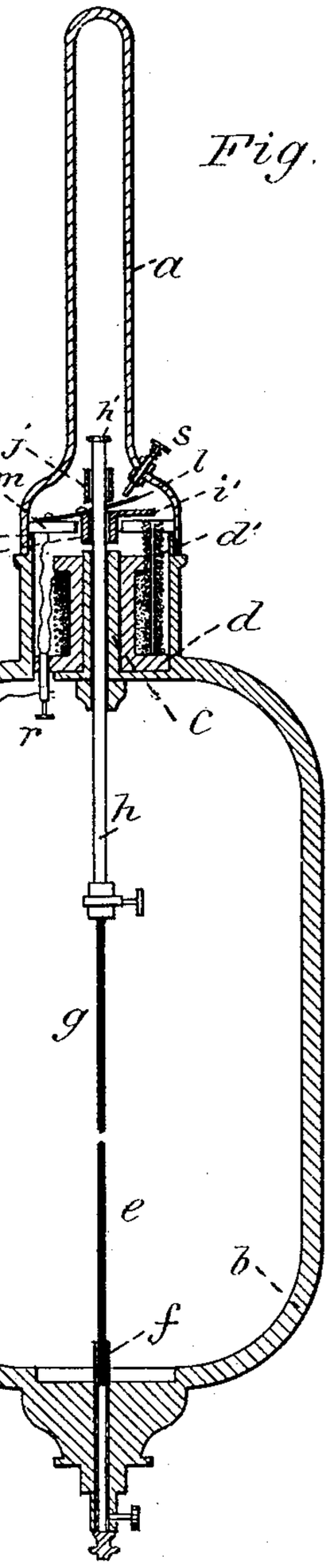
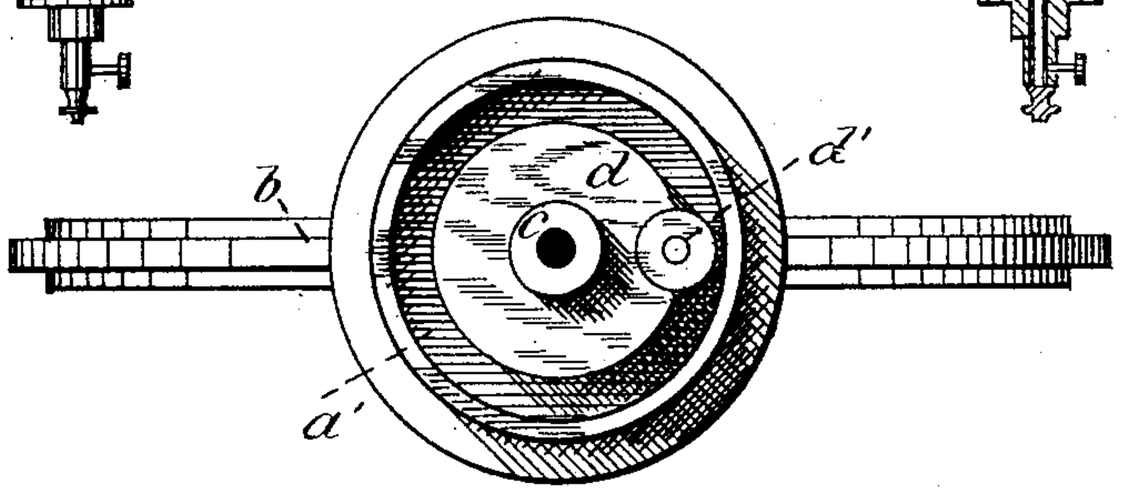


Fig. 4.



Witnesses.

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(No Model.) 2 Sheets—Sheet 2.

R. H. MATHER.

ELECTRIC ARC LAMP.

No. 268,254. Patented Nov. 28, 1882.

Fig. 5

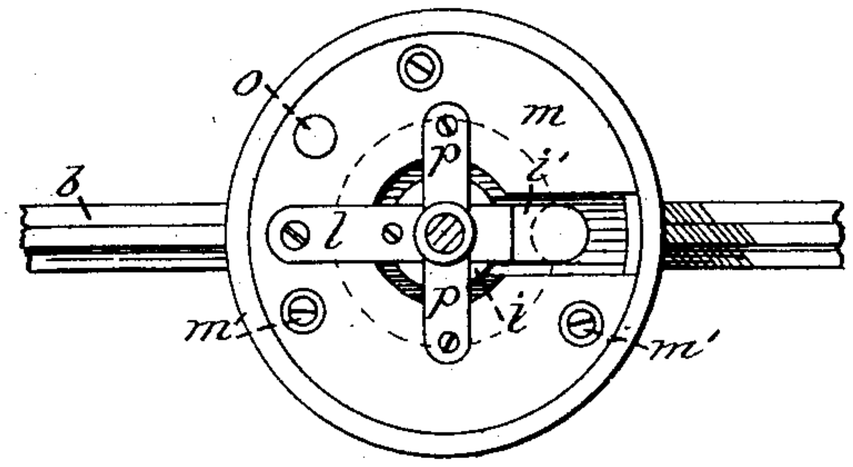


Fig. 6

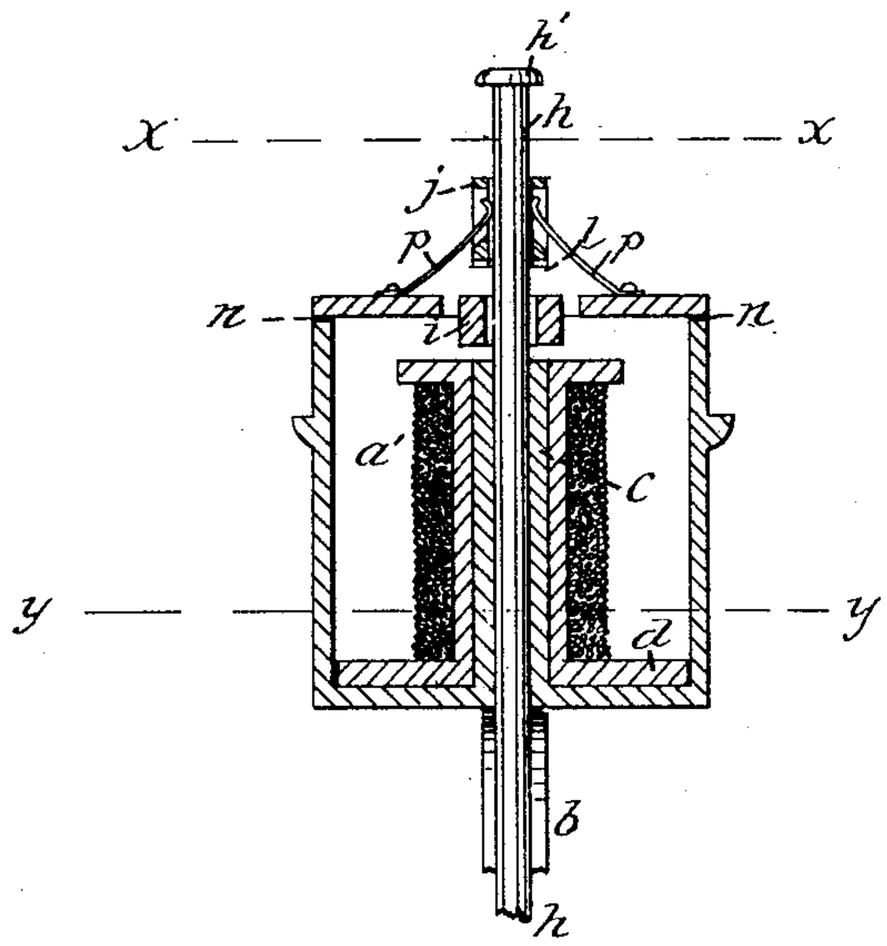
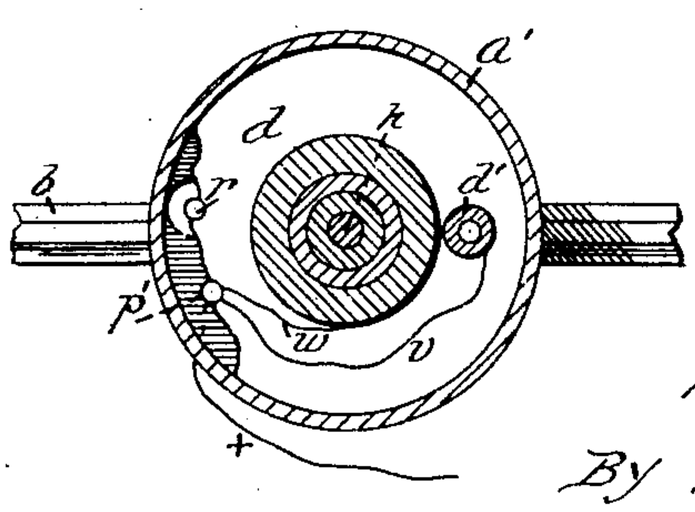


Fig. 7.



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UNITED STATES PATENT OFFICE.

RICHARD H. MATHER, OF WINDSOR, CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 268,254, dated November 28, 1882.

Application filed July 28, 1881. (No model.)

To all whom it may concern:

Be it known that I, RICHARD H. MATHER, of Windsor, in the county of Hartford and State of Connecticut, have invented a certain new and useful Improvement in Electric-Arc Lamps, of which the following is a description, reference being had to the accompanying drawings, where—

Figure 1 is a front view of my improved lamp. Fig. 2 is a view in vertical section on a plane passing through the centers of the side frame. Fig. 3 is a view of a portion of the upper part of my improved lamp with a portion cut away. Fig. 4 is a top view of the same with cover and plate removed. Fig. 5 is a top view of the box and upper plate, showing details from a plane cutting the upper rod on plane *x x*. Fig. 6 is a view in vertical section through the box and shunt-magnet on a plane at right angles to that of Fig. 2. Fig. 7 is a top view of the box below the plane *y y* of Fig. 6, and it shows the method of connecting one terminal of the switch-magnet, one terminal of the shunt-magnet, and the wire from the positive pole of the battery with the post which passes through and is in contact with the frame of the lamp. The bottom of the spool is cut away at the left side of this view to show that the other post fast to the bottom of the spool is insulated by an air-space from the frame.

I am aware that electric lamps have been used in which the feed motion of the carbons has been effected, but this has been done in most cases by means of a costly system of regulating mechanism of clock-work or similar devices.

My improvement in this part of the lamp consists of a simple device for attaining the desired result, and secures a perfect and reliable lamp and practically steady light. I make use of a spring-clamp which supports the upper carbon and releases it automatically as the carbon is consumed. The clamp has appurtenant to it the armature of a shunt and of a switch magnet.

Another improvement consists in avoiding the many parts and the laborious method of fastening these parts by rods and nuts of the ordinary form of lamp, and in casting the frame of my lamp of suitable metal, as iron, in but two parts, which are easily and cheaply assembled.

In the accompanying drawings, the letter *a* denotes the cover or upper part of the lamp-frame, and *b* the lower part, having a portion extending upward and forming the hollow cylindrical core *c* of a shunt-magnet, and a box, *a'*, to contain the shunt and also a switch magnet.

A spool of any insulating material, as wood, is wound with a coil of insulated fine wire, the whole arranged to fit into the box *a'* about the core and forming the shunt-magnet *d*.

The lower carbon, *e*, is held in a split tube, *f*, which is inserted from below the frame *a* through a suitable opening, and is held in place by a thumb-screw or similar device. The upper carbon, *g*, is held by a rod, *h*, which passes through the center of the cylindrical core, *c*, through the annular armature *i*, through the spring-clamp *l*, and the sleeve *j*, and terminates at its top with a button or projecting rim, *h'*.

Within the box *a'*, and upon the insulated base of the shunt-magnet *d*, is placed a switch-magnet, *d'*, formed of a core of soft-iron wound with large copper wire.

A plate, *m*, of metal, is placed upon the rim of box *a'*, and is insulated from it by a washer, *n*, of suitable material, as paper. The plate *m* is secured to the rim by screws *m'*, which pass through insulating-washers of suitable material, as ivory or bone.

Fastened at one end to the plate *m*, and rising above it at the other end, is a spring-clamp, *l*, having in it a hole slightly larger in diameter than the rod *h*, which passes through it. In this raised and normal position of the spring-clamp the rod *h* is clamped by it and held in a fixed position.

Two thin strips of metal (brushes *p p*) are fastened to the upper surface of the plate *m*, (see Figs. 3, 5, 6,) and in such manner as to reach through openings in sleeve *j*, (see Figs. 3, 6,) and rest lightly against rod *h*, securing good connection between rod *h* and the plate *m*, which plate is connected with one pole of the battery (in this case the negative) by means of a wire attached to that pole and to post *o*, appurtenant to said plate.

The annular armature *i* is secured to the under side of the spring-clamp immediately over

the shunt-magnet core, and it forms, also, by means of projection *i'*, the armature of the switch-magnet *d'*.

A post, *p'*, passes through the frame *a*, in contact with it, and is secured to the wooden base of the shunt-magnet *d*. With this post are connected the wire (+) from the positive pole of the battery, one terminal, *w*, of the shunt-magnet, and one terminal of the switch-magnet, as seen in Fig. 7.

A post, *r*, passes through the frame *a*, insulated from it, as shown in Fig. 2, and is secured to the base of the shunt-magnet. Wires from the negative pole of the battery, from post *o*, and the other end of the wire of the shunt-magnet are connected with this post.

The operation of my device is as follows: A current of electricity from a suitable source—as a battery or a dynamo-electric machine, in which the whole current is passed through the external work—is passed into the lamp at any part, as post *p*, and as the carbons are not in contact through the coil of the shunt-magnet *d*, this current magnetizes the core *c* very strongly, and draws down the armature *i* and the appurtenant spring-clamp *l*, and allows the rod *h* and the upper carbon to slip down by the action of gravity and make contact between the upper and lower carbons. The main portion of the current at once passes through the carbons, and only a small portion of it through the coil of the shunt-magnet, releasing the armature and spring-clamp, which, springing up, causes the clamp to engage rod *h*, lift it, and slightly separate the points of the carbons. The circuit through the carbons is now the shortest, the arc is formed, and the points of the carbons become incandescent. In proportion as the carbons are consumed, and the distance between the points widens the strength of current through the coil of the shunt-magnet is increased and the armature is drawn down, and with it rod *h*, until it is released from spring-clamp *l* and the rod and carbon fall. The carbon continues to fall until the current through the shunt-magnet is decreased by the shortening of the arc, the armature is released, and the clamp again holds the rod. If the carbon should fall too far—that is, so as to strike the lower carbon—the recoil of the spring-clamp is sufficient to separate the carbons and form an arc of proper length.

I make provision for the automatic extinction of any lamp on a circuit by using a switch-magnet, placed as already described, and having one end of the coil attached to the frame of the lamp, as at post *p*, and the other to the soft-iron core of the magnet. As soon as the upper carbon is nearly consumed the button *h'* strikes the top of the loose sleeve *j*, which rests on the spring-clamp *l*. The carbon now fails to feed when the armature is depressed, and the strength of the current through the shunt-magnet increases with the length of arc as the carbons are consumed, and the armature is pulled down until it brings its projecting portion *i'* into contact with the core of the switch-magnet. Instantly through the coil of the switch-magnet a new circuit is formed, magnetizing the core and retaining the armature in its depressed position. At the instant when the armature strikes the core of the switch-magnet there are three circuits open for the current—one through the carbons, a second through the shunt-magnet, and a third through the switch-magnet. The latter acts as a short circuit, and the light goes out without extinguishing any other lamp that may be on the same circuit.

A switch of any ordinary form operated by hand is used on each lamp to connect the ends of the positive and negative wires and cut the lamp to which it is affixed out of the circuit.

The cover *a* fits on the flanged rim of box *a'*, and is secured to it by screws. Inserted through an opening in the cover *a* and held in a raised position by a spring is a pin, *s*, which, when pushed down, strikes the spring-clamp *l*, and by depressing it allows the rod *h* to fall.

By holding down the spring-clamp by pressing down the pin or finger *s* the rod *h* may be slipped up through the spring-clamp and a new carbon inserted without removing the cover of the lamp.

I have used the term "spring-clamp" as that best describes the perforated spring in which the edges of the annular perforation bind or clamp the rod and hold it suspended by the spring. This binding action begins at a point a short distance below the normal position of the spring when holding the rod. It is of the utmost importance to the perfect action of the device that these functions of spring support and clamp be joined in one part or piece, as herein shown and described, and this constitutes one of the main features of my improvement.

I claim as my invention—

1. In combination, in an electric lamp, a frame, *b*, shunt-magnet *d*, switch-magnet *d'*, rod *h*, having button *h'*, or its equivalent, and sleeve *j*, whereby the spring-clamp is automatically depressed, the rod released, and the lamp extinguished, all substantially as described.

2. In an electric lamp, the shunt-magnet core *c* and concentric walls of box *a'*, cast integral with the lamp-frame *b*, in combination with the centrally-located carbon-holder *h* and its feeding mechanism, all substantially as described.

3. In an electric lamp, the shunt-magnet core *c*, cast integral with the lamp-frame *b*, in combination with the centrally and vertically reciprocating carbon-holder, rod *h*, armature *i*, shunt-magnet *d*, switch-magnet *d'*, spring-clamp *l*, and electrodes, all substantially as described.

4. In an electric lamp, the combination of frame *b*, shunt-magnet *d*, switch-magnet *d'*, armature *i*, spring-clamp *l*, sleeve *j*, rod *h*, with button *h'*, brushes *p*, holder *f*, and carbons *g*

and *c*, connected with and operated by a single or main battery, all substantially as described.

5. In an electric lamp, the combination of frame *b*, shunt-magnet *d*, armature *i*, spring-clamp *l*, rod *h*, holder *f*, and carbons *g* and *c*, all substantially as described.

6. In an electric lamp, a feeding device consisting of a carbon-supporting spring-clamp operated by a shunt-magnet and the recoil of the spring, in combination with an automatic extinguishing device, all substantially as described, and for the purpose set forth.

7. In an electric lamp, a leaf-spring secured at one end to the lamp-frame and perforated at the other and raised end for the passage of a carbon-holder, which holder is supported and operated by the spring and a shunt-magnet in feeding the upper carbon, all substantially as described.

8. In an electric lamp, in combination, a leaf-spring secured at one end to the lamp and perforated at the other and raised end, rod *h*, and automatic extinguishing device, all substantially as described.

9. In an electric lamp, the combination of spring-clamp *l*, shunt-magnet *d*, armature *i i'*, switch-magnet *d'*, and rod *h*, all substantially as described.

10. In an electric lamp, in combination, a leaf-spring secured at one end to the lamp and perforated at the other and raised end, whereby a clamp is formed, a carbon-supporting rod adapted to reciprocate vertically within the clamp, and a pin or finger retracted by a spring, all substantially as described, and for the purpose set forth.

11. In an electric lamp, in combination, frame *b*, cover *a*, pin *s*, with supporting-spring, spring-clamp *l*, and rod *h*, all substantially as described.

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Witnesses:
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