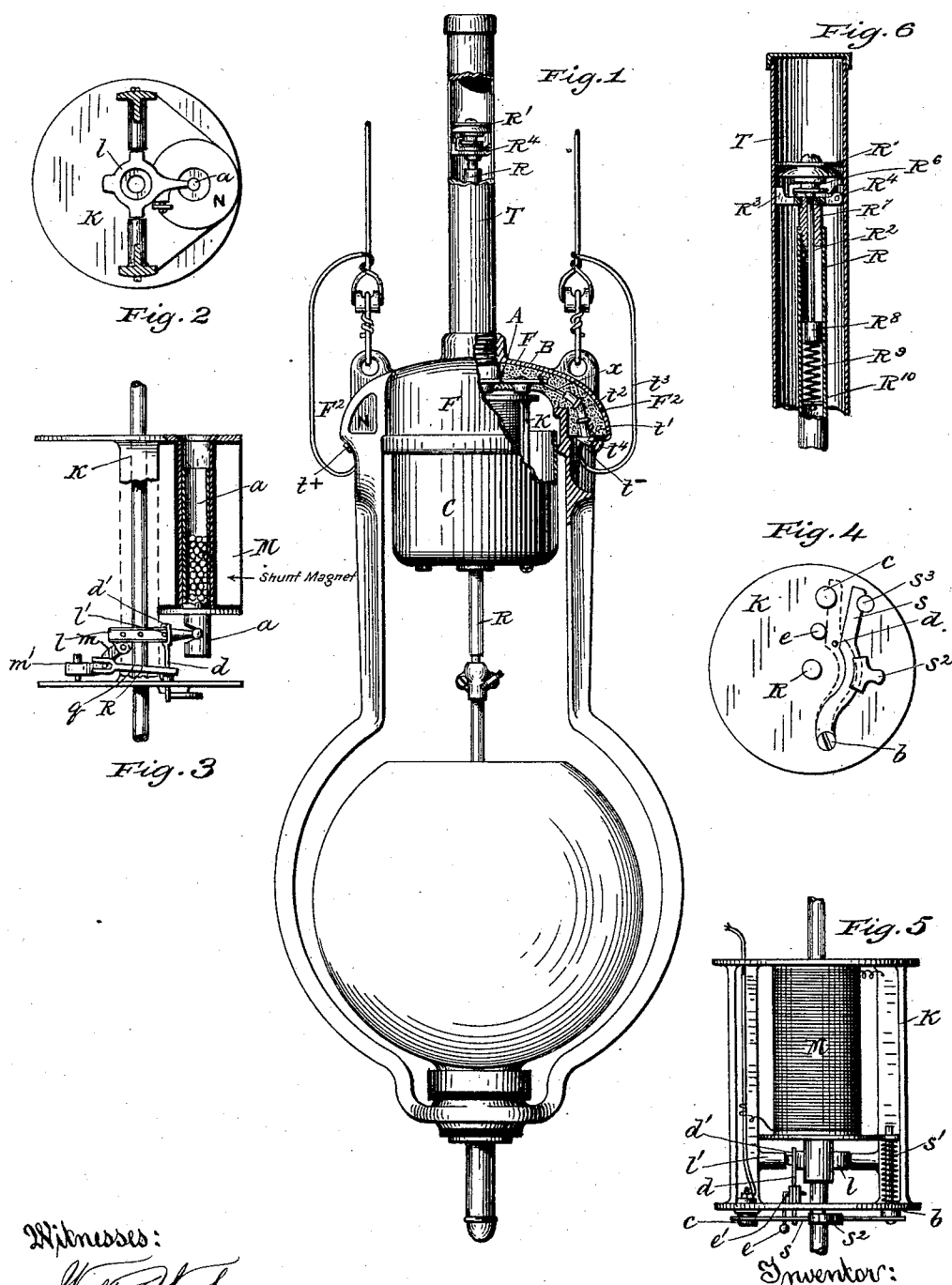


(No Model.)

A. G. WATERHOUSE.
ELECTRIC ARC LAMP.

No. 468,711.

Patented Feb. 9, 1892.



Witnesses:

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UNITED STATES PATENT OFFICE.

ADDISON G. WATERHOUSE, OF HARTFORD, CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 468,711, dated February 9, 1892.

Application filed August 21, 1891. Serial No. 403,348. (No model.)

To all whom it may concern:

Be it known that I, ADDISON G. WATERHOUSE, a citizen of the United States, residing at the city of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

In another application, Serial No. 387,317, filed by me April 1, 1891, I have shown and described an electric-arc lamp having certain novel features which relate to the lamp-frame and the means of connecting the regulating mechanism and electrodes to the same, together with improvements in its details.

My present invention consists in some modifications and improvements upon the devices shown in said application, and also in certain improvements in automatic cut-out devices for electric-arc lamps, and the same will be understood with reference to the accompanying drawings.

Figure 1 shows a side elevation of an arc lamp with part cut away. Fig. 2 is a sectional plan of the regulating mechanism. Fig. 3 is a side sectional elevation of Fig. 2. Fig. 4 is the bottom of Fig. 2, showing part of the regulating mechanism. Fig. 5 is an elevation at right angles to that shown in Fig. 3. Fig. 6 is a detail.

Fig. 1 shows a side elevation of a lamp with part cut away, showing the interior of part of its cup-shaped top F, exposing part of the regulating mechanism K, which is screwed to anchor-plate A, rigidly secured in the interior of F by means of the cement B, as described in my said previous application.

My present invention relates in part to the manner of constructing and securing the terminals $t-$ and $t+$ in the frame F. In the drawings referred to $t-$ only is shown. This terminal is provided with a head t' , in which the conductor t^3 is inserted and secured by the screw t^4 , which enters the head at right angles to the conductor t^3 and binds it. The terminal $t-$ is provided with a rough or ribbed shank t^2 , which is electrically connected to the anchor-plate A by means of the conductor x . The terminal $t-$ is surrounded, except on its under side, by the socket or projection F^2 , which completely shelters the terminal $t-$ from rain

or moisture and allows the conductor t^3 to reach it by being bent in a way that will cause any water descending on F and t^3 to drip off before it reaches the terminal $t-$. The cup-shaped lamp-top F and the projections F^2 are made large enough to receive the anchor-plate A and terminals $t+$ and $t-$ without forming a contact between them and the lamp-frame. These parts are first inserted and held in their positions while a cement, which will harden and also act as an insulator, is poured or pressed into F and F^2 , so as to surround A and t and conform to the inner surface of F and F^2 and securely hold these parts in their places.

The cut-out, consisting of a hand-switch, which is also worked automatically by the controlling magnet or magnets of the lamp, is shown in Figs. 2, 3, 4, and 5. The purpose of this switch is for short-circuiting the lamp by hand to trim the carbons or extinguish the light or to enable the controlling magnet or magnets to short-circuit the lamp automatically whenever the arc becomes dangerously long or for other causes which may happen, tending to increase the resistance of the lamp beyond its proper limit. When the switch S (see Fig. 4) is closed, the terminals b and c are electrically short-circuited, and when the switch is open the direct communication from b to c through S is broken. I have not shown the conductors leading to these terminals b and c , as it is understood they represent the two sides of the arc, so that when they are connected the current passes through S, which forms a short circuit around the arc and lamp, and when the switch is open the current passes through the lamp and arc. In construction this switch consists of the terminals b and c and blade S, as shown in Fig. 4. The blade S is pivoted to b and provided with a spring S' , (see Fig. 5,) which brings a swinging tension on the blade, which will cause it to snap toward terminal c and press hard enough against it to secure a good contact. S is provided with an insulated handle S^2 . By taking hold of S^2 and drawing S back, as shown in Fig. 4, so that it will rest in a notch formed in the insulated bearing S^3 , the drop-bolt d slides down past the edge of S and prevents

its return or holds the switch open. (See Fig. 5.) When the switch is to be closed by hand in order to cut the lamp out, the insulated knob *e* is pressed upward, this knob *e* being attached to the bolt *d* by means of a wire *e'* or in any other way raises the bolt *d* so that its end passes the edge of *S* and liberates *S* and allows it to snap against the terminal *c* and close the switch. The automatic operation of this switch is as follows: The bolt *d* (see Fig. 3) is provided with a slotted head or a hook *d'*, against which a pin *l'*, placed in the lever *l*, strikes. When the lever is tipped to a certain angle, this pin *l'* raises the bolt *d* and allows the switch-blade to snap and close the switch. The lever *l* is actuated by the controlling-magnets and so arranged that the movement of the magnets, acting through the lever *l* and clutch *q*, (see Fig. 3,) raise and lower the carbon-rod *R*, thereby regulating the arc.

Fig. 3 shows a sub-lever *m*, which is pivoted to the main lever *l* at one end, while its other end is provided with an adjusting-screw *m'*. The lower end of this screw rests upon the bottom of the frame *K* and acts as a fulcrum for the lever *m*. The clutch *q* is pivoted to *m* at a point between the lever *l* and the fulcrum-screw *m'*. By changing the screw *m'* the liberating-point of the clutch *q* can be adjusted. The motion of the magnet is such in this case as to separate the carbons by means of the weight of the armature *a*. As the current begins, it has to pass through the high-resistance shunt-coil *M*, which immediately draws the armature *a* up and tips the lever *l* in a way to lower the clutch *q* and allow the upper carbon to gravitate, so as to cause the carbons to meet. Then the main current finds a low-resistance route and passing through the arc produces light. As the arc is formed the resistance of the lamp is lowered, the magnet *M* weakened, and the weight of *a* raises the upper carbon until an increase of resistance, resulting from the carbons burning away, strengthens *M*, and again causes the carbons to feed together, as above described.

The method of causing the movement of the magnet to snap the switch *d* is by adjusting the clutch so as to cause the carbon to feed before the armature reaches the end of its stroke; but if the armature moves beyond that point it will snap the switch.

In case the lamp works correctly the armature will only move far enough to cause the lamp to feed; but in case the rod gets caught or the carbons fail to feed, then the resistance of the lamp increasing will move the armature to the extreme end of its stroke and snap the switch. This form of switch is not confined to the form of regulating-magnet shown, as it will apply as well to the form in which a main-circuit magnet is used to separate the carbons while they are fed together by the opposing force of a shunt-circuit coil. The peculiarity of the form of magnet shown is that the upper carbon is raised by the pre-

dominating weight of the armature *a*, acting through the lever *l*, sub-lever *m*, and clutch *q*.

The lamp is regulated by changing the weight of *a* by inserting or taking out the shot shown in the bore of *a*.

Fig. 6 is a detail of the clamping device used for producing a slow downward motion to the carbon rod similar to the one shown in my aforesaid application. The present improvements consist in connecting the head *R*³, into which the cam-lever *R*⁴ is secured, to the carbon rod *R* by means of the nipple *R*⁷, made of bone or some insulating material. The stem *R*², attached to the plunger *R*¹, is insulated from but guided in the rod *R* by means of the nipple *R*⁷ and lower insulator *R*⁸. The spring *R*⁹ is supported by the cross-pin *R*¹⁰ and presses the stem *R*² upward, and this raises the plunger *R*¹ and tilts the lever *R*⁴, which enters the groove *R*⁶ of plunger *R*¹, thereby taking out any slack motion between the head *R*³, lever *R*⁴, and tube *T*.

What I claim as my invention is—

1. An electric-arc-lamp frame consisting of a cup-shaped top *F*, having side sockets for receiving lamp-terminals, said lamp top and sockets formed so as to completely cover and surround the regulating mechanism belonging to the lamp and the lamp-terminals, and an anchor-plate *A*, electrically connected to one of said terminals, said anchor-plate and terminals being embedded and rigidly secured in their places by means of said cement, which conforms and adheres to the inner surface of said lamp top and sockets, substantially as and for the purposes set forth.

2. In an electric-arc lamp, the combination of the anchor-plate *A*, and terminals *t*— and *t*+, and the insulating-cement *B*, into which they are embedded, with the lamp-top *F*, having sockets *F*², adapted for sheltering and surrounding said anchor-plate and terminals, substantially as and for the purposes set forth.

3. In an electric-arc lamp, the combination of a carbon-rod, a regulating-magnet, an adjustably-weighted armature therefor, and means controlled by the armature for normally separating the carbons, substantially as and for the purposes set forth.

4. In an electric-arc lamp, the retarding mechanism consisting of the closed top tube *T*, plunger *R*¹, and stem *R*², connected to the carbon-rod *R* by means of the clamping-lever *R*⁴ and head *R*³, in combination with the insulating-nipple *R*⁷, tightening-spring *R*⁹, and the grooved head *R*⁶ for engaging the lever *R*⁴, substantially as and for the purposes set forth.

5. In an electric-arc lamp, the external hand-switch *S*, provided with a vertical pivot, and a torsional spring *S'*, placed inside of the frame holding the regulating mechanism and adapted to keep the switch closed by pressing it against the insulated terminal *c*, in combination with the latch-bolt *d*, adapted for holding the switch *S* open, said bolt being withdrawn by the extreme movement of the lever

l, actuated by the regulating-magnet and allowing said switch to close, substantially as and for the purposes set forth.

5 6. In an electric-arclamp, a short-circuiting device consisting of the swinging blade S and vertical pivot and spring S', normally adapted to keep the terminals b and c closed, in combination with the upright latch-bolt d, adapted for being liberated by the controlling-lever l,
10 and the hand-knob e, substantially as and for the purposes set forth.

7. The compound lever m, pivoted at one end to the main lever l and resting on the floor of the magnet-frame at its other end, said compound lever having the regulating- 15 clutch q pivoted at or near its center, substantially as and for the purposes set forth.

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Witnesses:

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