

(No Model.)

H. R. BOISSIER.

ELECTRIC LAMP.

No. 354,530.

Patented Dec. 21, 1886.

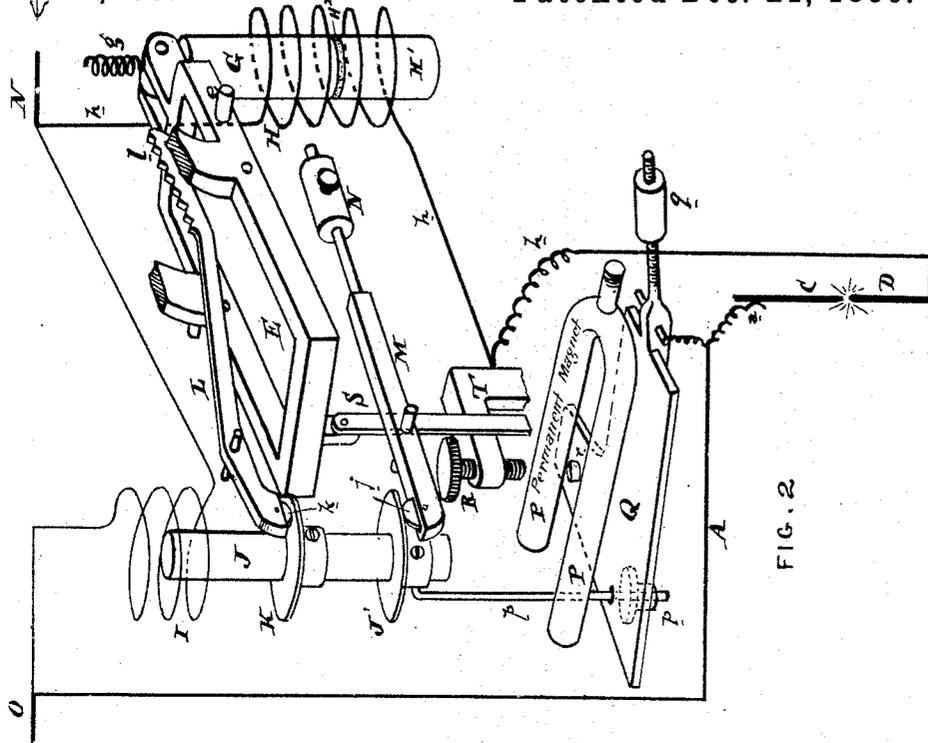


FIG. 2

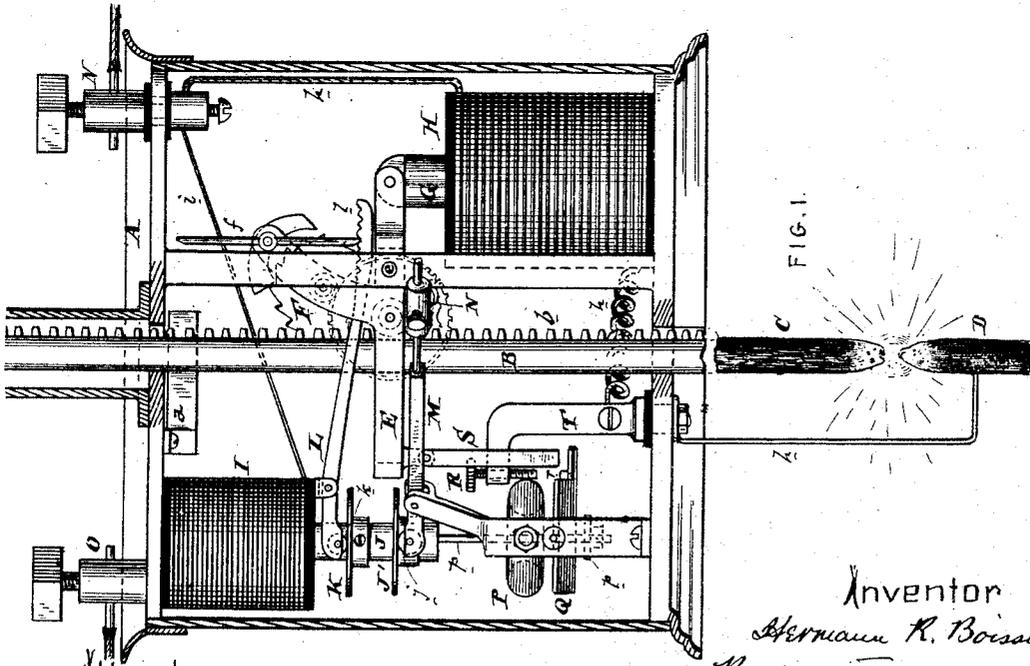


FIG. 1.

Test
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Inventor
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 By his atty
[Signature]

UNITED STATES PATENT OFFICE.

HERMANN R. BOISSIER, OF NEW YORK, N. Y.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 354,530, dated December 21, 1886.

Application filed June 7, 1886. Serial No. 204,399. (No model.)

To all whom it may concern:

Be it known that I, HERMANN R. BOISSIER, of the city, county, and State of New York, have invented a new and useful Improvement in Electric Lamps, of which the following is a specification.

My invention has reference to electric lamps; and it consists in certain improvements, fully set forth in the following specification and shown in the accompanying drawings, which form part thereof.

In carrying out my invention I provide the lamp with a low-resistance helix and a high-resistance helix, both of which are always in circuit, and in which, when the lamp is properly working, the low-resistance helix constantly attracts its armature-core and does not perform any direct action, so far as the regulation of the distance apart of the carbons is concerned, this latter function being controlled exclusively by the high-resistance helix, which is also arranged in a shunt-circuit. The main functions of the low and high resistance magnet or helices are to first draw the carbons apart when the current is turned on; secondly, regulate the distance apart of the carbon; thirdly, if from any cause the carbon should not feed and the arc be cut out, the current shall still traverse the low-resistance helix, preventing destruction of the high-resistance helix, and, fourthly, if the line-current should be broken or the lamp cut out of the circuit, the low-resistance helix would become practically demagnetized, and this action would lower the carbons and reset the cut-out, so that when the current is once more sent through the lamp it is found to be in operative condition. In a lamp of this construction it will be observed that the carbons, once the arc is formed, always approach each other and cannot be drawn apart, the high-resistance helix and its core operating to control the approach of the carbons. The core or armature of the high-resistance or arc-controlling helix is counterbalanced by an adjustable counterbalancing-lever, or its equivalent, so that the slightest variation in the strength of the current instantly controls the feeding of the carbons. This feature of counterbalancing the carbon-feeding core is very important. To cut out the arc of the lamps, I provide a permanent magnet and pivoted

armature, which armature is connected to the frame of the lamp or in circuit with one main binding-post, and this armature, when the strength of the high-resistance helix has greatly increased, is drawn up by the attraction of the core of said helix moving the armature of the permanent magnet within such a position that it is instantly attracted and caused to close a cut-out circuit, which cuts the carbons out and insures an auxiliary circuit being closed, which has the effect of still keeping the low-resistance helix in circuit, and thus prevents any possibility of the destruction of the high-resistance helix. A finger actuated by the core of the low-resistance helix is so arranged that when the said helix is de-electrified from any cause the said finger is caused to press down the armature of the cut-out or permanent magnet and break the shunt-connection, the said operation also bringing the carbons together and re-establishing the arc.

My object is to make the lamp so that the feeding of the carbon is wholly under the control of the high-resistance or shunt helix, whereby if a number of lamps arranged in series are on a circuit in which the current varies to an appreciable extent the lamps shall be so sensitive in working that they may be controlled by such a small portion of said current as to be incapable of showing such variations in the arc as is commonly the case in differential-principled lamps, or those in which the arc is controlled by the differences in an attraction of a low-resistance helix in arc circuit and a high-resistance helix in a shunt-circuit. This is particularly valuable in the illumination of houses and buildings where the number of lamps in circuit is constantly being changed. The resistances of the helices do not require to be closely calculated for the given number of lamps in said circuit. Increasing or decreasing the number of lamps in circuit does not materially affect the working of these lamps, and a most steady light is obtained even with considerable variations in the strength of the current used.

In the drawings, Figure 1 is a sectional elevation of an arc embodying my improvements, and Fig. 2 is a perspective view illustrating the main working parts and circuits.

A is the frame of the lamp.

B is the upper-carbon holder, and carries the carbon C, and is provided with a rack, *b*. This carbon-holder is fed by gravity and controlled by the escapement-gearing F, which is provided with the usual resistance-fan, *f*, whose vibrations are controlled by a lever, L, having teeth *l* to catch said fan and arrest its vibration, the said lever being provided on the other end with an anti-friction wheel, *k*, working upon a disk, K, which is attached to the core J of the high-resistance helix I. By this means it is seen that if the high-resistance helix is excessively magnetized and attracts its core the fan F will be liberated and the carbon C will approach the carbon D, regulating the arc and decreasing its resistance. The armature J is counterbalanced by a lever, M, having upon one end the adjustable counterbalancing-weight N, and upon the other end with a wheel or roller, *j*, working against a disk, J', upon the armature or core J. By this means the core can be accurately counterbalanced, and thereby made sensitive to the slightest variation in the magnetization of the helix I.

The frame E is pivoted at *e*, and carries the escapement-gearing F, and is oscillated by the core G of the low-resistance helix H, which helix is in circuit with the binding-post N by the wire *h*, the current passing through the arc, carbons, holder B, contact-spring *a*, frame A, and binding-post O. By this it is seen that so long as the arc is maintained the helix H is fully magnetized and its core remains down. The attraction of the core is still further insured and its depression not affected by slight variations in current by providing the lower part of the helix H with an iron core, H', whereby the core G is drawn down with great force and positively held down. A disk of paper or non-conducting material, H², is placed between the cores H' and G to prevent actual contact.

If the current were broken, the frame E would oscillate, raising the core G and lower the carbon-holder until the carbon touched. As soon as the current was put on or the circuit established the frame E would be oscillated in an opposite direction, raising the carbon-holder and separating the carbons. Further regulation necessary, due to the burning of the carbons, will be accomplished by the helix I, as hereinbefore stated, this helix being in circuit with the binding-post O and N by shunt-wire *i*.

P is a permanent magnet, and Q is its armature, which latter is preferably provided with a counter-balance, *g*, to regulate the time of positive action of the magnet P. If this armature Q be raised within a certain distance of the magnet P, it will be instantly attracted thereto, and will close an auxiliary or shunt circuit and keep it closed until the said armature is pushed out of range of the attraction of said magnet. This armature Q may be raised directly or indirectly by the core J of the helix I, for when this helix is unduly mag-

netized by an excessive arc or breaking of the arc this auxiliary cut-out must act. This armature Q is in circuit with the binding-post O through the frame of the lamp or otherwise, and is provided with a contact, *r*, which, when the armature is raised, touches the adjustable contact-screw R, carried by the bracket F. This bracket is connected in circuit with the wire *h* and between the low-resistance helix H and carbons. If, now, we suppose that for some reasons the arc became too great or broke and thereby endangered the insulation of the high-resistance helix I, the core J would be instantly raised, lifting the armature Q and closing the auxiliary shunt-circuit, completing the main circuit through said auxiliary cut-out and circuit. This places the carbons and the arc in what might be termed a "shunt," for now the main current will pass through the cut-out device and practically cut the arc out of circuit, owing to its high resistance, and this also absolutely protects the insulation of the high-resistance helix I. If, now, the main circuit be broken, the helix H will become demagnetized and the frame E will draw the core G more or less out of the said helix and depress the contact breaker or arm S, which is loosely pivoted thereto, causing it to strike the raised armature Q of the cut-out and break the connection between H and *r*, thereby breaking the cut-out or auxiliary circuit. This oscillation of the frame E also depresses the carbons, bringing them in contact, so as to form the arc upon the current once more being established in the line-circuit. The frame or lever E may be so weighted that the moment the helix H is demagnetized it oscillates to raise the core G, or, if desired, a spring, *g*, may be used to mechanically raise the said core and oscillate the frame E.

The frame E and its gearing, by which the carbon-holder B is fed, is old and in use on the well-known Arnoux and Hochhausen lamps, but they are not controlled in the manner herein specified and shown. Of course it is evident that any other form of feeding mechanism might be used in place of that shown, the same being controlled by the armature J of the high-resistance helix I and worked independently of the low-resistance helix H, and I therefore do not limit myself to this particular construction. The general construction of the lamp may be varied to suit the ideas of the designer, and the details may be more or less modified without departing from my invention, for it is readily seen that while the construction of the adjustable disks K and J are advantageous, yet the levers L and M, or the counter-balances, might be coupled with said core J in any other mechanical manner—as, for instance, the lever M might work directly upon the bottom of the core J.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric lamp, the carbon-holders, feeding devices for the carbons, a high-resist-

ance helix arranged in a closed shunt-circuit to arrest the feeding of the carbons together, and the armature or core of said helix, which directly arrests the action of the feeding devices of the carbons, in combination with a counter-balance to counterbalance the weight of said armature-core, and means to adjust the connection of the counter-balance with respect to the core, substantially as and for the purpose specified.

2. In an electric lamp, the carbon-holders, feeding devices for the carbons, a high-resistance helix arranged in a shunt-circuit to arrest the feeding of the carbon, the armature or core of said helix working vertically in said helix, a lever operated thereby to directly control the feeding devices for the carbons, in combination with an adjustable counter-balance to counterbalance the weight of said armature or core, and a low-resistance helix to separate the carbons, substantially as and for the purpose specified.

3. In an electric lamp, the carbon-holders, feeding devices for the carbons, a high-resistance helix arranged in a closed shunt-circuit to arrest the feeding of the carbons, the core of said helix working vertically, a lever controlled by said core to directly arrest the action of the feeding devices for the carbons, in combination with a counter-balance to counterbalance the weight of said armature or core, a low-resistance helix in the main circuit, an armature or core therefor, and carbon-separating devices to move the carbons apart when the current is put on to form the arc, substantially as and for the purpose specified.

4. In an electric lamp, the carbon-holders, a high-resistance helix arranged in a shunt-circuit to control the feeding of the carbons and the armature or core of said helix, which directly actuates the feeding devices of the carbons, in combination with a counter-balance to counterbalance the weight of said armature or core, a low-resistance helix in the main circuit, an armature or core therefor, and carbon-separating devices to move the carbons apart when the current is put on to form the arc, a shunt, and an electrically-actuated cut-out device thrown into action to shunt or cut out the carbons or arc when the high-resistance helix is unduly magnetized, and a connection between said cut-out and low-resistance magnet, whereby it is thrown out of action to put the carbons into direct circuit by the action of the low-resistance helix upon breaking or greatly reducing the line-circuit, substantially as and for the purpose specified.

5. In an electric lamp, the low-resistance helix, always in line-circuit, the carbon mechanism, substantially as described, actuated by the low-resistance helix to separate the carbons to establish the arc, in combination with a cut-out or shunting device, which, upon an excessive length of arc being formed or upon the arc going out owing to the carbons not feed-

ing, shall automatically put said carbons into a shunt-circuit and connect the low-resistance magnet with the line-circuit, substantially as and for the purpose specified.

6. In an electric lamp, the low-resistance helix, always in the line-circuit, the carbon mechanism, substantially as described, actuated by the low-resistance helix to separate the carbons to establish the arc, in combination with a shunt-circuit, a cut-out or shunting device, a connection between said cut-out and high-resistance magnet, which, upon an excessive length of arc being formed or upon the arc going out owing to the carbons not feeding, shall automatically actuate said cut-out to put said carbons into a shunt-circuit and connect the low-resistance magnet with the line-circuit, and a connection between said cut-out and carbon-separating mechanism to break said shunt and reset the cut-out, whereby, when the low-resistance helix is demagnetized and the carbons made to meet, the cut-out circuit shall be broken and the carbons once more put into the line or main circuit, substantially as and for the purpose specified.

7. In an electric lamp, the combination of a high-resistance helix to feed the carbons and put the cut-out into action, a low-resistance helix to separate the carbons to establish the arc and put the cut-out out of action, and a magnetic cut-out device consisting of a permanent magnet and its current-closing armature, a circuit through the low-resistance helix and carbons, a shunt-circuit through the high-resistance helix, and an auxiliary circuit opened or closed by the cut-out armature to put the carbons into direct or shunted circuit, substantially as and for the purpose specified.

8. In an electric lamp, the combination of a high-resistance helix to feed the carbons and put the cut-out into action, a low-resistance helix to separate the carbons to establish the arc and put the cut-out out of action, and a magnetic cut-out device consisting of a permanent magnet and its circuit-closing armature, a circuit through the low-resistance helix and carbons, a shunt-circuit through the high-resistance helix, and an auxiliary circuit opened or closed by the cut-out armature to put the carbons into direct or shunted circuit, substantially as and for the purpose specified.

9. In an electric lamp, a cut-out for the carbons, consisting of a permanent magnet, in combination with an armature moved into and out of range of its magnetic field by the action of electro-magnets under the influences of the line-circuit, and a circuit opened or closed by the armature of the cut-out to put the carbons into or out of the line-circuit, substantially as and for the purpose specified.

10. In an electric lamp, the combination of the high-resistance helix I and its core J with the feeding mechanism for the carbons, and counterbalancing-lever M, having adjustable weight N, the low-resistance helix H, to establish the arc, the helix I being in a shunt-cir-

cuit around the carbons, and the helix H being in a direct circuit with the carbons, substantially as and for the purpose specified.

5 11. In an electric lamp, the combination of the high-resistance helix I and its vertically-
 10 moving core J, surrounded by said helix, with the regulating-lever L, actuated by said core, feeding mechanism for the carbons, and counter-
 15 balancing-lever M, having adjustable weight N, low-resistance helix H, to establish the arc, the
 20 helix I being in a shunt-circuit around the carbons and the helix H in a direct circuit with the carbons, permanent magnet P, cut-out armature Q, cut-out contacts R r, the contact r
 25 being in circuit with one binding-post and the contact R being in circuit with the line-circuit between the helix H and the carbons, a connection actuated by the helix H to throw
 30 the armature Q out of attractive position with reference to magnet P, and a connection between said core J and armature Q, by which the armature Q is raised within attractive distance of the magnet P when the helix I is unduly magnetized, substantially as and for the purpose specified.

12. In an electric lamp, the combination of the high-resistance helix I and its core J, with the feeding mechanism for the carbons, and counterbalancing-lever M, having adjustable
 30 weight N, the low-resistance helix H, to estab-

lish the arc, the helix I being in a shunt-circuit around the carbons, and the helix H being in a direct circuit with the carbons, permanent magnet P, cut-out armature Q, cut-out contacts R r, the contact r being in circuit 35 with one binding-post, and the contact R being in circuit with the line-circuit between the helix H and the carbons, and a connection between said core J and armature Q, by which the armature Q is raised within attractive distance 40 of the magnet P when the helix I is unduly magnetized, and finger or arm S, actuated by the low-resistance helix and adapted to push the armature Q out of attractive action of magnet P when the arc is established, sub- 45 stantially as and for the purpose specified.

13. The combination of the carbon-holder B, carbons C D, low-resistance helix H, having a fixed core, H', and in the line-circuit, 50 movable core G, actuated thereby to separate the carbons, high-resistance helix I in a shunt-circuit around the helix H, and suitable carbon-feeding devices actuated thereby, substantially as and for the purpose specified.

In testimony of which invention I hereunto 55 set my hand.

HERMANN R. BOISSIER.

Witnesses:

P. T. BROWN,
 W. PRINZLAU.