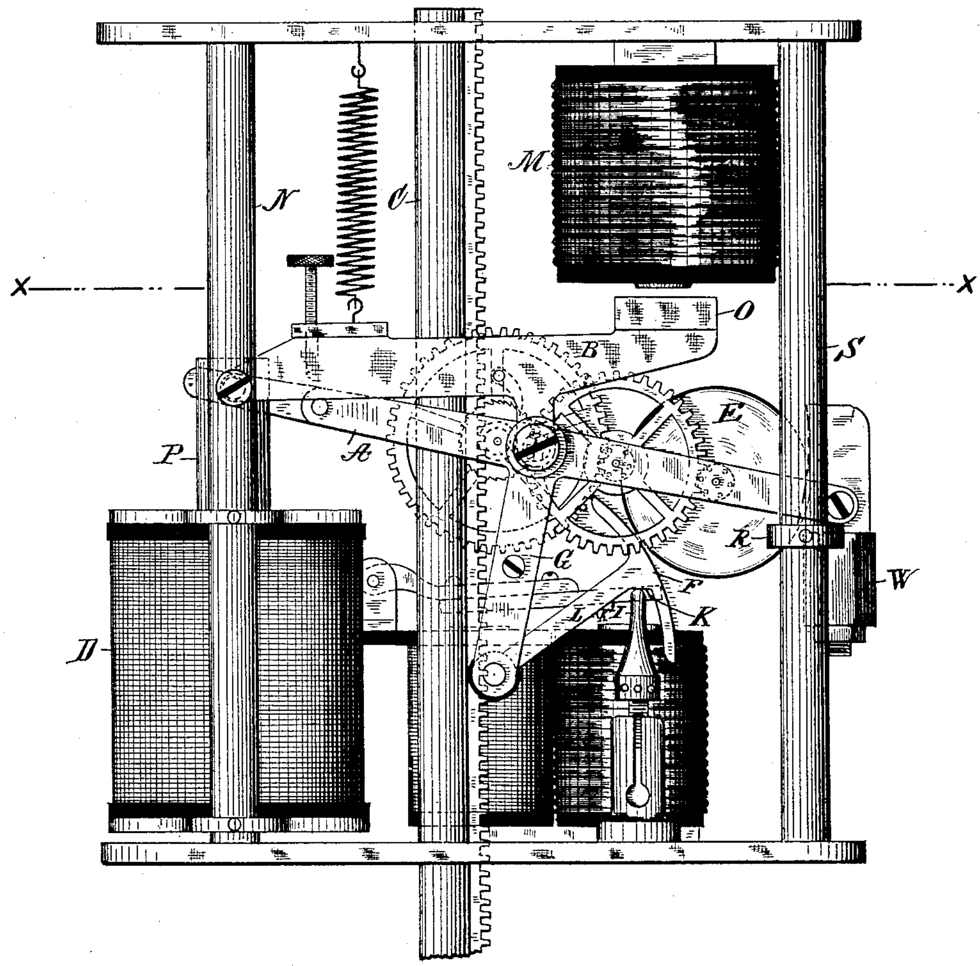
(No Model.) 3 Sheets—Sheet 1.

H. LEMP & M. J. WIGHTMAN.

ELECTRIC ARC LAMP.

No. 454,485. Patented June 23, 1891.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

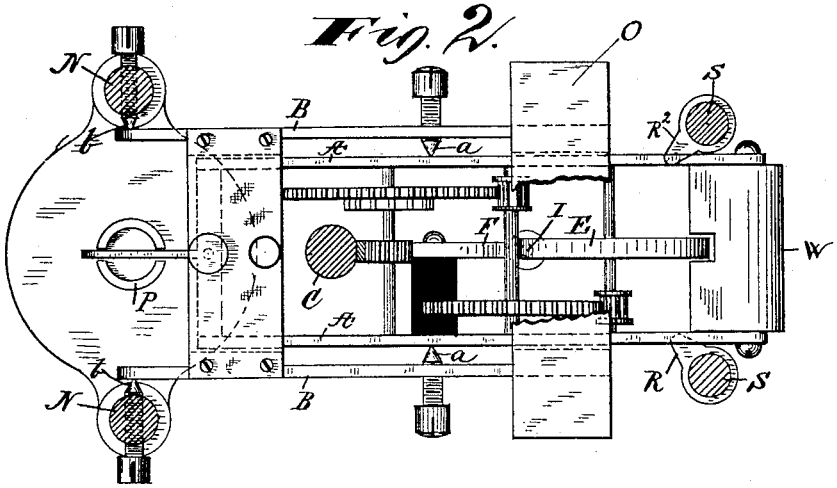

Fig. 3.

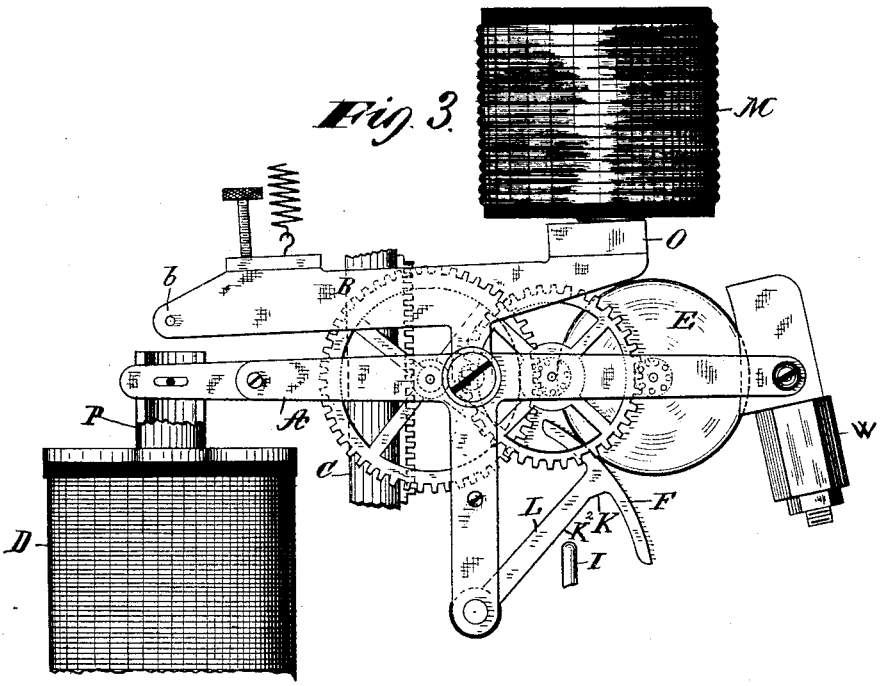

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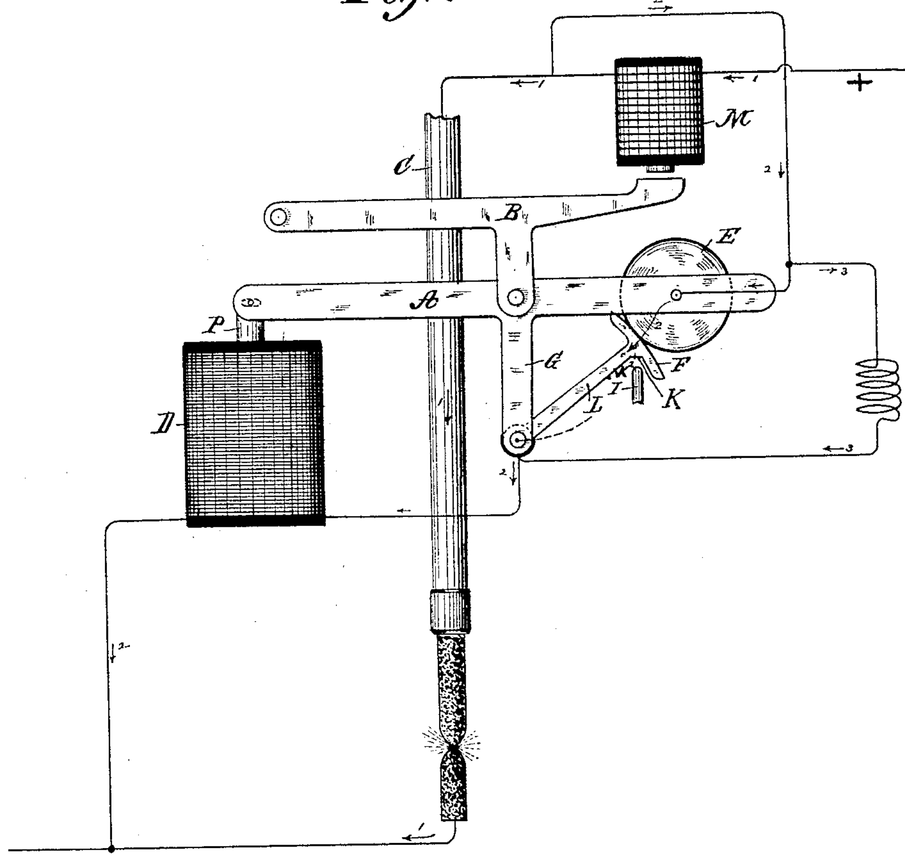
Fig. 4



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UNITED STATES PATENT OFFICE.

HERMANN LEMP AND MERLE J. WIGHTMAN, OF HARTFORD, CONNECTICUT, ASSIGNORS TO THE SCHUYLER ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 454,485, dated June 23, 1891.

Application filed October 26, 1886. Serial No. 217,241. (No model.)

To all whom it may concern:

Be it known that we, HERMANN LEMP and MERLE J. WIGHTMAN, citizens of the United States, and residents of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

Our invention relates to that class of electric-arc lamps in which the carbon or carbon-carrier is engaged by a feed-controlling mechanism supported on a lever that during the normal action of the lamp is under the sole control of a derived-circuit magnet acting in opposition to a suitable retractor. It has been before proposed to start a lamp of this kind into action by the agency of the current in a circuit independent of the derived circuit.

Our invention relates to an improved construction of such type of lamp whereby the arc may be formed by the operation of a main-circuit magnet which as soon as the arc is formed no longer plays any part in the operation of the lamp, the actions thereafter being under the control of the derived-circuit magnet and its retractor until the current is shut off from the circuit.

Our invention relates, also, to certain improvements in the detent devices controlling the movement of the feed-controlling mechanism, the object of which improvements is to secure increased delicacy of action and uniformity of feed.

Our invention consists in the special combinations of devices and improved details of construction, that will be described in connection with the accompanying drawings, and then specifically recited in the claims.

Referring to the drawings, Figure 1 is a side elevation of a lamp embodying our invention. Fig. 2 is a horizontal cross-section of the same on the line X X, Fig. 1. Fig. 3 shows the position of the parts when the lamp is in operation. Fig. 4 is a diagram of the circuits of the lamp.

The parts hereinafter referred to are supported in any suitable frame and in any suitable manner, as will be well understood by those skilled in the art.

C indicates a carbon or carbon-carrier of any description, which engages with the feed-controlling mechanism supported or carried by a lever or frame A or other suitable movable support adapted to have a reciprocating movement in the line of the carbons.

The feed-controlling mechanism may be of any desired description, but is herein illustrated as a wheel with which the carbon or carbon-carrier engages or is connected in any suitable manner, said wheel being in turn connected with a train of wheels, preferably also mounted on the support. The train of wheels herein shown is one that is commonly employed in what is known as "clock-work" lamps. The mechanical detent or releasing devices whereby said train of wheels may be held from rotation or may be permitted to move when a feed is to take place are herein shown as consisting of a brake-wheel E and a brake F, normally tending to engage with the brake-wheel and hold the same stationary and carried by a lever L. A suitable releasing-stop I, with which lever L may engage, is employed for disengaging the brake from the brake-wheel to permit the descent of the carbon-carrier under the action of gravity.

The lever or frame A is pivoted, as more clearly indicated in Fig. 2, on points *a*, that are in turn carried by a lever or movable support B, pivoted on points *b*, supported on posts N.

The lever A carries the core P of the derived-circuit magnet D, and is provided with a suitable retractor consisting of a weight W, that acts in opposition to the derived-circuit magnet.

The lever B carries the armature O of an electro-magnet M in the main circuit.

Stops R R^2, carried by posts S S, limit the movements of lever A.

Detent-lever L is pivoted on a post H, carried by an arm G, depending from lever A, and is adapted to come into engagement with the stop I at two points K K^2 on said lever L, according to the condition of the electro-magnets D M. The magnet mounted on the lower plate of the frame to the right of magnet D is an automatic switch-magnet of any ordinary construction; but as this forms no part of our present invention it will not be further referred to. The magnets D M are connected into the circuit in any proper manner,

as is well understood in the art and as shown in Fig. 4. When no current is on the circuit, the parts are in the position shown in Fig. 1 and the brake is removed from engagement with the brake-wheel through impingement of the lever L upon the stop at the surface K, so that the carbon is free to feed down into contact with the opposite carbon rod before the commencement of the operation of the lamp. When current is turned on, the magnet M, becoming excited, lifts the frame B and with it raises the lever A bodily, with the effect of first removing the brake or detent-lever L from engagement with its stop, so that the wheel E is locked, and a further movement of the parts results in lifting the upper carbon and gradually forming the arc. As the arc forms, the derived-circuit magnet D gradually increases in power and tilts the lever A, so that by the time a normal arc is formed the parts will assume the position shown in Fig. 3, with the part K^2 of the brake-lever opposite the stop I, so that a movement of translation of the lever L in a general horizontal direction would result in a disengagement of the brake from the brake-wheel and a consequent feed of the carbon.

The magnet M is supposed to be of sufficient power to hold the parts in a position shown in Fig. 3, its function as concerned in the operation of the lamp ceasing the moment the arc is formed. The point K^2 of the brake-lever being to one side of the horizontal line of lever A when in the position shown in Fig. 3, it is obvious that on an increase in the length of arc and a consequent increase of the power of the derived-circuit magnet D the lever A will be tilted or rocked, with the effect of giving to the detent-lever a movement in a general horizontal direction, so that by the engagement of the lever L with its stop the wheel E will be released and the carbon will feed down until through the establishment of the normal arc the balance between the derived-circuit magnet and its retractor may be re-established and the lever A will resume the normal position indicated in Fig. 3, where it will be maintained so long as the arc remains normal. If by any mischance the carbon should fail to feed, thus depriving the derived-circuit magnet of its power, weight W will tilt the lever A, so as to reform the arc, and this will be done independently of the main-circuit magnet M, which, being excited continually, will still hold its lever B in the position shown in Fig. 3.

When the current is turned off, the parts resume the position shown in Fig. 1, in which position the detent or locking devices for holding the carbon-feed mechanism to prevent movement of the carbon-carrier are unlocked, so that the carbon-carrier or carbon may fall sufficiently into contact with the opposite carbon-rod for a resumption of another operation when the current is turned on again.

In order to increase the delicacy of the feeding action, we interpose in the circuit of derived-circuit magnet D, as indicated in Fig. 4, an artificial resistance R^3, and we form a shunt around said artificial resistance through the contact-surface of the detent or governing devices that are in engagement when the feed-controlling mechanism is locked against movement. This is readily effected in the case of a detent or locking mechanism such as herein shown by suitably insulating the brake-wheel E and the lever L, one or both, from the frame in a manner obvious to electricians, and making suitable connections to said brake-wheel and lever, so that a shunt around the resistance shall be formed through the brake-surface, as clearly indicated in the diagram. With this construction of the parts it is clear that, so long as the brake is in engagement and the arc normal, the resistance R^3 will be shunted out of the derived circuit, and the magnet D will act with normal power to hold the parts in the position indicated. When, however, the arc increases in length requiring a feed to take place, the detent-lever is released, as before explained, by the engagement of the lever with its stop, thus unlocking the feed-controlling mechanism engaging with the carbon-carrier, so as to permit a slight downward movement to take place. At the instant, however, that the brake is disengaged and simultaneously with such disengagement the shunt around the resistance R^3 is obviously broken, and the current flowing through the magnet D encounters the increased resistance of R^3, thus causing the magnet D to be weakened, so that the retractor W immediately pulls the lever back into normal position and removes the brake-lever from engagement with its stop, thus locking the feed-controlling mechanism and bringing the carbon-carrier to a stop. If the feed has not been sufficient to re-establish the normal conditions, the magnet D will immediately pull the lever back, so as to cause a repetition of the action, and this operation will be repeated until the normal conditions are established.

We do not limit ourselves to any particular form of detent or controlling devices governing the action of the mechanism which engages with the carbon-carrier and acting in such way that it shall normally hold the same from movement or permit it to move; nor do we confine ourselves to any particular kind of feed-controlling mechanism. We prefer, however, to use the "clock-work," consisting of one or more wheels connected with or terminating in a wheel or device on which the detent or stop apparatus may act.

It is obvious that our invention is not confined to any particular kind or form of electro-magnet.

It is obvious that the surface K of the lever, acting in conjunction with the stop I, forms in effect a supplemental detent device which releases the controlling mechanism when the lamp is out of action.

What we claim as our invention is—

1. The combination, in an electric-arc lamp, of a lever or support carrying the feed-controlling mechanism that engages with the carbon or carbon-carrier, a frame or support in which the lever is pivoted, a main-circuit magnet for lifting or operating the frame, so as to form the arc, and detent devices for said controlling mechanism, having parts arranged, as described, to release the mechanism when the lever is moved by the controlling-magnet on an increase in the normal length of arc and when it is moved in a reverse direction to an abnormal extent when the lamp goes out of action.

2. The combination, with the carbon-supporting lever and the feed mechanism carried thereby, of a derived-circuit magnet and retractor, a frame or support on which the lever is pivoted, a main-circuit magnet for lifting said frame to form the arc, and a detent-lever having two points of engagement with a releasing-stop, one for releasing the feed mechanism when the frame is down and the other for releasing said mechanism when the carbon-supporting lever is tilted by the derived-circuit magnet during operation of the lamp.

3. The combination, with the carbon-supporting and feed-controlling lever, of a derived-circuit magnet for actuating the same to control the feed, a frame operated by a main-circuit magnet and carrying said lever, a detent-lever and releasing-stop arranged to be in engagement when the lever is lowered bodily, and a detent device whose engaging parts are located to one side of the horizontal line occupied by the lever and when the lever is tilted the release will be effected by the translation of the detent devices in a horizontal direction.

4. In an electric-arc lamp, the combination, with the derived-circuit magnet and the feed-controlling and carbon-supporting devices carried by a lever operated by said magnet, of a brake for the feed devices, pivoted on the lever and having two points of engagement with a releasing-stop, and a main-circuit magnet for moving the supporting-lever of the brake, so as to remove the brake-lever from engagement with the stop at one of the releasing-points, leaving the same, however, in position to be brought against the stop at its other point of engagement when the derived-circuit magnet tilts its lever to the proper extent.

5. The combination, in an electric-arc lamp, of a derived-circuit magnet, a carbon-supporting lever actuated thereby and mounted in a movable frame, a feed-controlling mechanism engaging with the carbon or carbon-carrier, a detent or releasing lever for governing the movement of the feed-controlling lever, and a releasing-stop with which said lever engages at two points, one when the frame is retracted and the lamp is out of action and the other when the supporting-lever is tilted on an increase in the normal length of arc.

6. The combination, in an electric-arc lamp, of the brake-wheel connected with the carbon-carrier and mounted on a support, a brake-lever normally tending to engage therewith, and a releasing-stop with which said brake-lever engages at two points, as and for the purpose described.

7. The combination of the governing-magnet for the feed-controlling mechanism, detent or releasing devices operated by the magnet, an artificial resistance in the circuit of said magnet, a shunt around said resistance normally completed while the feed-controlling mechanism holds the carbon from feeding, and means for automatically breaking said shunt at the instant the feed-controlling mechanism is released to permit the carbon to feed.

8. The combination, with the feed-controlling magnet, of an artificial resistance in the circuit of said magnet, and a shunt around said resistance, formed through the surfaces of the detent or releasing devices governed by the magnet.

9. The combination, with a brake-wheel and brake, of a stop for disengaging the brake, a magnet normally tending to bring the brake into engagement with the stop, an artificial resistance in the circuit of the magnet, and a shunt around said resistance formed through the brake-surfaces, as and for the purpose described.

10. The combination of a brake or clutch, a releasing-stop for disengaging the same, a magnet normally tending to draw the brake against the releasing-stop, and means whereby the magnet may be weakened simultaneously with the disengagement of the brake-surfaces, as and for the purpose described.

11. The combination of the brake, a releasing-stop therefor, a magnet normally tending to draw the brake against the stop, a branch around a portion of the magnet-circuit containing a resistance, and means for breaking said branch simultaneously with the disengagement of the brake-surfaces.

Signed at Hartford, in the county of Hartford and State of Connecticut, this 27th day of September, A. D. 1886.

HERMANN LEMP.
MERLE J. WIGHTMAN.

Witnesses:
J. A. DALZELL,
A. C. KENDALL.