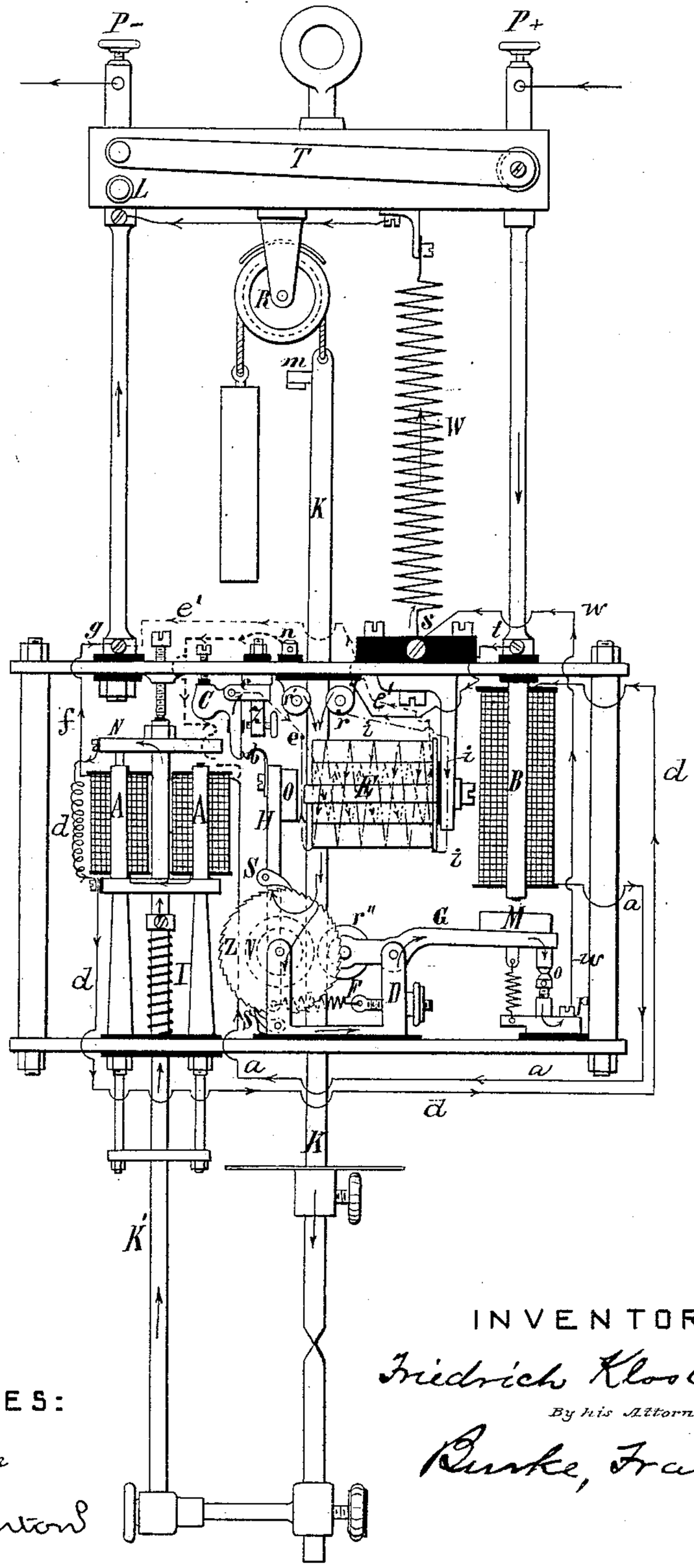
(No Model.)

F. KLOSTERMANN.

ELECTRIC ARC LAMP.

No. 335,459. Patented Feb. 2, 1886.



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ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 335,459, dated February 2, 1886.

Application filed July 9, 1885. Serial No. 171,088. (No model.) Patented in France July 26, 1882, No. 150,322, and in Austria-Hungary October 15, 1883, No. 33 and No. 1,976.

To all whom it may concern:

Be it known that I, FRIEDRICH KLOSTERMANN, a subject of the Emperor of Austria, and a resident of Vienna, Austria-Hungary, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention has for its object to provide an electric-arc lamp with a simple and efficient mechanism for regulating the length of the arc, which, although it works with great promptitude and accuracy, does not require delicate adjustment nor particular care in handling.

The accompanying drawing shows my improved lamp in side elevation, partly in section. The upper or positive carbon holder, K, is suspended from a cord or chain running over a pulley, R, attached to the top plate of the casing, and from the other end of the cord or chain is suspended a weight, which is somewhat lighter than the upper-carbon holder, together with its carbon pencil, so that the carbon-holder tends to descend by gravity. Its descent is, however, prevented by its being gripped, as soon as the current is established, between two friction wheels or rollers, r'' and V. The roller r'' is borne by one end of a lever, G, the other end of which carries the armature M of the magnet B, the coils of which are in the main circuit through the arc. The friction-roller V is rigidly connected to a ratchet-wheel, Z, which is operated by pawls S S, carried by a vibrating lever, H, which is pivoted on the same axis as the ratchet-wheel. The upper end of lever H carries the armature O of an electro-magnet, E. This magnet is rheotomic in its action, breaking its own circuit and becoming demagnetized each time it attracts its armature. A retracting-spring, F, engages the tail of the lever. As the lever H is vibrated by the alternate attraction of the magnet and retraction by the spring, the pawls S intermittently advance the wheel Z and friction-roller V, and the carbon-holder K is thereby fed downward. The magnet E is arranged in a derived circuit, and is wound with two coils, as will be presently described.

The carbon-holder or rod K′ for the lower or negative carbon pencil is so mounted as to have a limited vertical movement, and a spring, I, is arranged to press it upward. To it is fixed the armature N of an electro-magnet, A, the coils of which are in the main or arc circuit. When this magnet is excited, it draws down its armature, and so presses down the carbon-holder K′ against the tension of the spring I, thereby moving the lower carbon downward away from the upper one and establishing the arc. The current enters the lamp at the positive binding-post P+, and passes thence down the right-hand frame to the screw *t*, whence it passes to the contact-rollers $r\,r'$, (which serve also as a guide for the carbon-holder K,) and thence it flows down the carbon-holder through the carbons and up the negative carbon-holder K′ to the armature N. The current then passes around by the wire *d* to the coils of the magnet B, and thence by wire *a* to the coils of the magnet A, whence it goes by wire *f* to the screw *g* and up the left-hand frame to the negative binding-post P—. A switch-lever, T, is electrically connected at its pivoted end to the post P+, and its free end may be made to rest on a button, L, which is electrically connected to the post P—, so that the lamp may be short-circuited. When the current is established through the lamp, either by turning it on at the switch T or by the commencement of its flow over the line, (if the switch has been previously turned on,) the current flowing through the magnets B and A excites them, and they attract their armatures M and N. The movement of the armature M upward tilts the lever G, bringing the roller r'' downward and nearer to the roller V, thereby gripping the carbon-holder K and preventing its descent. Previous to this movement the carbon-holder K has been free, and consequently the upper-carbon pencil has been resting in contact with the lower pencil. The attraction of the armature N toward its magnet A at the same time moves down the lower-carbon pencil, thus establishing the arc. The derived circuit commences at the friction-roller V, whence the derived current passes up the lever H to contacts

b, at the rear end thereof, and thence into the elbow-lever C, and out at the pivot *c* of this lever by wire *e*, to one of the two coils of the magnet E—namely, the inner one—and thence by wire *e'* to the screw *g*, where it meets the main current. As the arc between the carbons lengthens more of the current is diverted through this derived circuit, and finally this derived current becomes sufficient to energize the magnet E and cause it to attract its armature O, and consequently to vibrate the lever H and cause the pawls to move the ratchet-wheel a short distance and feed downward the positive-carbon holder; but as the armature-lever H approaches the magnet E the contact at *b* is interrupted, because the elbow-lever C cannot follow the movement of the armature-lever beyond a certain point, being there stopped by an adjustable screw, *z;* hence the derived circuit is broken at *b*, and another derived circuit is thereby established. This latter circuit commences at roller *r*, whence the current traverses a wire, *i*, which connects the outer coil of the magnet E, and the terminal of this coil connects at *e* with the wire of the inner coil, which is then in its turn traversed by the current, (in the same direction as before,) and the current then passes out as at first, by the wire *e'* to the screw *g*. This derived circuit is always closed; but when the circuit through the lever H is established the current finds here an easier path, thus short-circuiting the outer coil of the magnet E. The two coils are wound in opposite directions, so that when the short circuit is broken the current in the outer coil, flowing oppositely to that in the inner coil, shall neutralize the inductive effect of the inner coil and demagnetize the core of the magnet. Thus as soon as the contact is broken at *b* the magnet E becomes demagnetized, and the armature-lever H is moved away from the magnet by its retracting spring F, thus again establishing contact at *b*. If the arc is still too long, the magnet E will again attract the armature-lever, and feed the positive carbon downward, and will again become depolarized and permit the free retraction of the armature-lever, and this vibratory movement will be repeated as many times as are necessary to feed the positive carbon downward and reduce the arc to the proper length. It is obvious that this same result of demagnetizing the rheotomic feeding-magnet at each attraction of its armature may be accomplished by different windings and connections, and I do not limit myself to the precise arrangement shown and described herein. Any rheotomic feed for an electric lamp the magnet of which is demagnetized by a reverse current upon the cessation of the attraction of its armature, thus overcoming residual magnetism and rendering the action quick and positive, will come properly within the scope of my invention.

When the carbons are very nearly consumed, a contact-piece, *m*, attached to the upper-carbon holder, K, touches a contact-button, *n*, whereby the lamp is thrown out of circuit, the current then passing from the upper-carbon holder through *m n*, and through the coils of magnet A, to the screw *g*, and negative terminal P—. As the magnet A remains in circuit and thus continues to attract its armature, the lower-carbon holder is prevented from being raised, and therefore the flickering of the lamp on being extinguished is prevented. In case the carbon-electrodes should become accidentally broken, the armature will fall off from the magnet B, thereby relieving lever G and releasing the carbon-holder K, permitting the latter to descend by gravity until the carbons meet again, when the arc is again established by the action of the magnet A, as before described. If, however, the lamp should, from any other cause, become inoperative, so that the current is momentarily interrupted, the armature M will fall off from the electro-magnet B, and the lever G, will touch a contact-stop, *o*. In this way a shunt is brought into operation, the current passing from the carbon-holder K by the rollers V and *r''*, thence by frame D and lever G to contact *o*, and thence by screw *p*, wire *w*, and screw *s* to resistance-coil W, and thence to the negative terminal P—. This prevents the failure of one lamp, causing the extinguishment of all the other lamps on the same circuit.

It is evident that my method of feeding the carbons might be employed in lamps wherein the lower carbon is movable. It will also be understood that solenoids may be used in place of either of the electro-magnets, and that other of the parts herein described may be replaced by known equivalents.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-arc lamp, the combination, with the carbon-holders, of a feeding mechanism, a rheotomic magnet actuating said mechanism, a normal shunt-circuit around the arc traversing the exciting-coil of said magnet and the rheotomic contacts, a demagnetizing shunt-circuit traversing a coil of said magnet in the opposite direction to said normal shunt-circuit, and electrical connections, substantially as described, whereby on the rheotomic breaking of said normal shunt-circuit a reverse current is caused to pass through said demagnetizing-circuit, and the core of said magnet is thereby demagnetized and its retraction is accelerated.

2. In an electric-arc lamp, the combination, with a feeding mechanism, of a rheotomic electro-magnet actuating said mechanism and wound with two coils in opposite directions, a derived circuit normally traversing one only of said coils, and commutating contacts and connections, substantially as set forth, whereby, when the movable member of said magnet is attracted, the current is shunted through both of said oppositely-wound coils, thereby demagnetizing the magnet and effecting the retraction of the moving member, as set forth.

3. In an electric-arc lamp, the combination,

with the feeding mechanism, of a rheotomic electro-magnet, E, having two coils oppositely wound, a shunt-circuit around the arc traversing normally one of said coils while the other is normally short-circuited, the armature-lever H, the commutator-lever C, and circuit-breaking contacts in connection with said levers, substantially as set forth, whereby the feeding movement of said armature-lever is terminated by the depolarization of said magnet and consequent retraction of said lever.

4. In an electric-arc lamp, the combination, with the carbon-holding rod, of a friction-roller, a ratchet-wheel in connection therewith, a vibrating pawl for advancing said wheel, a rheotomic electro-magnet for vibrating said pawl, another friction-roller journaled on the end of a distinct armature-lever, the said lever and the electro-magnet thereof, with its coil arranged in the arc circuit, whereby when the current passes this magnet forces said latter roller against the carbon-holding rod and prevents its moving from its own weight, substantially as set forth.

5. In an electric-arc lamp, the combination of the carbon-holder K, friction-rollers V and r'', armature-lever G, electro-magnet B, ratchet-wheel Z, pawl S, armature-lever H, and rheotomic feeding-magnet E, substantially as set forth.

6. In an electric-arc lamp, the combination of the positive-carbon holder, a feeding mechanism therefor, a rheotomic electro-magnet actuating said mechanism, arranged in a derived circuit, an electro-magnet arranged in the arc-circuit and adapted, when excited, to separate the carbons, a pair of contacts arranged to be closed by the downward movement of the positive-carbon holder before the complete consumption of the carbons, and a shunt-circuit traversing said contacts and the electro-magnet for separating the carbons, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRIEDRICH KLOSTERMANN.

Witnesses:
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