(No Model.)

E. THOMSON & E. W. RICE, Jr.

ELECTRIC ARC LAMP.

No. 449,715. Patented Apr. 7, 1891.

Fig. 1.

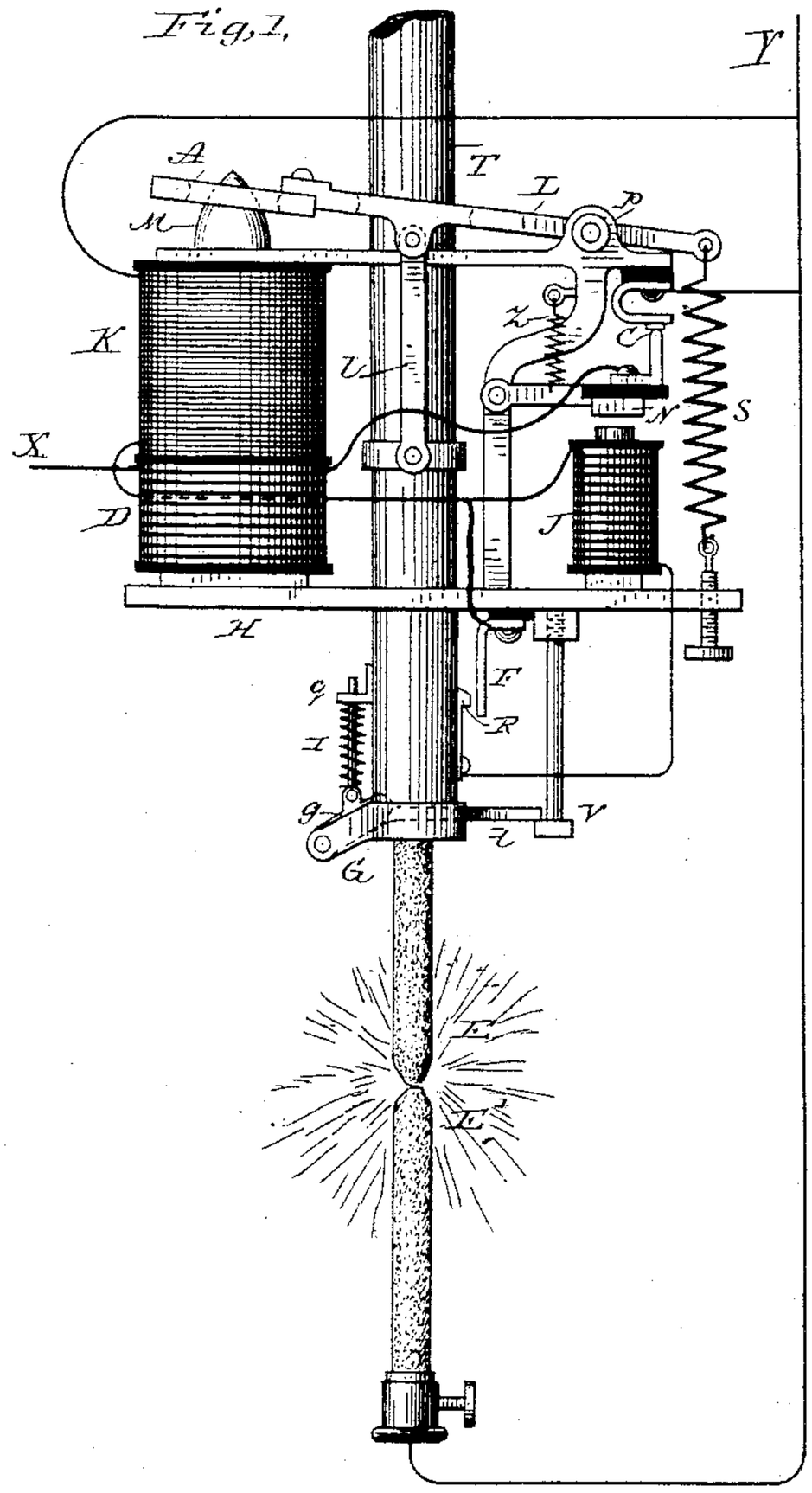


Fig. 2.

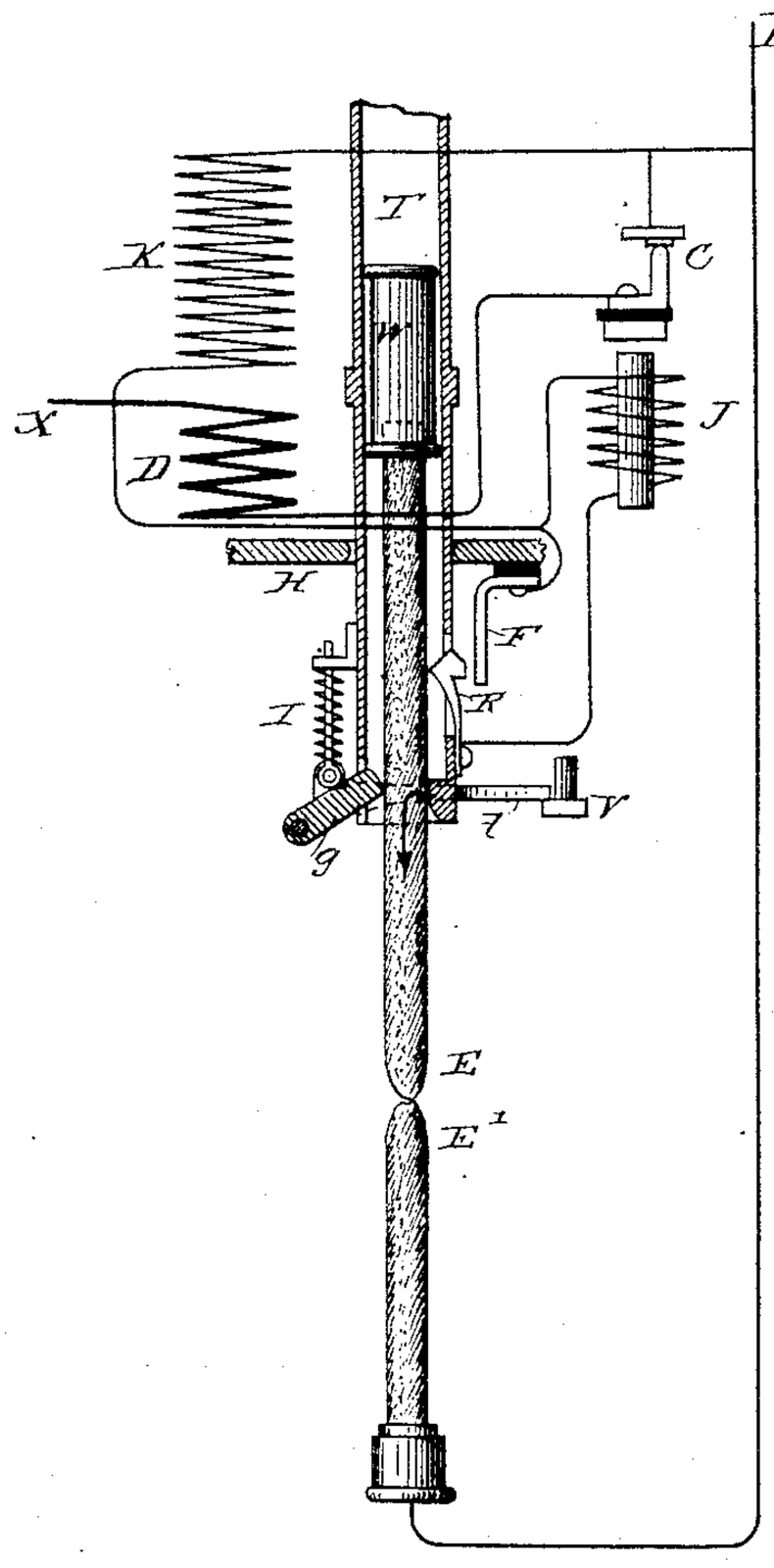


Fig. 3.

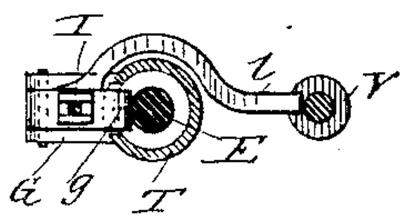


Fig. 4.

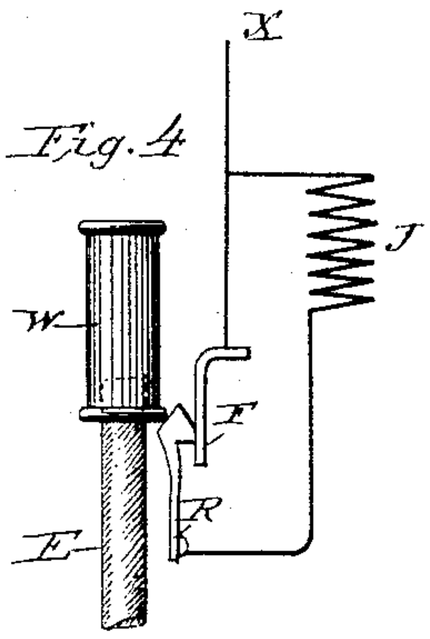
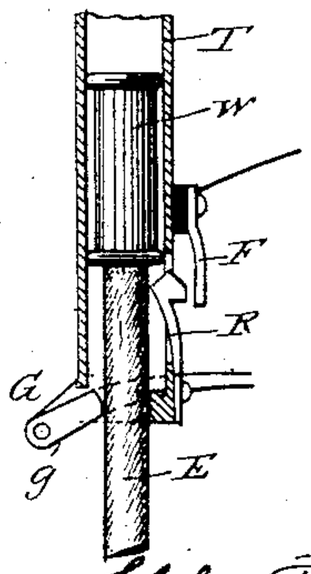


Fig. 5.



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By their Attorney: H. B. Turner

UNITED STATES PATENT OFFICE.

ELIHU THOMSON AND EDWIN WILBUR RICE, JR., OF LYNN, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 449,715, dated April 7, 1891.

Application filed April 9, 1885. Serial No. 161,635. (No model.)

To all whom it may concern:

Be it known that we, ELIHU THOMSON and EDWIN WILBUR RICE, Jr., citizens of the United States, and residents of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

Our present invention relates to a means for feeding the carbon rod or pencil of an electric-arc lamp by means of a clutch, clamping, or feed device acting directly on said rod or pencil instead of upon the metallic rod or bar to which the carbon is usually attached.

Our invention consists in the combination of a movable guide-tube for the carbon, movable by or suspended from the feed-regulating or carbon-adjusting magnet of the lamp and serving to guide the carbon at its upper end, and a carbon lifting or separating and feed-releasing clamp or clutch carried or supported by said guide.

Our invention consists, further, in the combination, with the carbon stick or pencil, of a guide-tube inclosing said stick or pencil, a propelling device, such as a spring or weight bearing upon the pencil and carried on the tube, and a feed-regulating clamp or clutch or other device of any suitable construction for lifting the carbon when it is moved in one direction and for releasing the carbon so that it may be propelled when it is to be moved in the other direction, said clamp or feed-regulating device being supported so as to move with the tube under the action of the feed-regulating magnet, and being arranged to engage directly with the carbon rod or pencil.

Our invention consists, further, in certain specific combinations of devices and arrangements of parts, that will be specified in the claims.

The operative mechanism for imparting the desired movements to the tube and feed-regulating mechanism are herein shown as consisting of an arrangement similar to that described in prior patents granted to us, and in patent to C. O. Mailloux, and consisting, essentially, of an electro-magnet whose coils are in a circuit of high resistance around the carbons, a retractor acting in opposition thereto and in a direction to lift or separate the carbons, and a starting-coil branch or circuit of preferably low resistance, closed when the lamp is out of action, through which current may flow for the purpose of bringing the lamp into action, such coil or branch being combined with suitable switching appliances, whereby it may be thrown out of action when its function is accomplished, so as to permit the further and continued operation of the lamp to progress under the sole control of the derived-circuit magnet and its retractor.

In the present case we have also shown a special arrangement under the broad invention in which the starting-coil is thrown out of action by the agency of an electro-magnet in a circuit with the carbons.

Our present invention, however, relates more particularly to the devices in immediate operative relation to the carbon stick or pencil, and may be carried out with any desired feed-regulating-magnet system, such that the carbon-separating and feed-controlling mechanism may be moved in one direction to form the arc and in the opposite direction to produce a feed when the arc lengthens so as to require a feed or approach of the carbons.

Figure 1 is a side elevation of a lamp embodying our invention. Fig. 2 is a detached view of the parts immediately concerned in the present invention. Fig. 3 is a top view of the clutch. Fig. 4 is a diagram indicating the operation of our automatic switch for shunting the current when the carbons are consumed so far as need be. Fig. 5 is a modification of the latter device.

In Fig. 1 a magnet whose face is seen at M has upon it a coarse-wire coil D and a fine-wire coil K. A movable armature A, carried by a lever L, pivoted at *p* and retracted by an adjustable spring S, serves through a link or connection *l* to raise and lower a vertical tube T, at the lower end of which is attached or carried a clutch mechanism G, consisting of a clutch-body and a movable jaw or cam *g*, having a prolongation *t* arranged to be released by a fixed or adjustable stop V, suitably placed. The jaw *g* is forced into an engagement with a carbon pencil E, inclosed in the tube T by means of a spring I, compressed between the jaw and a stop or projection *q* suitably placed, as shown. A small switch-

magnet J is shown, which, when energized, opens a contact at C upon the attraction of its armature against the force of a retractile spring Z. The arc is formed between the carbons E E'.

In Fig. 2 the details of the parts concerned in this invention are shown diagrammatically. The tube T is shown in section, and the carbon rod E and an inclosed propelling-weight W, bearing upon the top of the carbon, are guided in its center. Projecting through the side of the tube T is shown a piece R, preferably made as a spring, opposite which, but not touching the same, is mounted a contact-piece F. The piece R is, however, movable, and is so shaped that upon the descent of the weight W it will be forced outward by said weight, so as to make contact with F. This is shown as having occurred in Fig. 4. The contacts R and F constitute a circuit-closer which establishes a shunt of small resistance around the switch-magnet J, as seen in Fig. 4.

The circuit-connections shown in Figs. 1 and 2 are as follows: Entering at X the circuit divides into three branches—viz., a closed circuit of high resistance from X to Y through the coil K of the feed-regulating magnet, a circuit of low resistance from X to Y through coil D and the contacts at C when the latter are closed, and, third, a circuit from X to Y through the magnet J to the carbon-supporting devices to the carbon E through the arc to E' and out to Y, the latter circuit being established when the carbons come together and being maintained as long as the arc continues.

The operation of the lamp is as follows: Before the start, with no current flowing, the parts are in the position shown in Fig. 1, the clutch and tube T having been elevated by the spring S and connection *l*. The carbon E is grasped and held lifted by the clutch, so that no contact exists at E, E'. The elongated arm *t* of the clutch is lifted off its releasing-stop V. The contact at C is closed. Upon the passage of the current from X to Y it finds least resistance through the coil D and contacts C, forming the starting branch, and the magnet is energized and attracts its armature A, moving the latter so as to release the clutch G by bringing the arm *t* of the clutch-jaw in contact with its releasing-stop V, and to cause the upper carbon to drop into contact with the lower. At this moment the current passes through the small magnet J and to the tube T and thence to the carbon E, in contact therewith, to the carbon E' and out at Y. The small magnet J, being thus energized, attracts its armature N, thus opening the contact at C, by which opening the branch through D is interrupted and the coil is thrown out of action. The armature A now rises under the action of the spring S, separating the carbons at E E' until the retractile force of the spring S is balanced by the increased influence of the current in the derived circuit K upon the armature A, due to the arc formed at E E'. It will thus be seen that as the carbons burn, the force of the magnet K will continue to increase and attract the armature A, so as to finally again feed the carbons by the release of the clutch G upon the downward motion of the latter. It will be noticed that in all the movements of regulation the tube T and clutch G move as one piece, as also the weight W and carbon E, except at the moment of feeding.

Our invention secures the great advantage, therefore, of reduction of friction, due to the fact that the tube T moves simply in its guides during regulation, while the parts carried thereby are relatively to it at rest, except, as before stated, at the moment of feeding. This feature is applicable to many other forms of regulating-magnet systems besides that shown, and we do not limit ourselves to any particular device for imparting motion to the tube T and its appurtenances. We do do not limit ourselves to any particular form of lifting and releasing mechanism to engage with the carbon rod or pencil, and might use other forms in place of the clutch shown. So, also, we may employ other forms of clutch instead of that shown. We do not limit ourselves to the means shown of actuating the tube and clutch or other device, the essence of the invention consisting in so mounting and connecting these parts to the magnet system that they shall both move.

It remains only to describe the action of the weight W, when after consumption of carbons to a predetermined point it comes into contact with the piece R and closes the contact R F. In this case the magnet J is shunted, as shown in Fig. 4, whereupon the spring Z closes the contact at C, thus restoring the current to the starting or assisting branch through D. The contact F is so shaped that the piece R, having once been put into contact therewith by the weight W, shall remain in contact during the whole range of motion of the tube T up and down. This is accomplished by constructing F so as to present a flat side of some length to the contact R. It is preferable to mount the piece R upon a spring, so that upon the insertion of new carbons, and the consequent release of the weight W from the piece R, the contact at R F shall automatically open, and so leave the lamp-rod to be operated as before.

In Fig. 5 the insulated contact F is shown as carried on the side of the tube T itself, so as to be independent of change of position of T.

What we claim as our invention is—

1. The combination, in an electric lamp, of an illuminating pencil or electrode, a feed regulating or controlling mechanism of any suitable construction, as described, for lifting the carbon when it is moved in one direction and for releasing the carbon when moved in the other direction, so that the carbon may be fed by gravity, a guide-tube inclosing the the pencil and moving with the feed-control-

ling device, and a propelling weight or follower resting on the end of the electrode and moving in the guide-tube.

2. The combination, in an electric-arc lamp, of a movable guide-tube supported by the magnet system of the lamp, a carbon pencil or electrode movable therein when released by the feed-controlling devices, a propelling-follower moving in the guide-tube, and a feed-regulating clamp or clutch or its equivalent, as described, adapted to grasp the carbon and lift the same when the controlling-magnet armature moves in one direction or to free the carbon to permit it to move downward under the action of its propelling-follower when moved in the opposite direction, said clamp or clutch being also supported by the magnet system of the lamp.

3. The combination, in an electric lamp, of a movable guide-tube T, supported by a magnet system of the lamp, a feed-regulating clamp or clutch having a suitable releasing-stop engaging directly with the carbon rod or pencil and carried by said tube, a feed-regulating magnet supporting the tube and feed mechanism, and a propelling block or follower pressing on the end of the carbon pencil and guided within the tube, as and for the purpose described.

4. The combination, in an electric lamp, of a vertical guide-tube T, in which the carbon pencil moves, a feed-regulating magnet supporting the same, a feed-regulating mechanism controlled in its action by a magnet and engaging with the carbon, said mechanism being supported by the tube, and a vertically-moving propelling-weight W, pressing on the end of the pencil and working in the tube.

5. The combination, with the guide-tube and propelling-follower therein, of a switch operated by said follower, a magnet in the carbon-circuit, a shunt around said magnet controlled by the switch, and a branch of low resistance between the poles of the lamp controlled by a switch that closes when the said magnet loses its power.

6. The combination of the weight W and the elastic contact R, the contact F, presenting a contact force parallel to the plane of bodily movement of the contact F, and the switch-magnet J, as set forth.

7. The combination, in an electric lamp, of a movable guide-tube T, extended up to or above the upper end of the carbon rod and supported by the feed-regulating lever, the carbon pencil movable in said guide-tube, and a carbon-lifting and feed-regulating mechanism for engaging with the carbon to form the arc when the lever moves said mechanism in one direction and adapted to free the carbon to permit it to feed by gravity when moved in the other direction to a determinate extent.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 6th day of April, A. D. 1885.

ELIHU THOMSON.
E. WILBUR RICE, JR.

Witnesses:
E. H. KITFIELD,
W. O. WAKEFIELD.