E. J. HOUSTON & E. THOMSON.
Regulator for Electric-Lamps.

No. 220,287. Patented Oct. 7, 1879.

FIG. 1.

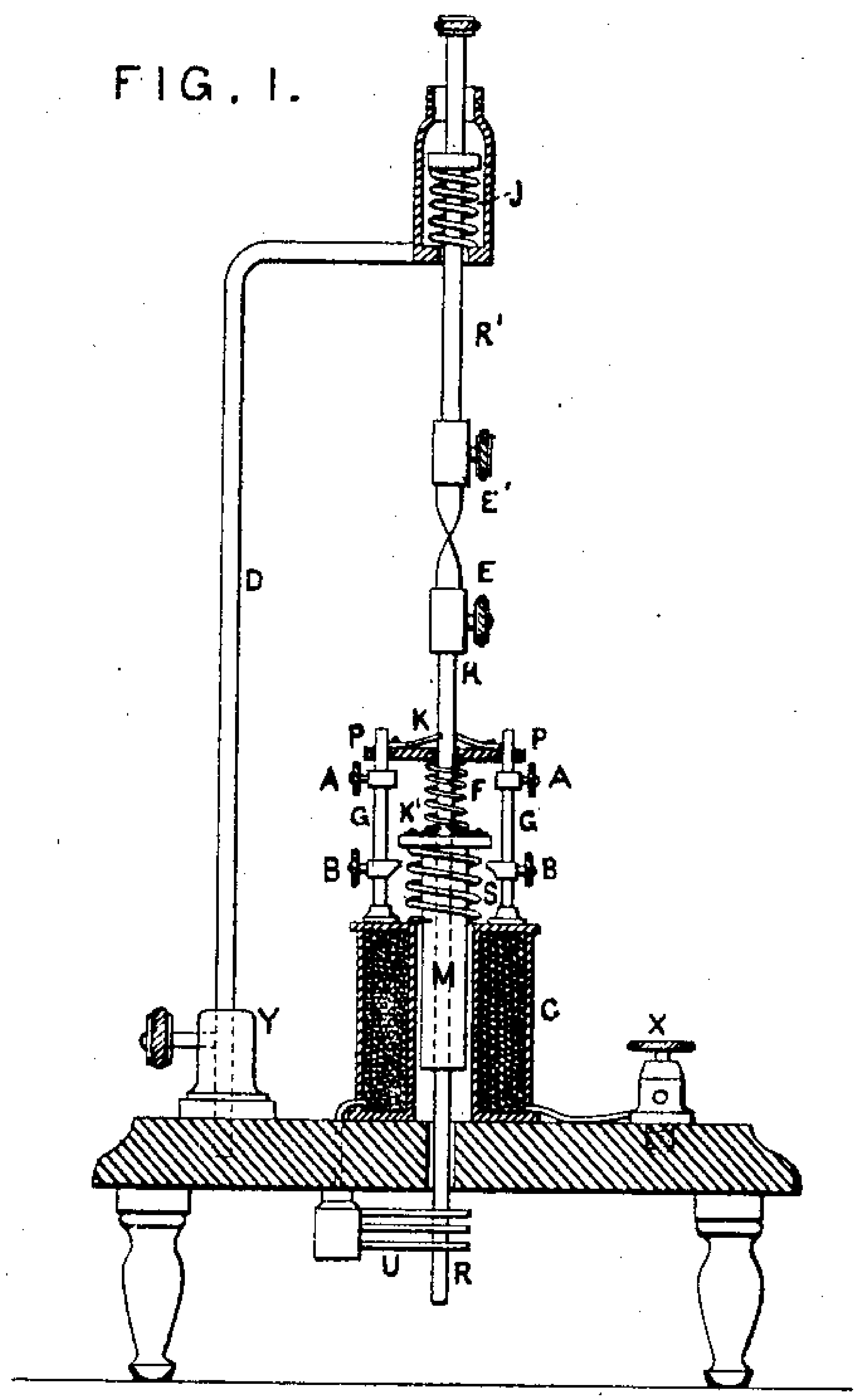


FIG. 5.

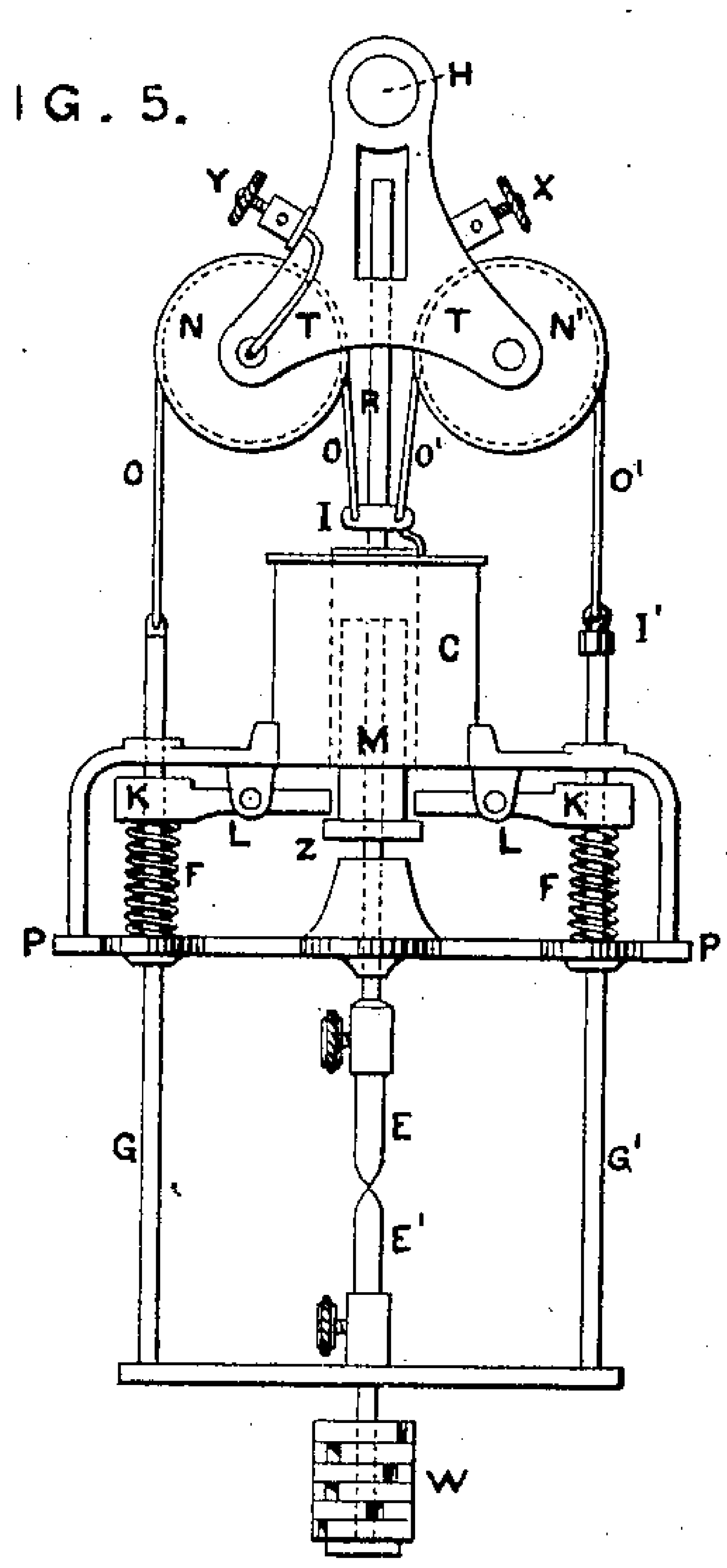


FIG. 3.

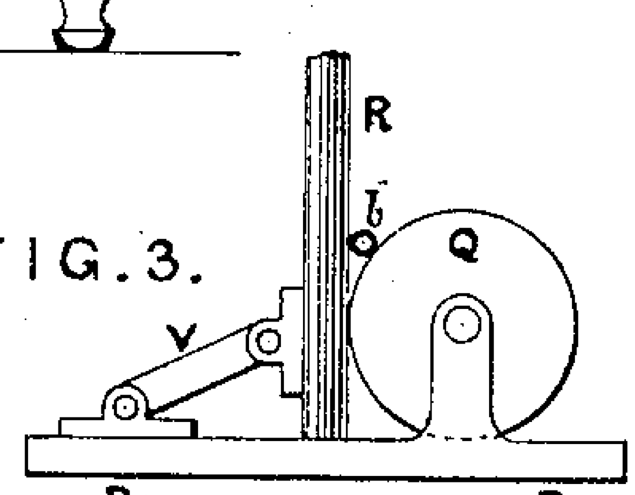


FIG. 2.

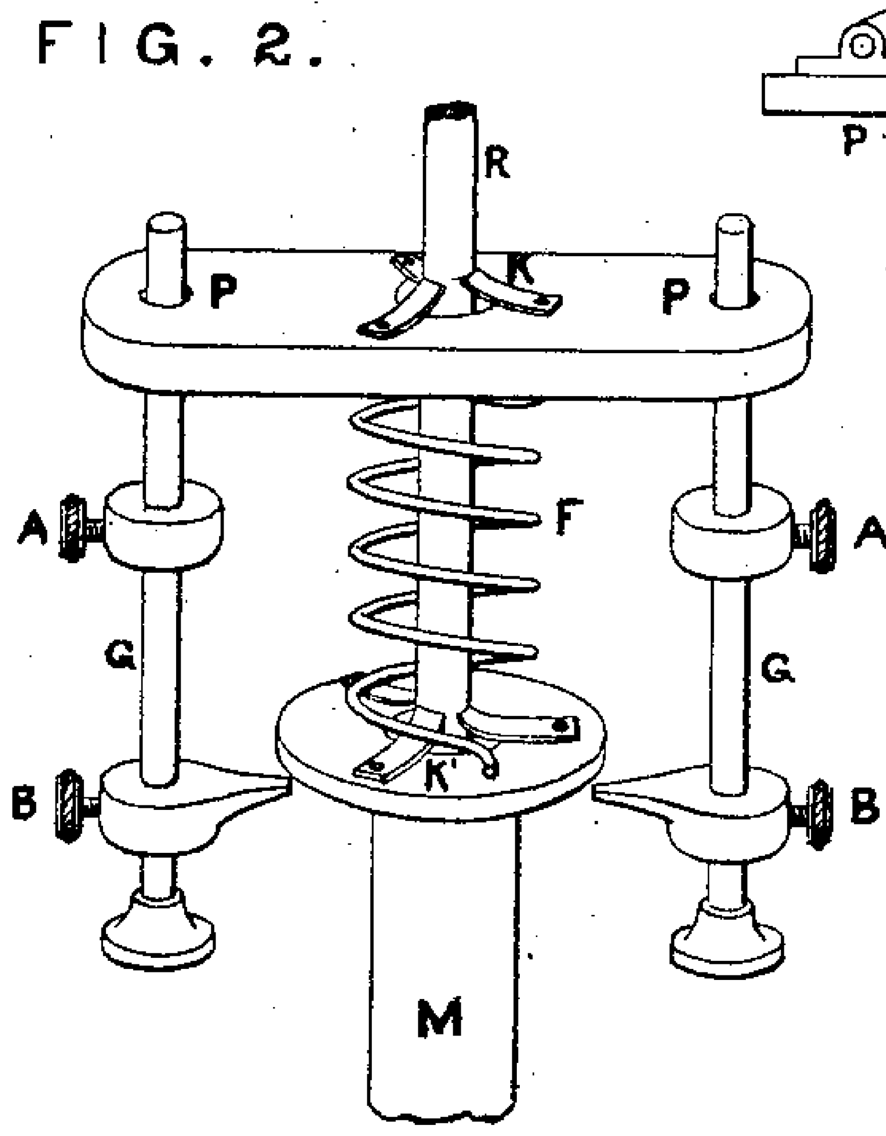
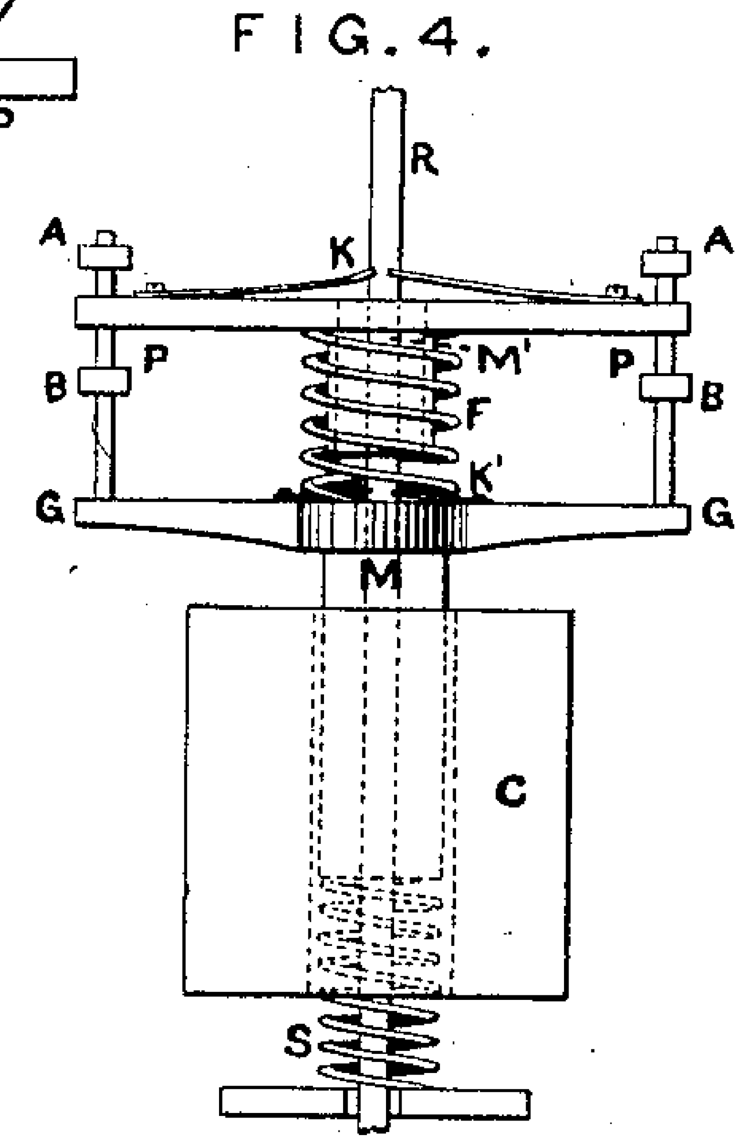


FIG. 4.



WITNESSES:

M B Snyder

N. Miller

INVENTORS

Edwin J. Houston

Elihu Thomson

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE

EDWIN J. HOUSTON AND ELIHU THOMSON, OF PHILADELPHIA, PA.

IMPROVEMENT IN REGULATORS FOR ELECTRIC LAMPS.

Specification forming part of Letters Patent No. **220,287**, dated October 7, 1879; application filed January 23, 1879.

To all whom it may concern:

Be it known that we, EDWIN J. HOUSTON and ELIHU THOMSON, both of the city and county of Philadelphia, State of Pennsylvania, have invented certain Improvements in Electric Lamps, whereby great steadiness of light is obtained and an automatic feed secured for the carbon electrodes without the aid of the complicated mechanism, such as clock-work, &c., commonly employed for this purpose, of which the following is a specification.

Our invention consists in employing a single electro-magnet the core or armature of which is made movable, and the motion of which not only directly effects the separation of the carbon electrodes, but also directly operates to feed forward said electrodes as rapidly as they are consumed, thereby maintaining a nearly constant distance between them.

In the lamps heretofore constructed, when a single electro-magnet is made to effect the separation of the carbons, the approach of the carbons necessitated by their combustion has been obtained either by the action of complex mechanism, such as clock-work, or by the fall of the electrodes occasioned by gravity on the weakening of the current due to too great separation of the electrodes. The latter contrivance, though simple, fails to be effective in securing a steady light, while in cases where clock-work or similar mechanism is employed, although the light produced is steady, yet the expense of construction and the frequent need of repair make it desirable that a simpler form securing equal steadiness be employed.

In Figure 1 a lamp is shown embodying our invention. Upon the base is secured a hollow coil, C, of insulated wire, surrounding a movable iron core, M, which, in turn, surrounds a metallic rod, R R, serving as a support for the electrode E. The rod R R does not fit tightly the opening through the core M. The core M is supported by a spring, S, so that, on the passage of a current through the coil C, the core may be drawn downward, thereby compressing the spring, the elasticity of which lifts the core on the cessation or weakening of the current. Attached to the core by the extensible spring F is a movable platform, P P, through which the rod R R passes. Guide-rods G G, supported by the coil C, serve to prevent lateral motion of the platform P P. Adjustable stops A A and B B are placed upon the guide-rods G G, for the purpose of limiting the extent of downward motion of the platform P P and the core M, respectively. The rod is free to move through the platform P P only in an upward direction, its fall downward due to its weight being prevented by catches K, which jam firmly against the sides of the rod R, and so prevent its downward motion. Said catches are so placed as to permit free motion in an upward direction. The core M is likewise provided with catches K′, which act in the same manner to prevent downward motion of the rod R R through said core, but to permit its full upward motion. The upper electrode, E′, is supported by the rod R′, attached to the standard D, securing also an electrical connection from the binding-screw Y to the rod R′. The manner of support of the rod R′ is of but little importance; but we prefer to make its support to a certain extent elastic by interposing a spring, J, between the standard D and the rod R′.

Fig. 2 shows, on a larger scale, the relations of the core M, the platform P P, and the rod R R with one another. The catch K of the platform P P, which catch may be of any suitable construction which permits free motion of the rod R R in but one direction, is in the figure shown as consisting of metal plates resting against the rod R at one extremity, and being fastened at the other extremity to the platform P P. Since that portion of the plate resting against the rod R R is slightly elevated above the surface of the platform P P, any downward motion of the rod R, tending, as it does, to bring the plates into parallelism with the platform P P, would therefore, by developing a lateral pressure against the sides of the rod R, effectually prevent its downward movement. The catches K′ attached to the core M may be of the same or of different construction.

Fig. 3 shows two forms of device which are the equivalents of the catches K and K′. The jointed bar V will, on the downward motion of the rod R, Fig. 3, develop sufficient lateral pressure to stop its progress, but evidently permits free upward motion. The roller Q,

Fig. 3, to which the rod R is tangential, in combination with the small piece *b*, placed as shown, serves the same purpose.

The circuit-connections through the lamp (shown in Fig. 1) are as follows, viz: One terminal from the electrical source—for example, the positive terminal—is attached to the binding-post Y, and from thence the current passes up the standard D to R′, and to the electrode E′; thence through the arc to the electrode E; then by the rod R R to one extremity of the coil C by a suitable sliding contact, U, and from the coil C to the binding-post X, to which is attached the other terminal from the electrical source.

The manner of operation is substantially as follows: The passage of the current through the lamp causes the core M to be drawn into the coil C, thereby compressing the spring S, supporting said core. At the same time, however, the platform P P being supported, except by the core M, through the spring F, falls until it comes into contact with the regulable stops A A upon the guide-rods G G. Since both the core M and the platform P P, which are the only supports for the rod R R, have fallen, the rod R R accompanies them, and a separation of the electrodes E E′ ensues, an arc being thereby produced between them.

The stops A A are adjustable, so that, although the downward motion of the platform P P is arrested by them, and by the operation of the catch K the downward motion of the rod R R is also arrested, yet the core M continues its downward motion, thereby elongating the spring F, connecting the platform P P to the core. The downward motion of the core M is limited by the stops B B, and, since the amount of extension of the spring F depends on the position of the core M, limits also its extension. If, now, by the consumption of the electrodes the current is weakened, the core M rises slightly, relieving the extension of the spring F, and, lifting the rod R R, thereby causes the approach of the electrodes. During this action of feeding of the lower electrode, E, the platform P P will not have changed its position in contact with the stops A A. Should, however, by any accident, a total cessation of current occur, the core M, impelled by the spring S, immediately rises, carrying with it the rod R R and the platform P P, and thus bringing the electrodes into contact. This latter action will, however, never occur unless the current be purposely stopped or a sudden break in the circuit take place.

When the current flowing through the lamp remains of normal strength, the core M being held by it firmly in contact with the stops B B, considerable variations in the current may occur without bringing the feeding device into operation. The desired amount of separation of the carbons is obtained by placing the stops A A the proper distance below the platform P P when no current is flowing.

Fig. 4 shows an evident modification of some of the parts shown in Fig. 1. The spring S supports the movable core M of the coil C, a before. The guide-rods G G are attached t the core M and move with it. The platforn P P, connected to the core M by the spring F as before described, supports an armature, M′ which can be attracted by the magnetism de veloped in the core M. The stops A A an B B limit the motion of the platform P P upo the guide-rods. The catches K and K′ are ar ranged as before. With this modified arrange ment of parts, the separation of the electrode is effected by the fall of the core M, while th upward feed is secured by the variations i the position of the platform P P consequen on variations in the attraction of the core M for the armature M′.

The arrangement of the lamps constructe in accordance with our invention described i connection with Figs. 1, 2, 3, and 4 are adapte for giving motion to only one of the electrodes When it is desired that both electrodes be fe forward, so as to maintain the position of th arc nearly constant, which result we also as sist by giving a greater section to the positiv than to the negative electrode, we construc the lamp as shown in Fig. 5. The frame T T provided with a means of attachment to a sup port, H, bears two pulleys, N N′, over whic pass the flexible metallic conducting-bands O O′, respectively. The rod R is supported at its lower part by those ends of the bands O O′ adjacent to each other, the end O attached to the rod being insulated from it by a non-conducting material, I, the pulley N, over which the band O passes, being also insulated from the rod R and from the frame T T, but is in electrical connection with the binding-post Y. The pulley N′ is electrically connected to the rod R and to the binding-post X. The oute extremities of the bands O O′ are firmly attached to the upper extremities of the rods G G′, as shown, which rods are placed parallel to each other and support the lower electrode, E′. The band O′ is insulated from the rod G′ by a suitable non-conducting substance, I′.

Attached to the lower extremity of the rod R is a coil, C, of insulated wire, whose core M is movable and supports the upper electrode E. The coil C, in turn, supports the hollo frame P P, through openings in which the rods G G′, before mentioned, freely slide. On the upward motion of the core M a flange, Z, upo its lower extremity, comes in contact with the ends of the levers L L adjacent to said core, the other ends of said levers inclosing the rods G G′, respectively, and each being provided with an automatic catch mechanism, K K′, o similar purpose to those described in connection with Figs. 1, 2, and 3—that is, to permit only of the upward motion of the rods G G′ through them. Springs F F are so placed as to resist the movement of the levers L L consequent upon the lifting of the core M, as above described.

The circuit-connections through the lamp are as follows: The current, entering at X, passes to the pulley N′, thence through the coil C, whose other terminal is in contact with the core M. The current passes through M to the electrode E, thence to E′, and back by the rod G′ to the band O and to the pulley N, and leaves the lamp at Y.

The weight W serves to increase the weight of the supports of the electrode E′, so that they balance the weight of the attachments to the electrode E, consisting of the rod R, the coil C, the core M, the levers L L, and the frame P P.

The method of operation is substantially as follows, viz: On the passage of the current the magnetism developed in the coil C causes the lifting of the core M, thereby effecting the separation of the electrodes E E′. The flange Z, coming in contact with the levers L L, depresses the catches K K′, compressing the springs F F, but not giving motion to the rods G G′. The waste by combustion of the two electrodes results in a weakening of the current, and, the flange Z of the core pressing less forcibly on the levers L L, the elasticity of the springs F F forces upward the catches K K′, carrying with them the rods G G′, and by the motion so imparted to the bands O O′ depressing the supports of the electrode E and raising those of the electrode E′, thus causing the partial approach of the electrodes. On the cessation of the current the core M falls, and the electrodes are brought into contact.

It will thus be seen that in this arrangement motion is given to both electrodes by the movement of the core, while the motion of the core is employed both to effect the separation of the electrodes and to operate their feed as rapidly as they are consumed.

We do not confine ourselves to the use of springs as a means of controlling the various parts of our invention, but may employ their manifest equivalents. Neither do we confine ourselves to any special form of catch K K′ for imparting the feeding motion to the electrodes, but may use any equivalent device that permits motion in but one direction, as described.

We claim—

1. In an electric lamp, the combination of the magnet-core M with the platform P P, as described, the difference in the range of movement of which, on the passage of an electrical current, is employed, through the agency of suitable catches K K′, to produce, in the manner described, a gradual approach of the electrodes on the weakening of the current.

2. In an electric lamp, the combination, one with another, in the manner substantially as described, of the coil C, the core M, the platform P P, the springs S and F, suitable catches K K′, and the rod R R for the purpose specified.

3. In combination with the platform P P and the core M, adjustable stops A A and B B, limiting the motion of said platform and core, as described.

4. In an electric lamp, the magnet-core M and the platform P P, connected elastically to one another by a spring, F, so that, on the passage of an electrical current, the core M may be free to move after the platform P P, which partially accompanies it, has been brought to rest by suitable stops, and so that, upon the weakening of said current, the magnet-core M may partially return to its former position before the platform P P begins its return, for the purpose specified.

EDWIN J. HOUSTON.
ELIHU THOMSON.

Witnesses:
GEO. I. RICLIE,
M. STRAUBE.