(No Model.)

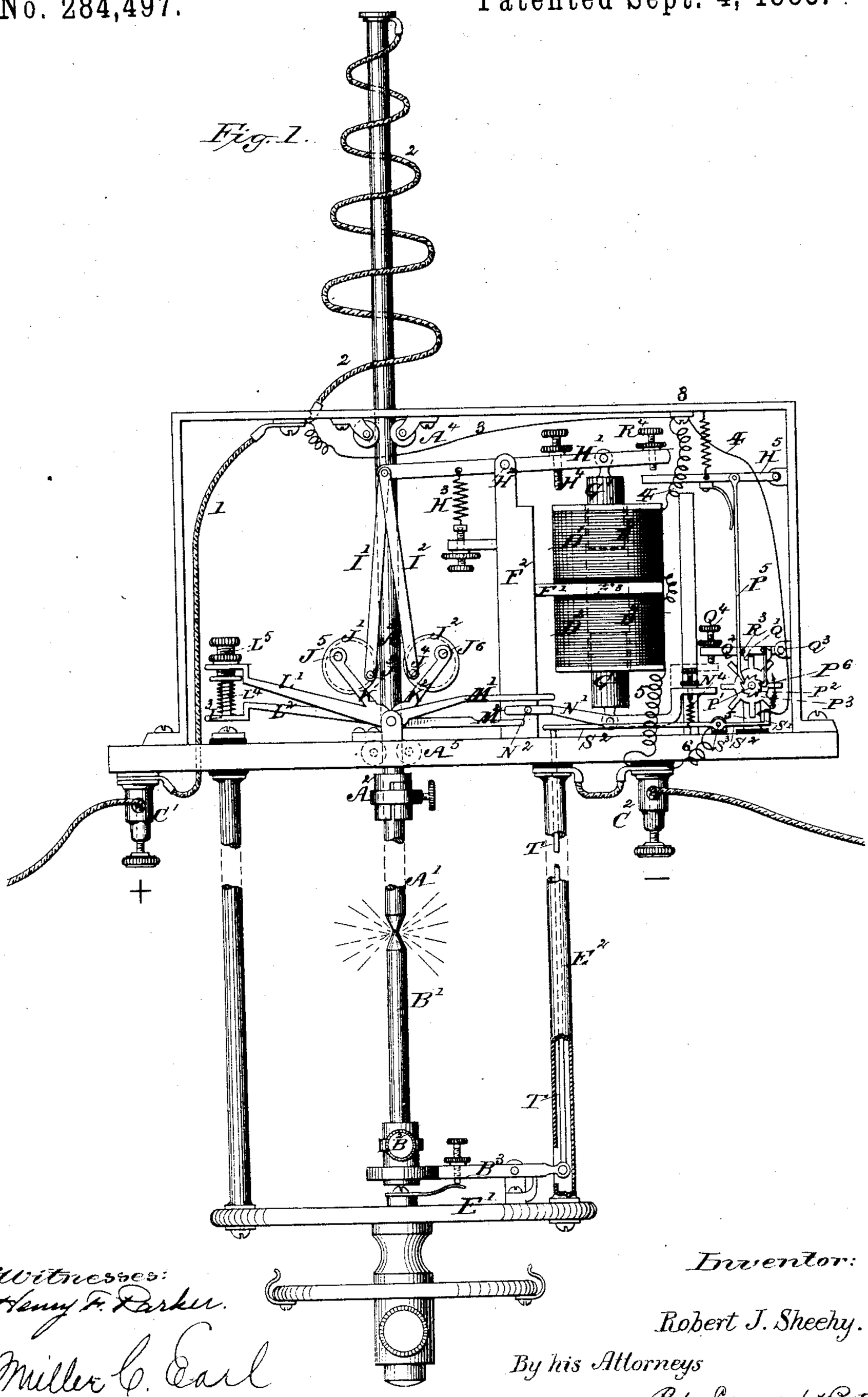
2 Sheets—Sheet 1

R. J. SHEEHY.

ELECTRIC ARC LAMP.

No. 284,497. Patented Sept. 4, 1883.

Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

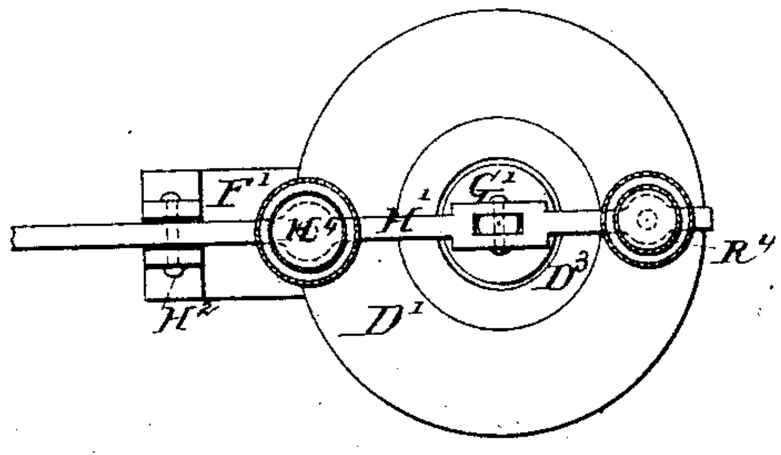


Fig. 3.

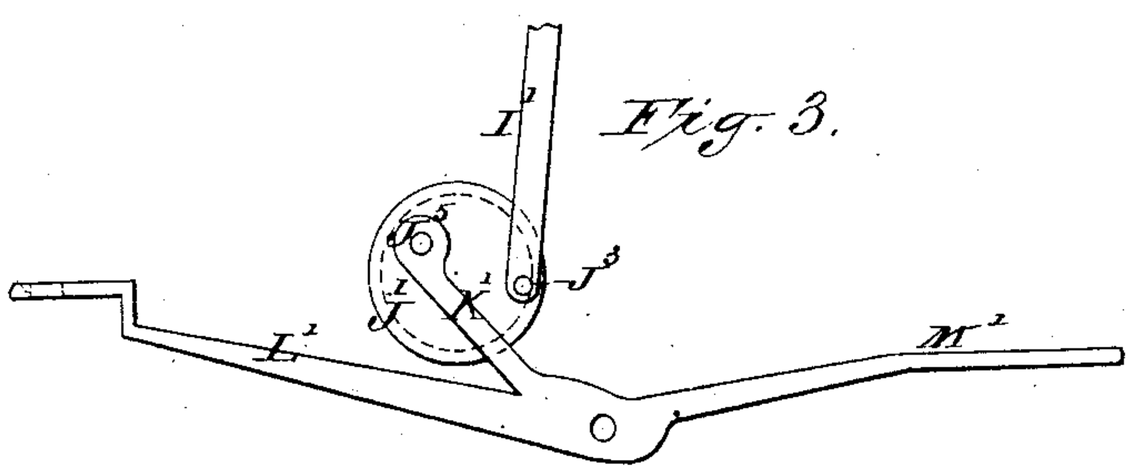


Fig. 4.

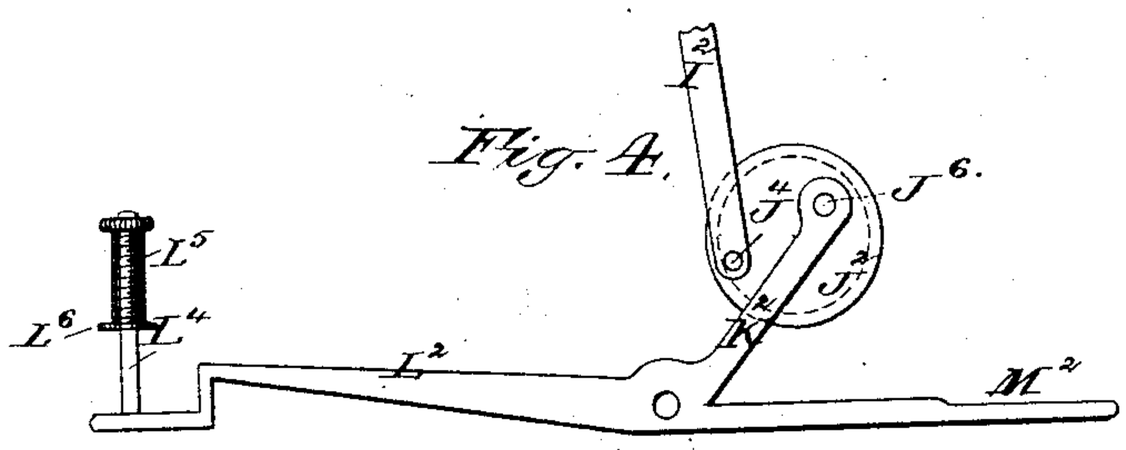


Fig. 6.

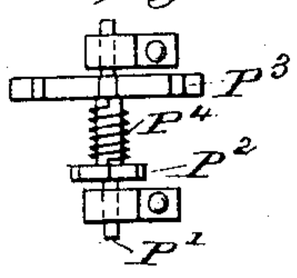
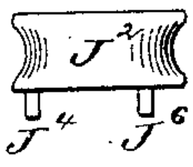


Fig. 5.



Witnesses:
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Inventor:
Robert J. Sheehy,
By his Attorneys
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UNITED STATES PATENT OFFICE.

ROBERT J. SHEEHY, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 284,497, dated September 4, 1883.

Application filed October 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, ROBERT J. SHEEHY, a citizen of the United States, residing in the city, county, and State of New Nork, have invented certain new and useful Improvements in Electric Arc-Regulators, of which the following is a specification.

My invention relates to that class of electric lights in which the so-called "electric arc" is maintained between two carbon electrodes. It particularly appertains to a class of devices or appliances commonly denominated "regulators," the office of which is to automatically maintain said electrodes in that relation to each other which is essential to the production of a uniform and maximum degree of illumination.

The object of my invention is to improve the hereinafter-named features or elements of apparatus common to the majority of arc-regulators, namely: first, the so-called "clutch or clamping device," the function of which is to unite the movable electrode with that portion of the apparatus which is to cause its withdrawal from the fixed electrode; second, the electro-magnet, which, by its varying attraction, actuates said clutch or clamping device; third, the so-called "cut-out," the function of which is to automatically withdraw the lamp from the electric circuit when, by reason of its abnormal resistance or other defects, it interferes with the successful working of other lights upon the same circuit; fourth, the device for automatically reintroducing the lamp into said circuit when the conditions necessary for its successful operation are restored.

The particular subject-matter claimed will be hereinafter specifically designated.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of my complete lamp. Fig. 2 is a plan of the electro-magnetic system by which the lamp mechanism is actuated. Figs. 3 and 4 are independent views of the levers of the clamping device. Fig. 5 is a plan of one of the clamping-wheels, and Fig. 6 is a plan view of the escapement mechanism and actuating-spring used in the cut-out device.

Parts appearing in more than one figure are designated in each by similar reference-letters.

Referring to Fig. 1, the positive or upper carbon is shown at A′. It is clamped at A^2 to a cylindrical holder, A^3, of brass or other appropriate conducting material. The said holder descends freely under the action of gravity between guide-wheels arranged in pairs, as shown at A^4 and A^5. The negative or lower carbon, B′, is united by clamp B^2 to the lever B^3, which is attached to the frame-work of the lamp in a manner to be hereinafter explained.

The positive binding-post is shown at C′, from which the current passes, by conductors 1 and 2, to the positive carbon-holder A^3. For the conductor 2, I prefer to use a flexible wire which is wound around said carbon-holder in a number of convolutions which decrease in diameter as they ascend, whereby the descent of the positive carbon has the effect of coiling said wire in a flat spiral upon the top surface of the case in which the regulating mechanism is contained. From said holder A^3 the current passes to the positive electrode A′, negative electrode B′, lever B^3, frame-work E′ E^2, and negative binding-post C^2. A shunt-circuit spans the electrodes and arc, and may be traced by the conductors 2 3 4, electro-magnets D′ D^2, conductor 5, frame-work E^2 E′, and lever B^3.

The electro-magnets D′ D^2 each consist of a soft-iron core, D^3 D^4, perforated axially, which is surrounded by a coil or helix of insulated wire. The two electro-magnets are attached, respectively, to the upper and lower faces of an iron extension plate, F′, projecting from the iron yoke F^2, and provided with a central opening, F^3. The armature of these electro-magnets (respectively shown at G′ and G^2) are cylinders of soft iron, which enter the axial openings to a greater or less distance, dependent upon the variable attraction of the electro-magnets. The uppermost core, G′, is sustained in its normal position by the lever H′, which is fulcrumed at H^2, maintained in an elevated position by the tension of a spring, H^3, and limited in its downward excursion by the adjustable stop H^4. To the outer end of this lever two links, I′ I^2, are jointed, the lower ends of these links being pivoted to the eccentrics J′ J^2 at points J^3 J^4, near the peripheries of the latter. To the same eccentrics, at points J^5 J^6, the lever-arms K′ K^2 are respectively pivoted.

The two systems of levers used in my clamp are independently presented in Figs. 3 and 4. They may each be regarded as composed of three parts.

First. The arms K′ K², connected in the manner described to the eccentrics.

Second. The arms L′ L², to the latter of which is rigidly attached, at the point L³, a vertical shaft, L⁴, carrying a loose sleeve, L⁵, provided with an exterior screw-thread turning in a nut formed in the arm L′. A spiral spring surrounds the shaft L⁴, which has a tendency to elongate or expand, but which is compressed between the flange L⁶ of the sleeve L⁵ and the lever L². The normal action of this spring is to therefore separate the levers L′ and L², the object of which will be hereinafter explained.

Third. The arms M′ M², extending in the direction of the electro-magnets D², in order to be operated by the armature-lever N′, which latter is fulcrumed at N² to the yoke F² of the electro-magnets D′ D², and provided with a spring attachment, N⁴, for maintaining it in the normal position of rest shown in figure.

The manner of operation of the above-described apparatus is as follows: A current entering by the binding-post C′ traverses the electrodes A′ and B′, which, let it be assumed, are in contact. The electrode-holders, together with the electrodes themselves, especially when rendered slightly incandescent by the first passage of the current, will offer a resistance sufficient to determine the passage through the coil of the magnet D′ of a fractional current of strength sufficient to set the same in operation, even though the electrodes are in contact. To render the action of the magnet D′ sufficiently sensitive, I prefer in practice to employ a large amount of fine wire, as, for example, No. 36. The armature G′ is so adjusted by spring H³ that it will be actuated (that is, attracted downward into the axial opening) by the slightest current which may traverse the electro-magnet D′, thereby operating the clamping device by bringing the eccentrics into frictional contact with the holder A³ of the positive electrode. If sufficiently strong to produce the electric arc, the current will not only clamp the holder of the positive electrode, but will also, by the continued motion of the armature G′, elevate it a sufficient distance to produce the required separation of the electrodes. This condition is established when the adjustable screw-stop H⁴ has reached its limit of movement, which prevents their further separation. The screw-stop H⁴ therefore serves to regulate the length of arc, and is the portion of the apparatus which is to be properly adjusted before use in order to adapt the lamp to a current of the required strength. The function of the lower armature, G², is to move the lever N′ on its stationary fulcrum N², thereby causing it, when the current exceeds its normal strength, to separate the arms M′ M² in opposition to the force of the spiral spring L⁴. This action serves to release the grasp of the clamping eccentrics J′ J² from the carbon-holder A² by moving the centers of revolution J⁵ J⁶ away from the said holder, which is thereupon liberated to the action of gravity. As the armature G² descends, the levers M′ M² are restored to the position of rest shown in the figure by the action of the spiral spring L⁴. In practice the action of the clamping mechanism is exceedingly delicate, and the carbon-holder appears to gradually descend as the electrodes are consumed, and the uniformity of the light is thus maintained.

The armatures of the electro-magnets D′ D² are, as shown in the figure, magnetically connected by the iron armature-levers H′ and N′, respectively, to the upper and lower ends of the iron yoke F²; hence the armatures G′ G² constitute the opposite poles of a single magnetic system, and attain respectively to a high degree of opposite polarity. They are therefore drawn into the respective axial openings not only by the attraction of the solenoids, but also by virtue of their mutual attraction, which attraction is greatly augmented by the presence of the yoke F².

I will next describe that portion of my invention which has for its object the withdrawal from the circuit of a defective lamp.

I have shown in the drawings an escapement-axis, P′, carrying escapement-wheels P² and P³, and normally impelled by a constant force (in this case a spring, P⁴, Fig. 6) in the direction of the arrow. It is, however, normally held in check by a stop, Q′, on the lever Q², which latter is fulcrumed at Q³. When the strength of current in the regulating shunt-circuit, owing to the increasing resistance of the arc, becomes abnormally great, the core G² is raised sufficiently to bring the free end of the lever N′ into contact with the screw Q⁴ of lever Q², as indicated by the dotted lines, thus disengaging the stop Q′ from the escapement-wheel P³ and permitting the latter to revolve. Thus liberated, the escapement-wheel P³ advances through that portion of a single revolution which is necessary to bring one of its teeth into contact with the stop S′ upon the lever S². The power which causes this revolution is derived, primarily, from the electro-magnet D′, which serves, through intermediate mechanism, (namely, lever H⁵, pawl P⁵, and ratchet P²,) to wind the spring P⁴. (Seen in Fig. 6.) The electro-magnet D′ is not employed in the office of winding the said spring until the current has reached a sufficient strength to bring the stop R⁴ into contact with the lever H⁵. Under this arrangement, while the spring is sure to be wound in time, the electro-magnet is not incumbered with the function of winding at times when the current is feeble and its energy required to be entirely devoted to the separation of the electrodes.

A second pawl or dog, P⁶, is employed in a well-known manner to prevent a retrograde

movement of the ratchet-wheel P^2, so that the spring-power will always be expended in causing the revolution of the wheel P^2. By this operation a shunt-circuit of low resistance is closed, spanning the electro-magnets, which circuit may be traced from the point 3 by the conductor 4, arbor-brace 5, escapement-wheel P^3, stop S′, wire 6, and binding-post C^2. Thus demagnetized by the diversion of the current, the magnets no longer attract their respective armatures, the clamping mechanism returns to a position of non-operation, and the upper electrode is left free to descend under the influence of gravity. This withdrawing action will occur when, for any reason, the resistance of the arc exceeds a given amount, which maximum is capable of adjustment or regulation by manipulating the adjusting-spring N^4.

I will next describe that part of my invention which relates to the reintroduction of a restored lamp.

I have shown in the drawings a lever, B^3, supporting the lower electrode, which lever is pivoted at B^4 in such manner that when the upper electrode descends upon and depresses the lower one, the descending motion will be communicated to the long arm of said lever, causing the short arm to be elevated. The motion of the short arm is transmitted by a rod, T, (contained within the hollow post E^2 of the frame-work,) to the long arm of the lever S^2. The stop S′ is thereby depressed and disengaged from the escapement-wheel P^3, thus interrupting the shunt-circuit spanning the electro-magnets, restoring them to the main circuit, and re-establishing the electric arc in the manner already described.

It is evident that the mechanism herein described may be varied in many particulars without departing from the principles of this invention. Therefore I do not wish to be considered as limiting myself strictly to the particular mechanical devices shown.

It is also evident that, as part only of each clamping-wheel J′ and J^2 is brought in contact with the electrode-holder J^3, the useless portion of the wheels may be cut away, or the wheels may be replaced by straight levers having their ends which are nearest to the electrode-holder curved and recessed.

I do not herein claim the method herein set forth of maintaining a light approximately uniform, which consists in revolving a clamping-wheel upon an eccentric bearing to separate the electrodes, and in moving said bearing to allow them to feed together, and I contemplate embodying substantially the same in an application to be hereafter filed by me.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of the movable electrode of an arc-light, clamping-wheels pivoted upon eccentric bearings, mechanism for revolving said clamping-wheels to clamp said movable electrode, and mechanism to vary the positions of said eccentric bearings for the purpose of releasing said movable electrode.

2. The combination, substantially as hereinbefore set forth, of the movable electrode of an arc-light, a shunt-circuit spanning the electric arc, a clamping-wheel mounted on an eccentric arbor in the vicinity of the holder of said movable electrode, two electro-magnets vitalized by the current traversing said shunt-circuit, respectively operating to revolve said clamping-wheel upon said eccentric arbor, and to impel said eccentric arbor away from or toward said electrode.

3. The combination, substantially as hereinbefore set forth, of the movable electrode of an arc-lamp, two solenoids centered upon the same axial line and included in a single shunt-circuit spanning the electric arc, an axial core in each solenoid, moving under variations in the attraction thereof, mechanism operated by one of said cores under the influence of slight currents to clamp said movable electrode, and mechanism actuated by the other core under the influence of strong currents to release said electrodes.

4. The combination, substantially as hereinbefore set forth, of two solenoids included in one circuit and placed end to end, two axial cores therein moving under the joint influence of the currents traversing said solenoids and their own mutual attraction, armature-levers actuated by the movements of said axial cores, and clamping mechanism revolved on eccentric bearings by slight movements of one of said axial cores, and mechanism actuated by movements of the other axial core when beyond a predetermined extent for imparting motion to said eccentric bearings.

5. The combination, substantially as hereinbefore set forth, of two electro-magnets situated in the shunt-circuit of an electric light, a spring, mechanism actuated by one of said electro-magnets for winding up said spring, mechanism actuated by the other magnet, when its strength exceeds a predetermined degree, to release said spring, and a mechanism for short-circuiting said electric light, actuated by said spring when thus liberated.

6. The combination, substantially as hereinbefore set forth, of a supporting-lever for carrying the lower electrode of an arc-light, and capable of yielding under the influence of pressure exerted upon said electrode, escapement mechanism, liberated by such movements of said supporting-lever, and a shunt-circuit spanning said arc-light, opened by the action of said escapement mechanism.

In testimony whereof I have hereunto subscribed my name this 5th day of October, A. D. 1882.

ROBERT J. SHEEHY.

Witnesses:
DANIEL W. EDGECOMB,
MILLER C. EARL.