(No Model.)

R. J. SHEEHY.

ELECTRIC ARC LAMP.

No. 279,824. Patented June 19, 1883.

Fig. 2.

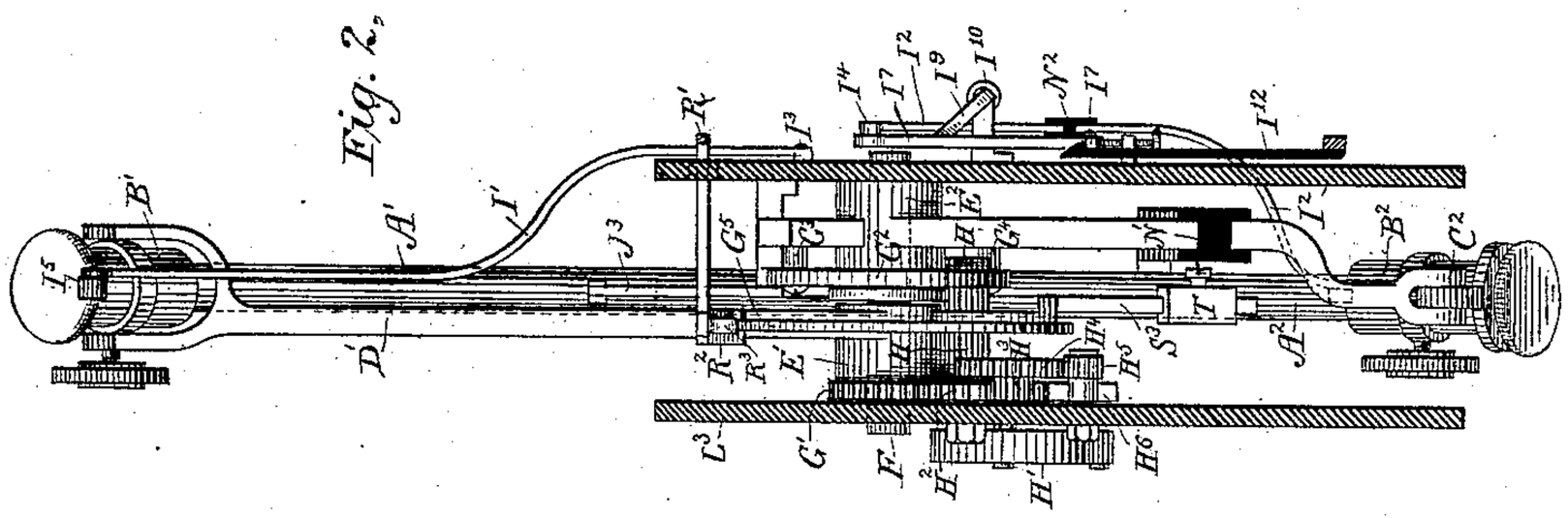

Fig. 3.

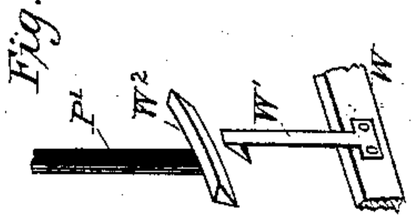

Fig. 1.

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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. 279,824, dated June 19, 1883.

Application filed October 16, 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 York, have invented certain new and useful Improvements in Electric-Light Regulators, of which the following is a specification.

My invention relates to that class of electric lighting apparatus in which the so-called, electric arc, is maintained between two carbon electrodes.

It particularly relates to a class of devices or appliances commonly denominated "regulators," the function 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.

To this end my invention consists in a method of and apparatus for maintaining the proper relative positions of the said electrodes, which may be described in outline as follows: Two metallic arms, serving as electrode-holders, are fulcrumed upon a common central shaft. The sockets of the electrodes are respectively pivoted to the outer ends of these arms or holders. When, therefore, the electrodes are in contact, a quadrilateral is completed, of which two adjacent sides are the electrodes, the remaining two being the arms or holders above mentioned. A tendency is given these arms to rotate upon the said central shaft in opposite directions under the action of a constant force. In other words, they are subjected to a continual force operating to approximate the electrodes. By means of a system of eccentrically-pivoted levers the electrodes are maintained in proper angular relation to each other, and by means of a system of pointed levers or lazy-tongs any deviation from the plane in which the electrodes are situated is prevented. The separation of the electrodes necessary to establish the arc is effected by the angular movement of an electro-magnet (vitalized by the light-producing current) upon a shaft, under the attractive force exerted by it upon a stationary armature. An undue separation of the electrodes is prevented by an angular movement in the reverse direction caused by the decrease of said attractive force coupled with the increase of attraction exerted by the pole of a second electro-magnet for the same armature, which is included in a shunt-circuit spanning the electric arc.

The electric-light regulator herein described is capable of being used either upon an independent circuit or in conjunction with other two-point lamps upon the same circuit. When used in conjunction with other lamps it is equipped with a cut-out mechanism for automatically withdrawing it from the main circuit whenever the resistance developed in the electric arc becomes so great as to disadvantageously effect the working of the other lamps. This cut-out mechanism is actuated by the pivoted shunt-magnet, which, on reaching a certain position of deflection, allows a switch heretofore maintained by it at a distance on its back contact-point to be liberated, so as to descend upon said contact-stop, and thereby close a shunt-circuit of low resistance, avoiding the arc. To reintroduce the light mechanism a device is provided which is actuated by the pressure of one electrode upon the other to divert the current upon the main line through the coils of the oscillating electro-magnet, the office of which is to separate the electrodes. The increased energy of these magnets is expanded in restoring the cut-out lever to its normal position of inaction.

The accompanying drawings illustrate my invention, in which Figure 1 is a side and Fig. 2 an end elevation of my complete lamp. Fig. 3 is a perspective view of certain parts of the cut-out mechanism.

I have applied similar reference-letters in all the drawings to such parts as appear in more than one of the figures.

A′ A^2 are the carbon electrodes, the sockets B′ B^2 of which are respectively pivoted at the points C′ C^2 to the arms D′ D^2. These arms are provided with hubs E′ E^2, both of which are carried upon the same shaft, F. The hub E′ is provided with a pinion, G′, rigidly affixed thereto. The hub E^2 carries the metallic segment G^2, which is securely attached to the holder D^2 at the points G^3 G^4. The pinion H (which is driven by a clock-work mechanism comprising the driving-spring H′, wheels H^2 H^3 H^4 H^5, and fan H^6) engages with the pinion

G′ and arc or segment G², thereby causing the arms D′ and D² to be impelled in opposite directions, the former at a less rapid rate of speed than the latter, so as to compensate for the unequal consumption of the electrodes and maintain the light constantly in the same horizontal plane. As the carbons are consumed, the quadrilateral figure A′ A² D′ D² will have two of its sides gradually diminished in length, thereby permitting the rotation of the remaining side under the influence of the force hereinbefore referred to, but subject to the control of the regulating mechanism to be hereinafter described. The normal direction of the rotation of the sockets tends to throw the electrodes out of adjustment, for which reason I employ levers I′ I², eccentrically pivoted at I³ I⁴ to the frame-work of the instrument, and to the electrode-sockets B′ B² at the points I⁵ I⁶, so that under their influence the electrodes are slightly turned upon the fulcrums C′ C² as they are advanced. This revolution is sufficient, however, to effect the proper variation in the angle of incidence necessitated by the consumption of the electrodes. I employ the system of lazy-tongs J′ J² J³ J⁴, attached to the frame-work of the lamp K′ and to the arm D² by means of the insulating-link K², and to the electrode A′ by the rollers K³ and K⁴. This system, while conforming to all variations in the said angle of incidence, will serve to maintain the electrode A′ from being displaced from the plane in which both the electrodes should continually remain. This system is applied to the electrode A′, for the reason that on account of its greater length is more liable to become displaced. By means of these devices the arc is constantly maintained in the same horizontal plane, and the proper direction is given to each of the electrodes. A lateral movement of the longer electrode is provided, and, in fact, any departure from the proper relative positions, except subject to the control of the regulating device hereinafter to be described, is effectually guarded against.

The electric current is applied to the apparatus in the following manner: Entering from the main line by positive binding-post L′, it traverses the conductor L² and the coils of the electro-magnet M′, and thence passes to the frame-work of the instrument L³; thence *via* the arm D′ to the carbon electrode A′ to the arc and the electrode A², (which is insulated at the points N′ N² from the frame-work of the instrument;) thence by the conductor L⁴ to contact-stop L⁵ and conductor L⁶ to negative binding-post L⁷ and line. A shunt-circuit which spans the arc may be traced from the main line L² by the line O′, electro-magnet M², of high resistance, and conductor O², to the main line again at L⁶. The shunt-wire is so coiled around the electro-magnet M² as to develop the same polarity at P′ as is manifested by the pole P². The common yoke Q′, supporting the electro-magnets M′ M², is movable, being pivoted at Q² to the frame-work of the instrument, and is prolonged at Q³ into an arm jointed at its extreme end to the link R′, which is provided with a clamp or clutch, R². This clamp is provided with a transverse groove, which is given a curvature similar to that of the segment G⁵, which latter fits loosely within the said groove, and travels freely within the same when the electro-magnets M′ M² are in the position of rest in the figure; but when under the influence of the variable attraction exerted by the poles P′ and P² upon a common fixed armature, U′, the system of magnets turns upon its fulcrum Q², the clamp R² grasps the segment G⁵ by the action of the spring R³ when the motion is in one direction, and releases the same by reason of the impingement of the clamp against the stop R⁴ when the motion is in the opposite direction. The segment G⁵ is attached rigidly to the arm D′, which carries the positive electrode, by means of the braces S′ S² S³, attached to the back face of the arc, so as not to interfere with the working of the clamp, the arm S³ being prolonged in order to carry the counterpoise T for balancing the arm D′ and the electrode carried thereby.

The operation of the mechanism is as follows: The carbon electrodes being normally in contact, the current which traverses the lines meets with little or no resistance at the point of contact; hence by far the greater portion of said current traverses the coils of the electro-magnet M′, which oscillates in the manner described upon the pivot Q², causing the clutch R² to revolve the segment G⁵ and separate the electrodes. This forms the luminous arc, and consequently introduces a resistance which causes the fractional current traversing the coils of the electro-magnet M² to increase in strength, and hence to increase the attraction of the pole-piece P′ for the common armature U′. Thus the electrodes are permitted to approach under the action of the constant force exerted by the clock-work mechanism. When the point is reached at which the stop R⁴ comes in contact with the clutch R², the clamp is so tilted as to free the arm D′. This allows the constant force of the clock-work mechanism to cause the electrodes to approximate. By these appliances the proper separation of the electrodes is continually maintained, and a uniform light in consequence is the result.

Another division of my invention relates to the automatic withdrawal of a defective lamp from a circuit and its reintroduction when the normal conditions of operation are restored. I have shown a cut-out lever, W, which, during the normal operation of the light, is suspended above its back contact-stop, L⁵, by means of a dog, W′, which engages with but slides laterally along the insulated grooved carrier W². (Better seen in the perspective at Fig. 3.) When the resistance of the electric arc becomes so great as to make it advisable to withdraw the lamp from the circuit, the pole-piece P′ of the magnet M² will be sufficiently deflected from its vertical position

to allow said dog to disengage itself from said carrier, thereby permitting the lever W to fall against its back contact-stop, L^5, and close a shunt-circuit of low resistance, which may be traced as follows: from the binding-post L′, by conductors L^2 L^8, lever W, back contact-stop, L^5, and conductor L^6, to binding-post L^7. This circuit may, if desired, contain a resistance, Y, equal to the normal resistance of the luminous arc, so that the operation or non-operation of this lamp will have no perceptible effect upon the remaining lamps in the same circuit.

To reintroduce the light when the conditions of successful operation are restored, I make use of the pressure exerted by the carbon electrode A′ upon the electrode A^2. This pressure has the effect of slightly turning the electrode A^2 upon the fulcrum C^2, which power is transmitted by the lever I^2 to the right-angled or bell-crank lever I^7, pivoted at I^8, and revolved upon said pivot in opposition to the force of the spring I^9, and the tension of which is adjusted by the screw I^{10}. The motion is further transmitted by the link I^{12} to the lever W, which is withdrawn from its back contact-stop, L^5, thus interrupting the shunt-circuit which spans the arc. This diverts the main portion of the current through the coils of the electro-magnet M′ and magnetizes the polar extension P^3 of the pole-piece P^2, which is now immediately above its armature U^2, causing it to attract said armature and elevate it into close proximity to said pole-piece until checked by the nut U^3 of the screw U^4, which passes loosely through the opening in the lever W; hence the further motion of the armature U^2 under the now increased attraction of the pole-piece P^3 moves said lever W forward sufficiently to carry the dog W′ over the edge of the curved carrier W^2, causing it to engage therewith and reinstate the normal conditions of operation as shown in the figure.

I claim as my invention—

1. The combination, substantially as herein-before set forth, of the electrodes of an arc-lamp, longitudinally inclined to each other, two arms supporting said electrodes, mounted upon a common shaft, toothed segments concentric with said shaft, and carried, respectively, by said arms, and a pinion rotating under the influence of a constant force and engaging with the teeth of said segments to cause the approach of said electrodes.

2. The combination, substantially as herein-before set forth, of the carbon electrodes meeting at an angle, arms for supporting said electrodes, arbored upon a common shaft, and a system of lazy-tong levers for maintaining both of said electrodes in the same plane without preventing their separation and approximation.

3. The combination, substantially as herein-before set forth, of the inclined carbon electrodes, arms for carrying said electrodes, arbored upon a common shaft, and lever devices actuated by the movements of said arms, substantially in the manner described, for modifying the angle of incidence between said carbon electrodes as they are consumed.

4. The combination, substantially as herein-before set forth, of a main circuit, a shunt-circuit, an electro-magnet included in each of said circuits, a support carrying said electro-magnets and movable upon an axis, an immovable armature stationed between the pole-pieces of said electro-magnets, and a clamping device of an electric-arc-light regulator, operated by the movements of said electro-magnets about said axis caused by the attractions of said pole-pieces for said armature.

5. The combination, substantially as herein-before set forth, of a main electric-light circuit, a shunt-circuit, an electro-magnet included in each of said circuits, a support movable upon an axis upon which both said magnets are mounted, and a stationary armature so arranged with reference to said electro-magnets that their like poles will act in opposite direction thereupon.

6. The combination, substantially as herein-before set forth, of a main circuit, a shunt-circuit, an electro-magnet included in each of said circuits, a support movable upon an axis upon which both said magnets are mounted, a stationary armature so arranged with reference to said electro-magnets that their like poles will act in opposite directions thereupon, a carbon holder or holders, and feeding mechanism whereby an intermittent advance movement is communicated from said movable electro-magnets to said carbon holder or holders.

7. The combination, substantially as herein-before set forth, of a main circuit, a shunt-circuit, an electro-magnet included in each of said circuits, a support movable upon an axis upon which both said magnets are mounted, a stationary armature so arranged with reference to said electro-magnets that their like poles will act in opposite directions thereupon, a carbon holder or holders, feeding mechanism whereby an intermittent advance movement is communicated from said movable electro-magnets to said carbon holder or holders, a normally-open shunt for diverting the electric current from the carbon-holders, a switch for closing said shunt, and mechanism for automatically bringing said switch into action upon the occurrence of an abnormal attraction between said shunt-magnet and its stationary armature.

8. The combination, substantially as herein-before set forth, of a main circuit, a shunt-circuit, an electro-magnet in each of said circuits, a support movable upon an axis upon which both said magnets are mounted, a stationary armature so arranged with reference to said electro-magnets that their corresponding poles will act in opposite directions thereupon, a carbon holder or holders, feeding mechanism whereby an intermittent advance movement is communicated from said movable electro-mag-

nets to said carbon holder or holders, a shunt for diverting the electric current from the carbon-holders, a switch for interrupting said shunt, and mechanism for automatically bringing said switch into action to interrupt said shunt by the pressure of the carbon electrodes against each other when in contact.

In testimony whereof I have hereunto subscribed my name this 11th day of October, A. D. 1882.

ROBERT J. SHEEHY.

Witnesses:

MILLER C. EARL,

CHARLES A. TERRY.