(No Model.)

C. BERTON.

ARC LAMP.

No. 380,545. Patented Apr. 3, 1888.

FIG. 5.

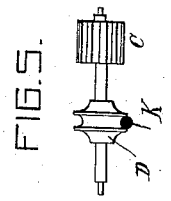

FIG. 4.

FIG. 2.

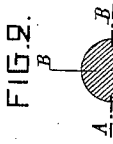

FIG. 3.

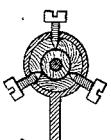

FIG. 1.

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UNITED STATES PATENT OFFICE.

CAMILLE BERTON, OF PARIS, FRANCE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 380,545, dated April 3, 1888.

Application filed July 14, 1887. Serial No. 244,266. (No model.)

To all whom it may concern:

Be it known that I, CAMILLE BERTON, of the city of Paris, France, have invented new and useful Improvements in Electric Lamps, of which the following is a full, clear, and exact description.

This invention relates to incandescent arc lamps or incandescent electric lamps burning in the open air, in which the carbons are fed mechanically and automatically. The lamps are of the type in which a carbon pencil is caused to abut against an infusible block; and one of the distinctive features of the invention is that the pressure of the carbon against this block is regulated automatically by the effect which the pressure itself exerts upon the feed mechanism. When two carbons in contact with each other are traversed by a current of sufficient intensity, the point or points at which they touch are rendered incandescent, and the more the carbons are pressed together the greater will be the quantity of electricity traversing them, and the less brilliant will be the points of incandescence, and conversely. The maximum of useful effect will therefore be obtained with the minimum of pressure between the carbons, inasmuch as the incandescence is then at its maximum and the quantity of electricity expended at its minimum. The same results are obtained if instead of two carbons a single carbon is in contact with a metal abutment, provided the latter be relatively inoxidizable.

This invention enables the lamp to be regulated in such manner that the predetermined minimum limit of pressure of the carbon upon its abutment shall never be exceeded.

Reference is to be had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of a lamp embodying my improvements. Fig. 2 is a cross-section on the line A B, Fig. 1. Fig. 3 is a cross-section through the parts M P‴. Fig. 4 is a vertical sectional view of a modified form of lamp, and Fig. 5 is a detail of the carbon-pencil-driving roller and its gear-wheel.

In Fig. 1 is represented a lamp intended for suspension, in which A is a metal plate traversed by a central metallic or other rod, B, and upon which the whole of the regulating mechanism is carried. The rod B has a longitudinal V-groove, as shown in cross-section in Fig. 2, to serve as a guide for a carbon pencil, C, of suitable diameter, forming one of the electrodes of the lamp. The carbon pencil is retained in the groove at its lower end beneath the base-plate A by a hinged metal clamping-jaw, D, which is pressed by a spring against the carbon, so as to insure perfect electrical contact of the carbon with the metal clamp and frame of the lamp, without, however, preventing the carbon from receiving a continuous downward movement from the feed mechanism. This mechanism is actuated by a weight, E, sliding upon the rod B and pressing at its lower end upon the upper end of the carbon pencil, so as to push it continually downward. It will be evident that the weight may be replaced by a spring or other motor; also that the motion of the carbon may be reversed when the arrangement of the lamp is to be inverted—as, for instance, when it is to stand upon a table instead of being suspended, the luminous focus being then at the upper instead of at the lower part of the lamp.

In order to regulate the feed-motion and bring it into operation at the proper times, the weight is attached to the end of a flexible steel ribbon, F, which passes round a supporting and guide roller, G, and is attached to a drum, H, upon which it is wound a sufficient number of turns to allow of the necessary movement of weight E. The drum H is fast with a toothed wheel, I, which gears with a train of wheels and pinions, whereby the descent of the weight, and consequently of the carbon pencil, will be considerably retarded, and a slight pressure upon the last wheel, I′, of the train is sufficient to altogether arrest the motion. The rate of descent is so calculated as to be a little greater than that of the combustion of the carbon when the lamp is working at its maximum rate of consumption.

K is the terminal connecting the carbon with any source of electricity through the lamp-frame.

The lower end of the carbon pencil rests upon a block, L, of carbon or metal of as inoxidizable a nature as possible. The block is

let into a tube, M, of refractory material, traversed by a metal wire, N, which is soldered to the bottom of block L, and serves to connect the latter to one of the poles of the source of electricity. The tube M serves to isolate the block L calorifically from the other parts of the lamp, and consequently diminish the conduction of heat away from the point of the carbon pencil, it being desirable to maintain the temperature of this point as high as possible in order to increase its luminosity.

O is a bracket fixed to the under side of the base-plate A and insulated therefrom, which communicates metallically, by means of a rod, (not shown,) with the other terminal, X, which is also insulated from the metal frame of the lamp. A lever, P, is pivoted at O′ to bracket O, the curved arm P′ of which terminates in a metal socket, P^3, in axial alignment with the carbon pencil. This socket P^3 is of larger diameter than the tube M, which is held centrally therein by means of three binding-screws, as shown in Fig. 3, the intervening space being filled with asbestus or other poor conductor of heat. The straight arm P^2 of the lever P extends upward and terminates in a detent, Q, of insulating material, which is caused by the oscillation of the arm P to engage with the last wheel, I′, of the train and arrest the movement. Below the detent Q is also attached an arm, R, at right angles to arm P^2 and insulated therefrom, said arm terminating in a weight, R′, which balances the combination of parts L, M, N, P, P′, P^2, P^3, Q, and R upon the center of oscillation O′, in order that the same may in all positions be in a state of indifferent equilibrium. To the arm R at R^2 are attached two antagonistic spiral springs, one of which, S, is hooked to plate A, while the other, S′, is connected to the end of an elbow-lever, T, pivoted at T′ to a lug, T^2, on the under side of a plate, U, forming the top plate of the casing which incloses the mechanism before described.

An aperture is provided in one side of the casing, through which is inserted the shank of the adjusting-screw V, which screws into part T^2 and bears against the tail end of lever T, to regulate the tension of spring S′.

Supposing the apparatus to be in position of rest, the carbon C being pressed down by the weight E onto the abutment L, and the lever being thereby oscillated sufficiently to cause detent Q to bear against the last wheel, I′, of the train, so as to arrest its movement, and consequently that of weight E. If, now, the current is supplied to the lamp, the point of the carbon C, which presents at its point of contact with the abutment L an obstacle to the passage of the current, becomes incandescent and in presence of the surrounding air becomes consumed away in a continuous manner, whereby the lever P is oscillated in the reverse direction so as to release the wheel I′, permitting the weight E to feed the carbon to an extent equal to the quantity which has been consumed. The lever is thereby again oscillated and the feed mechanism arrested until by the continued consumption of the carbon the same action is repeated, and so on. The mechanism will continue to act so long as the carbon is not entirely consumed and the weight has not arrived at the end of its course.

It will be seen by referring to Fig. 1 that the relative length of the lever-arms L O′ and O′ Q is such that a very slight consumption or descent of the carbon pencil suffices to release or arrest the wheel I′. It is also evident that the pressure of the point of the carbon pencil upon the abutment L is proportionate to the tension of spring S′, which can be regulated by means of adjusting-screw V. The pressure of the electrodes the one upon the other may thus be so regulated as to obtain the greatest luminous effect, as after the springs S S′ have been once regulated the pressure of the carbon C upon abutment L cannot exceed a certain amount without the weight E immediately ceasing to operate. By acting directly in this manner upon the feed-motion a perfectly automatic regulation is obtained, which is impossible in those lamps wherein instead of acting directly upon the motor a brake is employed whose action cannot be always relied on to counteract the power of the motor, and is in any case irregular. It will, however, be understood that the combination and arrangement of the various parts constituting the improved lamp may be varied without departing from the invention.

In order to illustrate such modification, I have represented in Fig. 4 a lamp actuated by a spring-barrel and provided with a supply of carbon, which are brought automatically and successively into use as fast as the preceding ones are consumed. This lamp is intended by its construction and dimensions to be mounted upon an ordinary lamp-pedestal, or upon a bracket-arm, in lieu of a gas-burner, or to be supported in a pendant. In this lamp the actuating-weight described in reference to Fig. 1 is replaced by a spring-barrel, A, driving a train of wheels similar to that described in Fig. 1. The spring-barrel also drives, through pinions B and C, a feed-wheel, D, having a roughened and grooved periphery, and which is shown separately in Fig. 5.

E is an electro-magnet of which only one coil is visible on the drawings. A lever, F, pivoted at F′, carries at its upper end an armature, G, which is at right angles to the lever and opposite the poles of the electro-magnet. At the middle of its length the lever F carries a roller, H, free to turn upon its axis, which is carried by the lever F and is situated in the same horizontal plane as the axis of the feed-roller D. The lever F carries at its lower end a spring terminating in a metal jaw, I, which enters a slot in the guide I′ for the carbon, which is fixed to the under side of the lower plate, M, of the lamp. Above the pair

of rollers D and H is fixed a reservoir, K, in which are placed a number of carbon sticks of suitable length. The bottom of this reservoir is formed by a plate of hardened steel, R, burnished on its upper surface, and is fixed at such an angle as to form an inclined plane down which the reserve of carbon pencils, which rest thereon by their lower ends, can slide. Between the lower end of this inclined plane and the adjacent side of the reservoir a slot is left of sufficient width to allow the foremost one of the carbon pencils to pass through freely for the purpose of feeding the lamps, this slot being situated exactly over the line of bite of the rollers C and H. The carbon pencil passing through this aperture and between the feed-rollers is fed downward with a constant motion derived from the feed-roller D, which, as before mentioned, is continuously rotated by the barrel A. The carbon pencil passes through the guide I′ and forces back the jaw I, by which it is nipped sufficiently to insure the perfect electrical contact with the mechanism of the lamp. The carbon pencil, continuing its descent, meets the block L, supported by the system of levers P P′ P², similar in every respect to that before described with reference to Fig. 1. It will be seen, therefore, that as soon as by the consumption of the carbon pencil its length becomes less than the distance between the block L and the rollers H it will be immediately succeeded by the next following carbon pencil, which will pass out of the reservoir and enter between the rollers and will continue to feed forward the remnant of the preceding carbon, and will ultimately take the place of the latter, and so on.

This arrangement of the conductors for supplying the electric current having been already described in reference to Fig. 1, and being capable of variation, it will be unnecessary to again describe it here. The lower plate, M, supporting the whole mechanism of the lamp above described, is itself supported by three hollow glass pillars, N, each traversed by a steel rod secured to the base Z, which is provided with a screw-socket for mounting it upon a suitable support.

The operation of the lamp is as follows: Supposing an electric current to traverse the circuit formed by the electro-magnet E, the block L, and the carbon pencil, which is in operative position in the lamp, the electro-magnet E becoming energized attracts its armature G, thereby oscillating the lever F, carrying the roller H, whereby the carbon pencil is nipped between the two rollers, and is fed downward by the revolution of the feed-roller D. At the moment when the roller H pressed against the carbon pencil the metal jaw I entered the notch in the guide I′ and insured the electrical contact of the carbon pencil in course of combustion with the mass of the lamp. The regulating mechanism then continues to work, as previously described in reference to Fig. 1—that is to say, should the pressure of the carbon upon block L become excessive, the lever P P′ P², which is equilibrated by the springs S S′, regulated by the screw V, rocks upon its axis, so that the detent carried by the arm P² engages with the last wheel X of the train actuated by the barrel and arrest the latter, so that the feed-motion of the carbon is interrupted and it no longer continues to descend. The lamp continues to work in this manner until the length of the carbon pencil becomes less than the distance between the extremity of the guide I′ and the block L, whereupon the remnant of the carbon, being no longer supported by the guide I′, falls into the globe. The electrical circuit being thereby interrupted, the electro-magnet becomes inactive and releases its armature, thereby allowing the lever F to move back, and with it the roller H and jaw I. The next succeeding carbon pencil, which, as above mentioned, has become entered between the feed-rollers, being no longer nipped against the feed-roller D, slips past the latter and falls by its own weight until it meets the block L, wherefrom the remnant of the preceding carbon has just fallen, and thus re-establishes the circuit. The electro-magnet again becomes active and the different parts of the mechanism resume their former position, and the working of the lamp continues as before. In this manner the automatic relighting of the lamp takes place within an inappreciable period of time—viz., that necessary for the second carbon to fall from a height of fifteen millimeters. In order, therefore, to keep the lamp burning continuously, it is only necessary to wind up the barrel and keep the reservoir filled with carbon pencils, the internal mechanism of the lamp requiring no attention.

I claim—

1. In an electric lamp, the combination, with a vertically-movable carbon, C, a motor for advancing the carbon, a regulating wheel-train, and a band, F, connecting the wheel-train with the motor, of the lever P, having the weighted arm R, springs S S′, connected with the arm R, for regulating the pressure of the lever against the carbon during consumption, and the rigid abutment-electrode L, carried by said lever P in the path of the carbon C, and upon which the carbon rests, the parts being so arranged that the pressure of the carbon upon the abutment will throw the lever into direct engagement with the wheel-train to stop the feed of the carbon, and as said carbon is consumed the lever will be moved away from the wheel-train to permit the feed of the carbon, substantially as described.

2. In an electric lamp, the carbon pencil C, the stationary carbon-guide B, the weight E, band F, and wheel-train connected by said band with the weight, in combination with the lever P, having weighted arm R, springs S S′, connected with the arm R, rigid abutment-electrode L, carried by said lever in the path of the carbon C to support said carbon, and

detent Q, carried by the lever P, for engagement with the wheel-train, all arranged so that the pressure of the carbon on the abutment L will throw the lever P to stop the feed of the carbon, and as the carbon is consumed the lever will be moved to release the carbon-feed mechanism, substantially as described.

The foregoing specification of my improvements in electric lamps signed by me this 14th day of June, 1887.

CAMILLE BERTON.

Witnesses:
ROBT. M. HOOPER,
ALBERT MOREAUX.

Correction in Letters Patent No. 380,545.

It is hereby certified that the name of the patentee in Letters Patent No. 380,545, granted April 3, 1888, for an improvement in "Arc Lamps," was erroneously written and printed "Camille Berton," whereas said name should have been written and printed *Camille Bertou;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 15th day of May, A. D. 1888.

[SEAL.] H. L. MULDROW,
First Assistant Secretary of the Interior.

Countersigned:

BENTON J. HALL,
Commissioner of Patents.