(No Model.)

E. J. HOUSTON.

ELECTRIC LAMP.

No. 256,693. Patented Apr. 18, 1882.

Fig. 1.

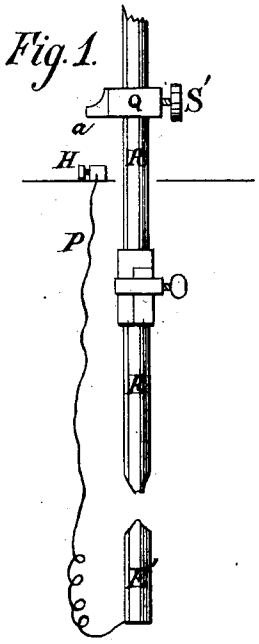


Fig. 2.

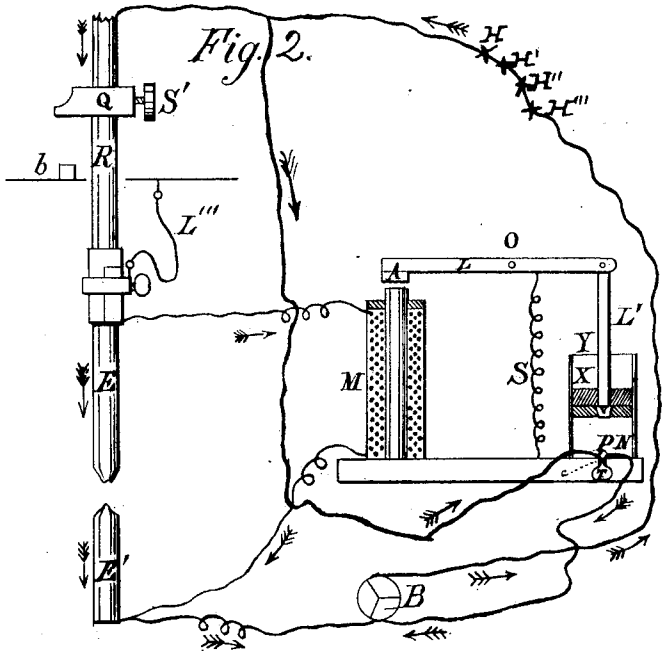
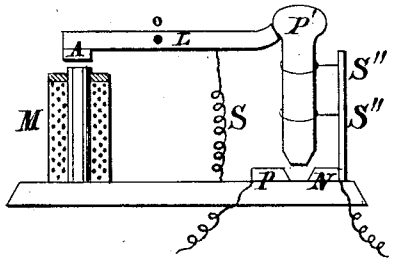


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 256,693, dated April 18, 1882.

Application filed June 3, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWIN J. HOUSTON, of the city and county of Philadelphia, Pennsylvania, have invented certain new and useful improvements, whereby in a system of electric lighting, where several electric lamps are placed in a single circuit, one or more of the separate lamps may be automatically cut out or removed from the circuit at a time or times that shall have been previously determined on without extinguishing the remaining lights, of which the following is a specification.

The following is a description of my invention, such as will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings.

My invention is designed for use with lamps of the arc type.

In a system of electric lighting for streets or other large areas where a considerable number of lights are operated in the same circuit it may be deemed desirable at certain hours of the night to extinguish alternate lamps, or a lamp here and there in the circuit. To obviate the necessity for going to each lamp and cutting it out singly and separately I accomplish the same thing automatically, by means of simple contrivances, which I place on or in connection with the lamps when they are recarboned, in positions varying according to the time it is desired that the light shall continue in operation.

Since electric lamps for general illumination—such as of streets or of large workshops—are generally hung far apart and in more or less inaccessible places it will be seen that my invention materially reduces the labor of superintending an extended system of electric illumination.

It will be evident to those skilled in the art that the means whereby I accomplish at predetermined times the automatic extinction of any electric lamp or lamps in a circuit must vary somewhat with the particular form of lamp or regulator employed. I will describe, therefore, some of the forms which I prefer to use in certain cases; but it is to be understood that I do not limit myself to these particular forms.

In all forms of lamp in which the carbons, one or both, are automatically fed toward each other I prevent or modify by suitable contrivances the free motion of the electrodes, one or both, or of their supporting-rods in positions corresponding to those in which the consumption of the carbons connected therewith has equaled the time during which it has been decided to permit the lamp to burn. Suppose, for example, that it be desired that certain lamps in a circuit shall be extinguished after burning for three hours. In this case the electrodes are permitted to feed freely until as much of the carbon has been consumed as has been found in practice to last for that time—say, for example, corresponding to an amount of feed equal to three inches for the upper electrode. A metallic ring sliding easily over the rod bearing the upper electrode, and capable of being fixed in position by means of a screw or other means, so as to be three inches distant from a metallic point in electrical connection with the other electrode or the wire connected to said electrode. As soon, therefore, as three inches of the upper electrode have been consumed the ring, coming in contact with the metallic point, cuts the lamp out of the circuit.

Figure 1 shows how this part of my invention may be carried out in practice. R is the rod, and E the upper electrode, of a lamp. The metallic ring Q is fixed by the screw S′ at a suitable distance, *a* H, above the contact-point H, in electrical contact with the lower electrode. In all lamps, however, in which any form of automatic cut-out is employed, or in which any means are used for automatically preventing the extinction of any lamp from breaking the circuit in which it is placed, a simpler arrangement may be employed. In this case the ring Q may be of any suitable material, and serves merely to check the further downward motion of the electrode when it has reached the position previously determined upon. This part of my invention is shown in Fig. 2, where the ring Q is attached to the rod R, bearing the electrode E, by means of the screw S′. As soon as the ring Q touches the stop *b* the further downward motion of the rod R and its electrode E is stopped. The rod R may also be checked

in any position of its downward motion by means of any suitable catch, as, for example, the wire or loop L‴, (shown in Fig. 2,) which will stop the downward motion of the rod in a position depending on the length of L‴. In these cases, as soon as the feeding of the electrode is thus prevented the resistance of the arc increases, until the automatic contrivance, connected in this instance with a shunted or derived circuit around the carbon-electrodes, comes into play and cuts the lamp out of the circuit, or otherwise prevents it from burning.

As a further explanation of the manner in which this part of my invention may be operated, I will describe a novel form of automatic cut-out, which I sometimes employ with my present system. This is shown in connection with Fig. 2.

A magnet, M, whose coils are formed of many layers of fine wire, is placed in a derived circuit around the carbon-electrodes, as shown. Its coils are preferably placed in the same derived circuit as the magnet, the movement of whose armature controls the feeding of the electrodes. The lever L, pivoted at *o*, is caused by the attraction of its armature A to raise the rod L′ and open the valve V. A spring, S, closes the valve V when the magnet M ceases to attract its armature. The cylinder X is filled with mercury, and on the raising of the valve V a few drops of mercury escape from X, and, filling the break between P and N, completes the circuit, and thus cuts the electrodes E E′ out of the circuit of the machine B. A leather cap, Y, prevents the escape of the mercury from above.

The method of operation is substantially as follows: As soon as the further downward motion of the rod R is checked by the ring Q striking the stop *b* or by the loop L‴ having descended its full length, the consumption of the electrode E continuing, the resistance of the arc between E and E′ constantly increases, and a larger and larger proportion of the current traversing the coils of M at last causes the attraction of its armature A, thus raising the valve V and permitting the momentary escape of mercury from X, whereby the electrodes E E′ are cut out from the circuit of the machine, which thus passes by P N through the remaining lights of the circuits, represented conventionally at H H′ H″ H″, &c. At this moment the loss of magnetism by M permits the closing of the valve V by the spring S, and so checks the further escape of the mercury from X.

When operating as an ordinary cut out during the operation of the lamp, since it sometimes happens that the failure of the lamp to feed is due only to some momentary defect, I sometimes afford the lamp a certain number of opportunities to again come into the circuit by the use of the following simple contrivance: An opening, *c*, much narrower than the opening of the valve V, permits the globule between P and N to slowly escape into the reservoir T, thus breaking the circuit P N B H, &c. If in the meanwhile the electrodes E E′ have come into contact, the current is again established between them, but if the electrodes have not come into contact, then the movement of the armature A again permits the momentary escape of mercury from X, and again establishes the current through P N B H, &c. This momentary opening of the circuit P N B H, &c., by the gradual escape of mercury from the space between P and N will of course cease when the reservoir T is filled, and it is evident that by so proportioning the capacity of T to the amount of mercury that escapes at any one time through V I can thus regulate the number of times that the lamp can come again into operation, provided its carbons have come into contact. The reservoir T may be emptied when the lamp is recarboned.

When it is not desired to afford the lamp the opportunity for again coming into the main circuit I sometimes replace the mercury-reservoir and its accessories by the simple arrangement shown in connection with Fig. 3. The movement of the armature A of the electro-magnet M releases the bar L from the head of the plug or pin P′, which, thus permitted to fall, completes the contact P N. To secure the fall of P in the proper direction it is suitably guided at S″ S″, as shown.

Since in the application of my system to extended circuits, in which numerous lamps are in operation, it may sometimes happen that a large proportion of all the lamps in the circuit are extinguished at the same time, it may be here remarked that the ability to do this without any attention to the machine either as to the regulation of its driving power or to the shifting of the position of its collecting-brushes is only possible where an automatic regulation of the collecting-brushes is employed in connection with the dynamo-electric machine supplying the current to the circuit. Such regulators are described in connection with United States Patents No. 223,659, January 20, 1880, and No. 238,315, March 1, 1881, to Thomson and Houston.

I do not claim broadly short-circuiting the lamp by means of the carrier when said carrier has descended by reason of the consumption of the carbon, nor do I claim broadly the combination, with an electric lamp, of a normally-open independent or derived circuit around the lamp closed by the descent of the carbon-carrier.

What I claim as novel in my invention, and desire to secure by Letters Patent, is—

1. The combination, with the carbon-carrier, of an electric lamp, devices, substantially as described, attached to and moving with said carrier, and adjustable in the manner and for the purposes set forth, so that the movement of the carrier may be stopped at any predetermined time.

2. The combination, with the carbon-carrier, of a lug or projection connected to or moving with the carrier, a block or anvil with which

the lug or projection upon the carrier may make contact, said lug and anvil being adjustable with relation to one another, and circuit-connections, substantially as described, to the anvil, adapted to form a derived or branch circuit around the lamp when the lug or projection moving with the carrier is in contact with the block or anvil.

3. The combination, with a carbon-carrier, of a ring or collar adjustable thereupon and a stop or anvil electrically connected to the opposite carbon, so that when the collar and the stop are in contact the carbons are short-circuited and the light is extinguished.

4. The carbon rod of an electric lamp, and an adjustable collar, acting as a stop, in combination with circuit-closing devices, substantially as described, whereby an automatic extinguishment of said electric lamp takes place at times previously determined upon.

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