(No Model.)

E. THOMSON.

ELECTRIC ARC LAMP.

No. 297,199. Patented Apr. 22, 1884.

Fig. 1,

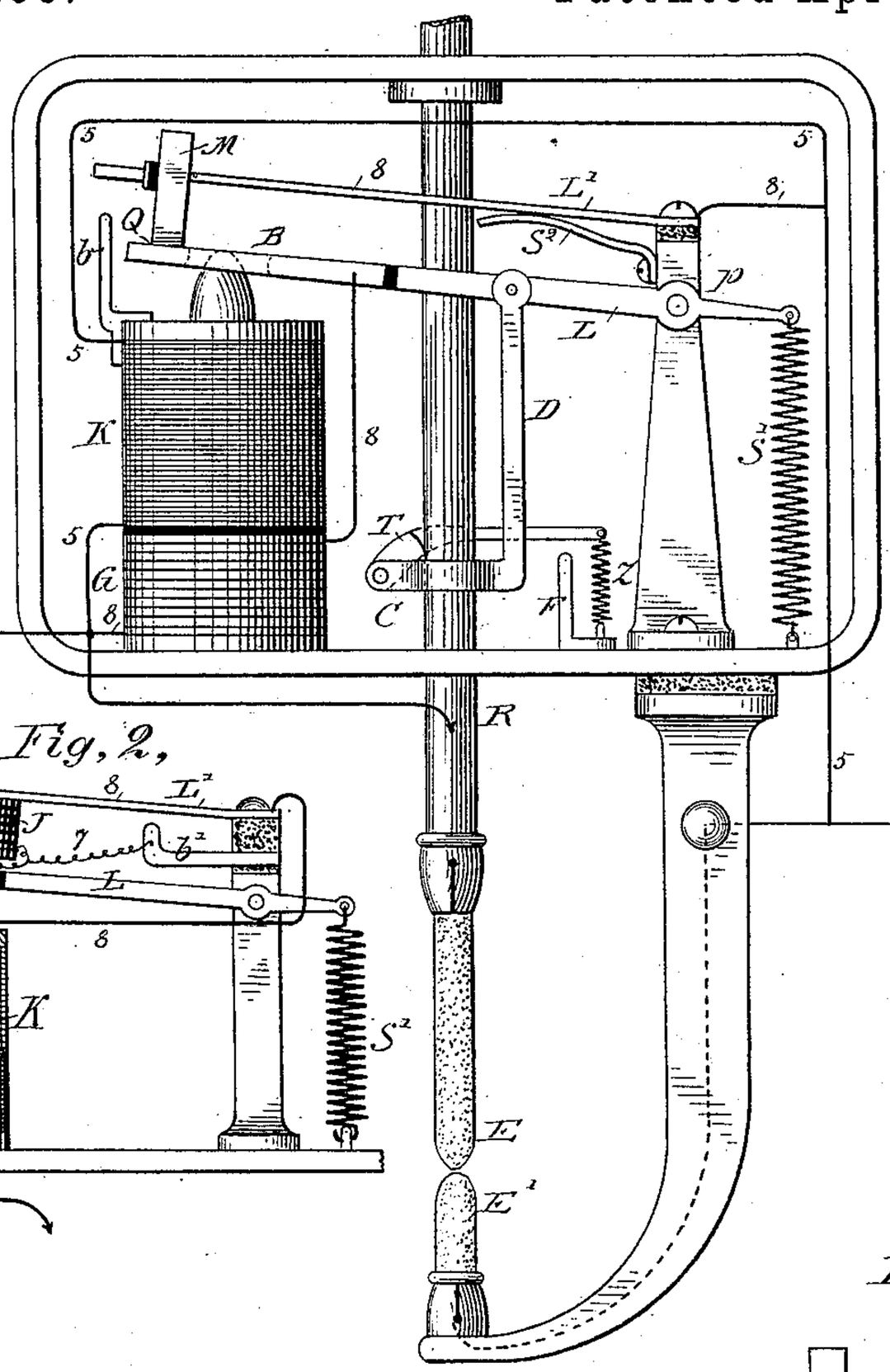


Fig. 2,

Fig. 3,

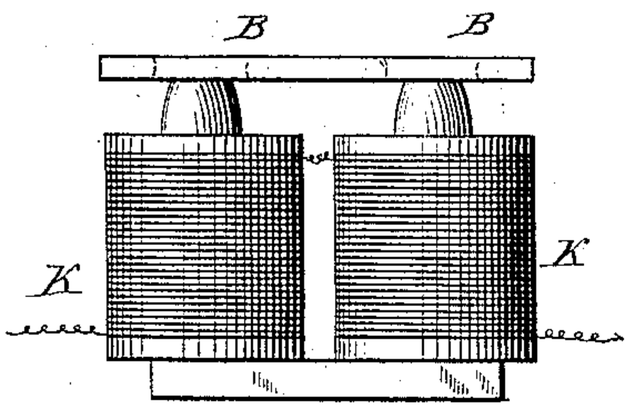


Fig. 4.

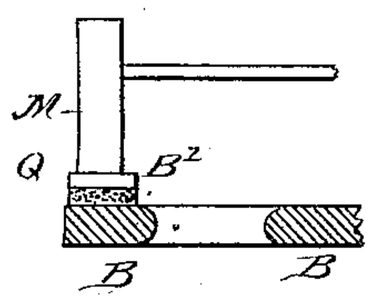
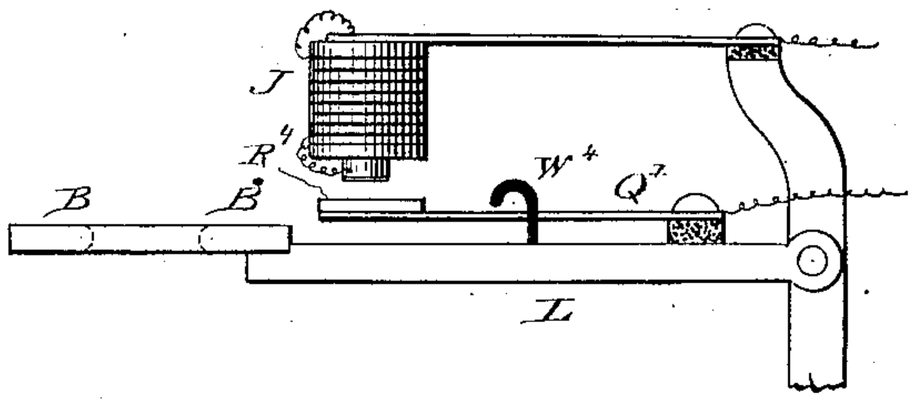


Fig. 5,



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UNITED STATES PATENT OFFICE.

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ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 297,199, dated April 22, 1884.

Application filed January 8, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to electric-arc lamps of the form in which the feed-regulating operations are carried on under the control of current in a high-resistance circuit around the carbons, and a starting circuit or coil is employed for bringing the lamp mechanism into normal or proper operating position at the start, and is immediately thereafter cut out or rendered ineffective, and is maintained in such condition while the lamp continues to act, so that the feed-regulating operations may progress under the action of the derived-circuit current only.

In other applications for patent filed by me as sole inventor or as co-inventor, various arrangements of a starting coil or circuit are described, all alike in the general respect that a starting circuit or coil indirectly or directly, by the flow of current through it, influences the lamp mechanism so as to bring it into position where it may be left to the control of the high-resistance derived-circuit magnet, and that said starting circuit or coil is controlled by a switch or circuit-controller, whose office is to keep the starting circuit or coil intact and operative until the lamp mechanism is brought to proper position, and then to automatically cut out, open, or otherwise render the starting-circuit ineffective and keep it in such condition while the lamp continues to operate.

This invention is broadly claimed in an application filed by E. W. Rice and myself as joint inventors, January 3, 1884, No. 116,300.

My present invention relates more especially to the method of operating the circuit-controller and of keeping its contacts in unchanged relation during movement of the lamp mechanism from a retracted position to a normal or feed-regulating position, and its distinguishing characteristic is the employment of a magnet and armature which hold the contacts together, in contradistinction to a mechanical catch or other mechanical device described in other applications.

My invention consists not only broadly in employing a magnet for holding the contacts together, but also in certain details of arrangement and combinations of parts, the nature of which will be understood from the accompanying drawings and description, and which will be specifically stated in the claims.

As illustrative of my invention, I have shown it as applied to a lamp in which the starting coil or circuit consists of a third branch or circuit around the carbons and closed at the start, said circuit containing an electro-magnetic coil or other device responding to the current, for assisting the regulating coil or magnet in pulling the feed-regulating armature to proper feed-regulating position, as described in the joint application before referred to; but it may be applied with equally good results to other arrangements of starting-circuit, and to lamps in which the current in the auxiliary branch is made to bring the lamp mechanism into operative position in other ways, as will be obvious to those skilled in the art.

In the drawings, Figure 1 is an elevation of an electric lamp embodying my invention. Figs. 2, 3, 4, and 5 illustrate modifications of the invention that will be stated in detail further on.

Referring to Fig. 1, R indicates the ordinary carbon-holder for the upper or positive carbon of an electric-arc lamp, and E E′, respectively, the positive and negative carbons.

L indicates a feed-regulating lever, pivoted at *p*, and acted upon by the opposing influences of a retractor, S′, and of current flowing in a high-resistance derived circuit around the carbons. The influence of such current is brought to bear in the present case, in the ordinary way, by means of a high-resistance magnet, K, whose coils are in the ordinary high-resistance shunt around the carbons, (indicated by the numeral 5,) which magnet acts upon a core or armature connected to L.

P is the pole of the magnet, and B a perforated armature attached to L, and embracing the conoidal or paraboloidal pole P. This form is adopted in order that the magnet may exert the same pull upon the lever L in all positions of the armature for the same strength of current. It is, however, to be understood that my invention is not limited to any par-

ticular form or construction of the magnet system.

Lever L is the feed regulating or controlling lever of the lamp, and serves to adjust the position of the carbons by acting directly or indirectly upon any suitable devices that will, when moved in one direction, raise the upper carbon, and when moved in the other direction to a certain extent will permit the carbon to feed or approach the opposite carbon. As typical of such devices, I have herein shown a clamp or clutch connected with lever L by a link, D, so as to be raised or lowered by said lever or held stationary, according to the relative strength of the current in the high-resistance regulating-circuit 5 and the strength of the retractor for the lever. Any other device or devices may be used in place of the clutch, provided they be of proper construction to cause a release of the carbon when moved in one direction, and to lift the carbon when moved in the opposite direction. The clutch here shown is of the form heretofore invented by me, and consisting, briefly speaking, of a clamp body or guide, C, through which the carbon or carbon-carrier may move, a dog or toe, T, pivoted on said body and held normally in engagement with the carbon or carrier by means of a spring, Z, applied to an arm extending from the toe, so as to prevent the carbon from moving downward through the clutch, and a stop, F, with which the arm engages to release the toe and permit the carbon to feed down whenever the clamp is lowered to a sufficient extent by the regulating-lever or other device, L. The starting-circuit is, in the present case, shown, as a branch, 8, around the carbons, formed through contacts Q of a switch or circuit-controller, L′, and including electro-magnetic coils G of low resistance wound on the same core with K, so that when current flows through said coils G the armature B will be drawn down and will lower the clutch to a point where the upper carbon will be released. The contacts Q are carried, one by the lever L′ and the other by or with the feed-regulating lever L, or device moving therewith. They are here shown as formed, one by the armature B and the other by a magnet, M, which latter is carried by L′, and is in electrical connection with it. When the lever L is retracted to its extreme position, the armature B and magnet M come together and at the same time close the contacts Q. When said lever is drawn down by the action of the current in coils G, magnet M sticks to B, so that the two contacts Q and lever L′ move together and preserve the circuit 8 until an arm extending from L′ strikes a fixed releasing-stop, *b*, whereby the magnet M and its armature B are pulled apart, and the spring S^2 thereupon acts upon L′ and opens the contacts Q. Said lever L′ is thereupon raised to its extreme position, where it is held out of range of the ordinary feed-regulating movements of L.

The general operation is as follows: The lamp being out of action and no current passing, the parts assume the position shown in Fig. 1, contacts Q being closed and the carbons held separated by the action of the retractor S′. When current is turned on, it finds no path through the carbons and divides through K and G, the larger part passing through G and strongly energizing the magnet, so that lever L is pulled down against the action of its retractor S′, and thus releases the upper carbon, so that it may feed down into contact with the lower carbon. In the downward movement of the parts the contacts Q are kept together, and the starting-circuit is thus preserved by the sticking of magnet M to its armature. The release and feed of the carbon having been effected, the lever L is now drawn against stop *b*, which is suitably adjusted for this purpose, and the contacts Q are thus forcibly separated, so as to break the circuit 8 for coils G. Since, at the same time, current is diverted into the circuit through the carbons, owing to the contact between them, the spring S′ now has sufficient power to lift the lever and separate the carbons so as to form the arc. The lifting movement continues until the arc is so far lengthened that the current forced into K balances S′. The lamp is now under the sole control of the coils K, and continues thus, the spring S^2 having at the release of M from its armature raised lever L′ to such a height that in ordinary feed-regulating movements of L the contacts Q will not be closed. When the lamp ceases to act, the spring S′ retracts the lever to a point where contacts Q come together and magnet M sticks to its armature, so that the parts are in readiness for the next operation. In the arrangement shown in Fig. 2 an electro-magnet, J, instead of a permanent magnet, M, is employed. The coils of J, as indicated, are in the starting-circuit 8, which is a branch around the carbons. By such arrangement the release of the magnet from its armature and the opening of the starting-circuit are facilitated, owing to the fact that at contact of the carbons current is largely diverted from 8. To still further assist the action, the releasing-stop *b*′ for lever L is made a contact-stop, and through a short circuit-wire, 7, shunts the current from J, thus de-energizing the latter and promoting the release of the magnet and its armature and consequent opening of the contacts. Fig. 4 simply indicates that the armature for M may be an armature, B′, independent of B, but insulated from it. In this arrangement it is unnecessary to insulate B from its lever. In the arrangement shown in Fig. 5 the magnet J is mounted on a fixed support; but its armature R^4 is carried by a spring, Q′, attached to and moving with L. The spring provides the necessary elasticity to permit the lever L to move without forcing the contacts apart, they being held together by the sticking of the armature R^4 to the magnet. The breaking of the contacts is insured by the action of a hook or stop, W^4,

carried by L and engaging positively with the spring near the end of the same, so as to pull the contacts apart at the proper time.

The general operation is substantially the same as before described in connection with the other figures.

Many other modifications may be made without departing from the spirit of my invention.

What I claim as my invention is—

1. The combination, in an electric lamp having a starting coil or circuit, of a switch or circuit-controller and a magnet and armature for keeping the contacts of the circuit-controller set during the forward movement of the feed-regulating mechanism from an extreme retracted position to a feed-regulating position.

2. The combination, in an electric lamp having a starting coil or circuit, as described, of a circuit-controller or switch that closes the starting-circuit when the feed-regulating lever is in an extreme retracted position, a magnet and armature for keeping the contacts closed during forward movement of the lever, and a detent or stop for opening the switch-contacts at a predetermined point in the movement of the feed-regulating mechanism.

3. The combination, in an electric lamp, of a starting coil or circuit, a circuit-controller or switch therefor, and a magnet for holding said switch-contacts in unchanged relation during forward movement of the lamp mechanism from an extreme retracted position, said magnet being wound with coils connected with the lamp circuits.

4. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller therefor, and a magnet for holding the switch-contacts in unchanged relation until the lamp mechanism has been brought to feed-regulating position, said magnet being wound with coils in the starting-circuit of the lamp.

5. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller therefor whose contacts are closed when the regulating-lever of the lamp is retracted to an extreme position, a magnet for keeping the switch-contacts in unchanged relation during forward movement of the regulating-lever, and mechanism for separating the armature from its magnet, as and for the purpose described.

6. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller therefor, and a magnet and armature movable with the switch and lamp mechanism for keeping the parts of said switch in unchanged electrical relation.

7. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller therefor, and a magnet and armature, one carried by the feed mechanism and the other by the circuit-controller, so that the contacts of the latter may be kept in unchanged electrical relation during an extended movement of the feed mechanism.

8. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller, one part of which is movable independently of the lamp mechanism, while the other moves with said mechanism, a magnet and armature for keeping said parts in unchanged electrical relation, and a spring or other retractor for separating the parts of the circuit-controller when the armature is freed from the magnet.

9. The combination, in an electric lamp, of a starting coil or circuit, a switch or circuit-controller therefor, and a magnet for keeping the contacts of said controller in unchanged electrical relation during forward movement of the lamp-regulating devices from a retracted position, said magnet's coils being in a branch around the carbons.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 4th day of January, A. D. 1884.

ELIHU THOMSON.

Witnesses:
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