(No Model.) 2 Sheets—Sheet 1.

E. THOMSON.

ELECTRIC LAMP.

No. 302,960. Patented Aug. 5, 1884.

Fig. 1.

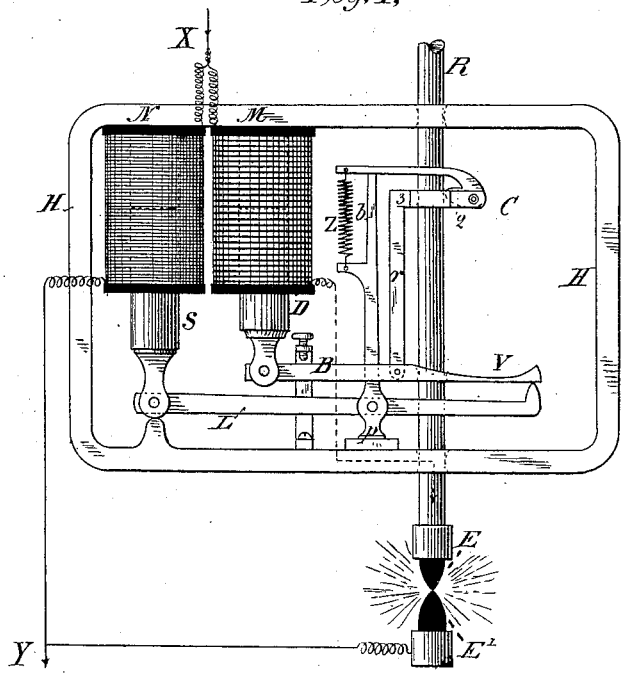
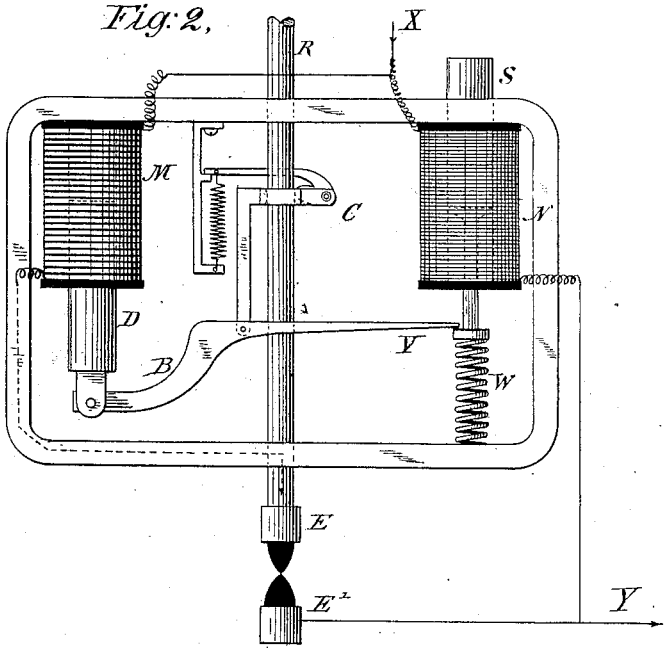


Fig. 2.



WITNESSES

Ernest Abshagen.

Thomas Toomey.

INVENTOR

Elihu Thomson.

By his Attorney

H. B. Townsend.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

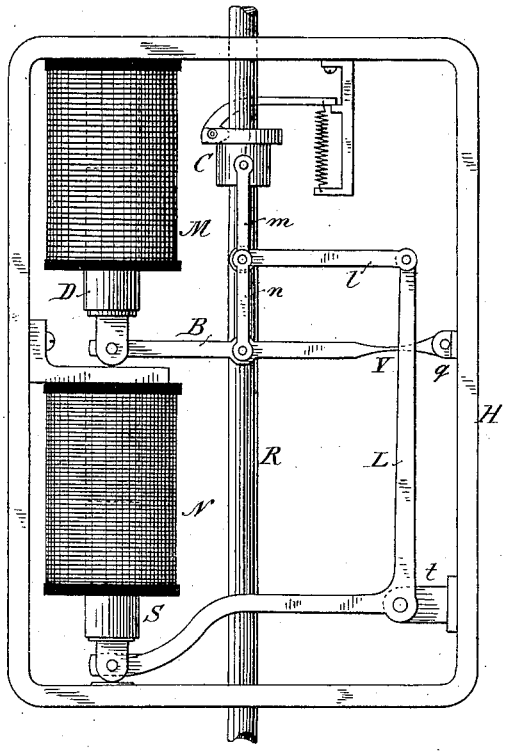


Fig. 4.

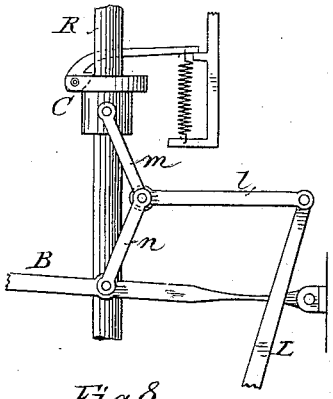


Fig. 5.

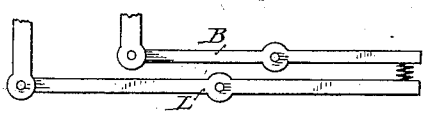


Fig. 6.

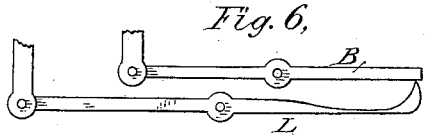


Fig. 7.

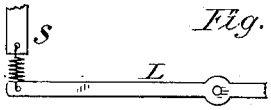


Fig. 8.

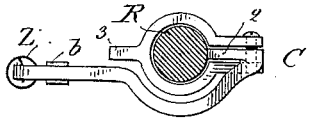
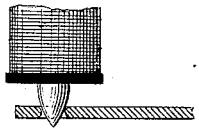


Fig. 9.



WITNESSES

Ernest Abshagen

Thomas Toomey

INVENTOR

Elihu Thomson

By his Attorney

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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 302,960, dated August 5, 1884.

Application filed January 2, 1883. (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 New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

My invention relates to the regulating mechanism of electric-arc lamps; and it consists in so combining a bodily-reciprocating clutch or clamp employed for lifting the carbon to form the arc, and for releasing said carbon to compensate for combustion, with main and derived circuit coils or magnets that said coils or magnets, instead of acting mutually to produce both of the desired operations, shall act independently of one another upon the clutch, the main-circuit coil having the function of so operating the clutch as to form the arc and remaining unaffected during operation of the lamp, while the derived-circuit coil has the independent function of actuating without reference to the position of the main-circuit magnet, and either directly or indirectly, the same clutch, so as to cause a feed of the carbon.

My invention consists, further, of certain details of construction and specific combinations of mechanism that will be described, and then pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation of the operative portions of a lamp embodying one form of my invention. Fig. 2 illustrates another method of carrying the invention into practice. Figs. 3 and 4 illustrate still another form of the invention. Figs. 5, 6, and 7 show modifications in the details of construction. Fig. 8 is a top view of the clutch shown in Fig. 1.

In Fig. 1, H H is a frame upon which the parts of the lamp are supported, and through which passes vertically the carbon holding and supporting rod R, which carries the carbon rod or electrode E. E' is the lower electrode, generally fixed in position. A clutch, C, acts upon the rod R, and consists, preferably, of a hinged toe or cam, 2, and body 3, said toe or cam being held against rod R by spring Z, and released therefrom, when lowered, by a fixed stop, *b*. This clutch or clamp has before been described by me in former Letters Patent. Other clutch mechanism or lifting and releasing mechanism of any suitable nature may be used, my present invention relating to a peculiar disposition of the regulating-magnets relatively thereto and to one another. The clutch C is upheld by an attachment, *r*, to a bar, B, one end of which latter is hinged to a lifting core or armature, D, which is actuated upward when a current circulates through the coil M. This coil is in the path of the direct current to the arc at E E', and its strength and the weight of the core or armature and supported parts are so adjusted with relation to one another that the current circulating in said coils during the operation of the lamp will be sufficient to hold the core or armature and the parts supported thereby in their upper position, despite any fluctuations in the length of arc which may attend the consumption of the carbon and the feed thereof by the derived-circuit coil. A suitable stop is preferred, to limit the upward movement of the core or armature, so as to determine the length of the arc formed when the lamp starts into action. When the armature or core D is unattracted, the clutch C is opened by its hinged portion resting on the stop *b*. A lever, L, pivoted at *p* to a support, has attached to one end a core or armature, S, actuated upward by a coil, N, in a derived circuit around the arc, as shown. The other end of the lever L is under the bar B, at a point near its end, as shown. The part V of the bar B is preferably made thin and somewhat elastic; or, instead, a spring of slight elasticity may be interposed between the bar B and the lever L, where they meet; or the lever L may be made thin and slightly elastic at any point; or it is connected to S by a slightly-elastic connection. The three latter modifications are shown, respectively, in Figs. 5, 6, and 7. The weight of the core S and the parts supported thereby, or the influence of the retracting-spring, if one be used, is made sufficiently great to prevent the clutch C from being released by the coils N, excepting when, by the lengthening of the arc beyond its normal and adjusted extent, the amount of current in said coils is increased beyond the amount which flows when the arc is of proper length, or when

said arc is being formed by the action of the main-circuit coils.

The lamp, as thus constructed, operates as follows: The passage of current through M' lifts D, which in turn lifts B and the clutch C, raising the rod R, and establishing the arc at E E'. During this operation the core S remains at rest when the current flowing in N is insufficient to lift the same. The formation of the arc is then effected by the main-circuit coils solely and independently of any effects from the current flowing in the derived-circuit coils. The position thus assumed by the core D is retained during the subsequent operations of feeding, and said core only drops when the current is withdrawn from the circuit or becomes abnormally weak. When the arc lengthens by consumption of the carbon, the coil N acts with sufficient force to raise S, and in consequence the bar B may descend, independently of the position occupied by the core or armature D. The clutch C is thus lowered and freed from the rod R, causing a feed of the carbons. This action is repeated as often as necessary, and, as will be seen, does not depend upon any differential action of the two coils or magnets upon each other, since the core D retains the position first assumed by it.

The object of the elastic portion above referred to is to steady the action of the clutch C. This may, however, be dispensed with in many instances without greatly affecting the result.

This device may be defined as an elastic connection between the point of attachment of the clutch C to the lifting bar or lever B, and the support of said bar when either fixed or movable, and I broadly claim this disposition.

Electro-magnets and armatures may be substituted for the cores and coils of Fig. 1, and are preferably magnets of any suitable construction possessing a long range or nearly uniform attraction in changed positions. One such construction, patented to me by Letters Patent of the United States No. 253,958, and consisting of a magnet having a tapered pole and a perforated armature, is shown in Fig. 9. The magnets may be disposed in various positions, while the other parts are practically disposed as in the preceding figure.

Fig. 2 shows a modification in the disposition of parts, the only essential change from the former figure being the dispensing with the lever L and allowing the coil N and core S to act directly upon the bar B. This requires the addition of a sustaining-spring, W, for the core S of strength sufficient to maintain said core in its upper position, except when actuated downward into the coil N by the derived-circuit current in causing a feed. Dash-pots for checking sudden movement may be provided, or the cores may be fitted closely to their coils, so as to compress and expand the air in the coil center, thus producing the same effects as a dash-pot.

Although the coil or magnet N S has been described as in a derived circuit, it may, nevertheless, be arranged in different positions, current being admitted to it at the proper time by means of a derived-circuit magnet, as shown in United States patent granted to me, No. 258,684. In any case all that is necessary is that the strength of the electro-magnet N S should be made to vary sufficiently to operate the feed-controlling mechanism whenever the arc increases in length beyond a determinate degree.

In Fig. 3 is shown a further modification of construction, utilizing the same principles as before. In this case the bar B is pivoted at *q* to a fixed support and connected to the clutch C by a double link consisting of parts *m n*, as shown. The connecting-rod *l* unites the double link *m n* with the lever L, pivoted at *t* and acted upon by the core S of the derived-circuit magnet-coil N. When current circulates through M, the core D and bar B are raised, and by virtue of the links *m n* the clutch C is also raised and an arc established. When the derived-circuit coil N is energized by formation of arc sufficiently to raise its core S, the links *m n* are thrown into the angular position shown in Fig. 4 by the movement given to L and *l*, thus lowering the clutch C and permitting a feed independently of the action or position of the magnet M and core D.

Various other modifications may be made in mechanical details of construction and the disposition of the parts without departing from my invention, provided that in all cases the electro-magnets be adjusted or constructed in the manner described, so that the core or armature of the electro-magnet in the main circuit will retain an upper or lifting position during the normal action of the lamp, while the derived-circuit coil will easily bring the mechanism controlled by it into action when the arc lengthens, so as to require the feed to take place; and provided, further, that the armature or cores of said magnets have independent mechanical connections with the clutch, such that they may at the proper times act upon the clutch independently of one another, and especially such that the derived-circuit coil may move the clutch to cause the connection of the feed without interference with or from the core of the main-circuit magnet.

I have herein stated that the magnets may be so constructed as to have a nearly uniform pull with the same current in the various positions of their armatures. I, however, make no special claim herein to the combination of a derived-circuit magnet thus constructed with the other mechanism herein described, as I propose making such combinations the subject of another application for patent.

In another application for patent, filed by me February 25, 1882, Serial No. 53,726, I have described an elastic connection between the clutch or clamp and its actuating lever or armature, and it is therefore to be understood

that my present application, so far as concerns the elastic support, is intended to cover only an improvement upon the broad invention contained in my prior application.

What I claim as my invention is—

1. The combination, in an electric lamp, of a clutch or clamp engaging with the carbon rod, a releasing-stop for said clamp, means for supporting the clamp, whereby it may be raised bodily by the action of a main-circuit magnet, and independent connections to the support for the clamp from a derived-circuit magnet, whereby the latter may on an increased attraction lower or impart a reverse movement bodily to the clamp without any movement of the main-circuit magnet armature or core.

2. The combination, in an electric-lamp, of a clutch or clamp and stop therefor, said clamp or clutch normally engaging with the carbon rod, but released therefrom when brought into engagement with a stop, a lifting core or armature for raising or moving the clamp bodily in one direction away from its releasing-stop, so as to form the arc, and constructed, in the manner described, to retain its lifted position during consumption of the carbon, a derived-circuit coil and core or armature therefor, acting only on an increase in the length of arc, and mechanical connections between said core or armature and the clamp-support independent of the lifting-armature, such that the derived-circuit magnet may move the clamp bodily in the opposite direction without any movement of the lifting armature or magnet, and thus bring the clamp against its stop, so as to cause a feed of the carbon.

3. In an electric lamp, two independently and separately acting electro-magnets or solenoids—one in the derived and the other in the main circuit—in combination with a free support, B, acted upon at two points removed from one another by said magnets, respectively, so that either magnet may raise or lower it without movement of the other, and carbon-adjusting mechanism carried by said support B between the points of connection of the two magnets, as and for the purpose described.

4. In an electric lamp, two independently and separately acting electro-magnets or solenoids—one in the direct and the other in the derived circuit—in combination with a loose connection, B, and carbon-adjusting mechanism supported or actuated by the latter.

5. The combination, with a reciprocating feed-controlling and carbon-separating device moving bodily in one direction or the other to produce a separation of the carbons or a release of a carbon, of a support for said device, fulcrumed at points on opposite sides of the point at which said device is connected, and means for raising or lowering said support at one or the other of its fulcrums, so as to cause a movement of the feed-controlling mechanism bodily in one or the other direction, according to the required operations of separation or feed of the carbons.

6. The combination, with a bodily-moving reciprocating clamp or clutch, of a rocking support adapted to rock on either of two fulcrums or points of support on opposite sides of the point at which the reciprocating clamp is connected, and means for causing said support to rock or tilt on one or the other of said fulcrums to raise or lower the clamp.

7. The combination, with a lifting and a feeding magnet, of a bar supported by independent connections from said magnets, and a reciprocatory clutch or clamp connected with said bar at a point between the points of connection of said magnets, so that either magnet may raise or lower the clutch bodily, and a releasing-stop in the path of said clamp or clutch.

8. The combination, in an electric lamp, of a lifting-magnet, a continuous bar, B, having an elastic support, a clutch or clamp connected with said bar, and having a movement up and down bodily in substantially a right line, and a stop or detent for said clutch arranged in its path, so as to release said clutch from the carbon or carrier when the clutch is lowered to a predetermined point.

9. The combination, in an electric lamp, of a lifting-magnet, a lifting-bar or support for the clamp or clutch, an elastic connection between said bar and its normal support, and a clamp or clutch consisting of a clamp-body and a pivoted clamping-toe pivoted on said body and normally held in engagement with the carbon rod by a spring.

Signed at New Britain, in the county of Hartford and State of Connecticut, this 28th day of December, A. D. 1882.

ELIHU THOMSON.

Witnesses:

E. WILBUR RICE,

W. O. WAKEFIELD.