(No Model.) 2 Sheets—Sheet 1.

E. THOMSON.

ELECTRIC ARC LAMP.

No. 356,903. Patented Feb. 1, 1887.

Fig. 1.

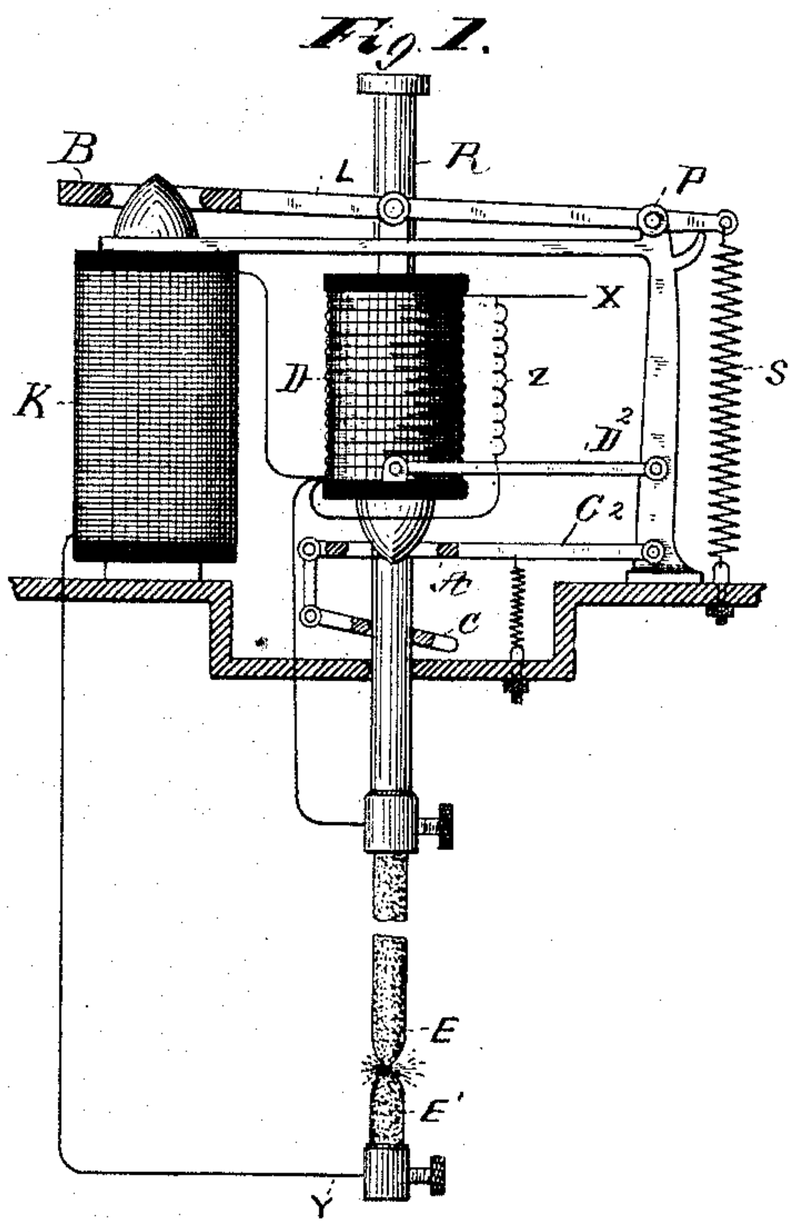
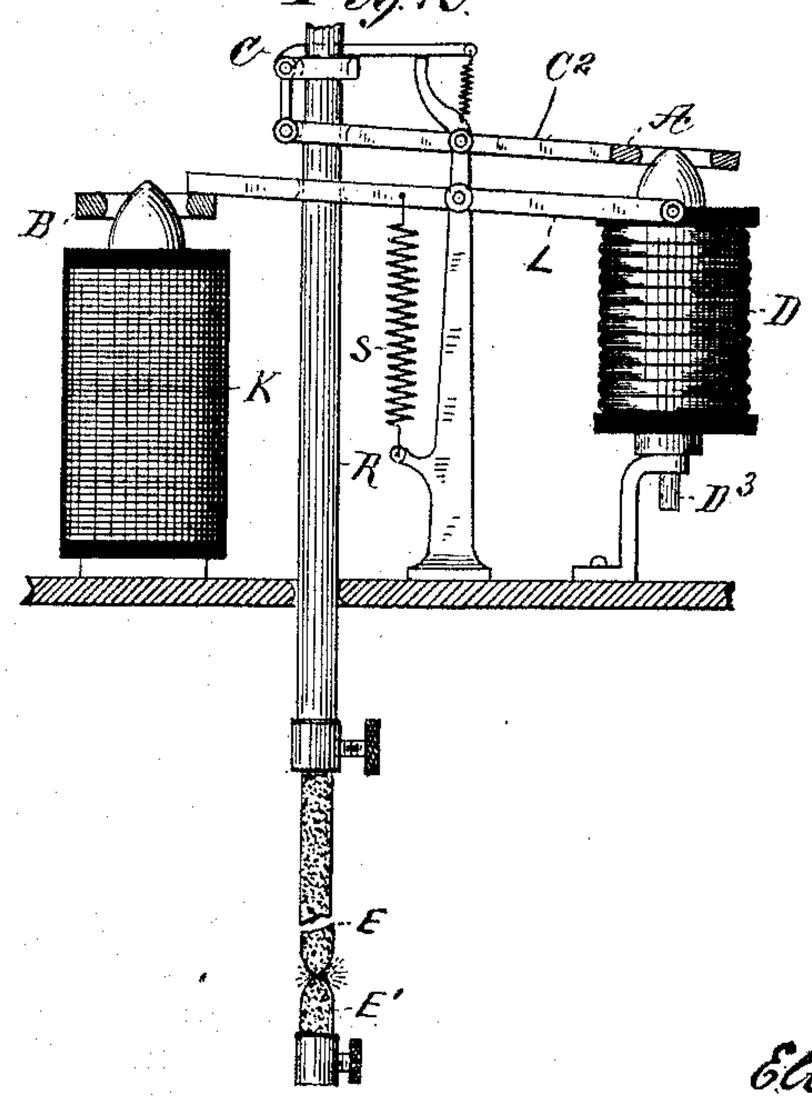


Fig. 2.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

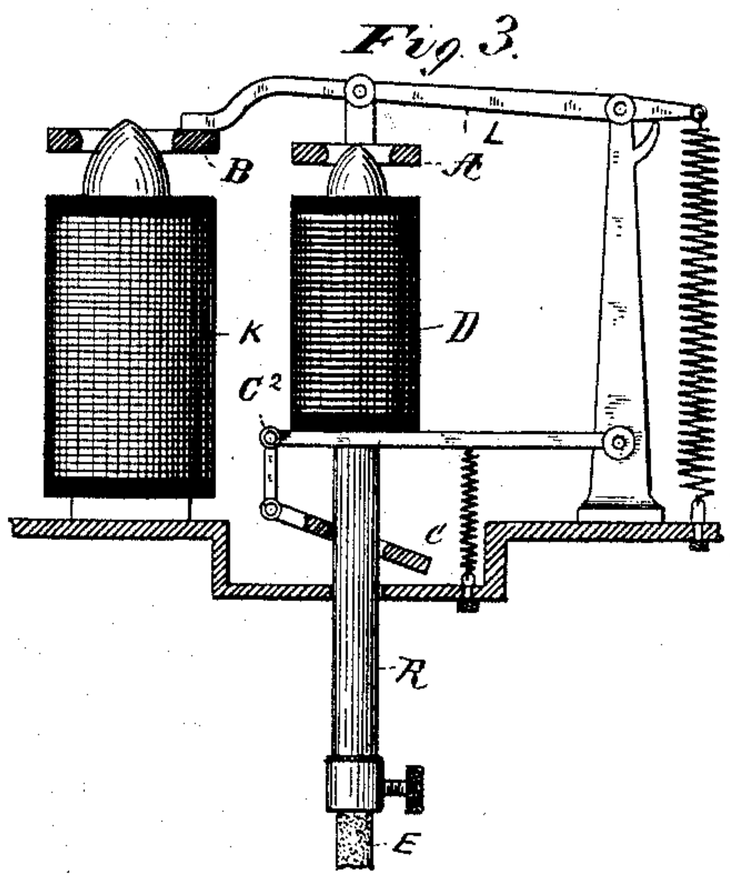


Fig. 4.

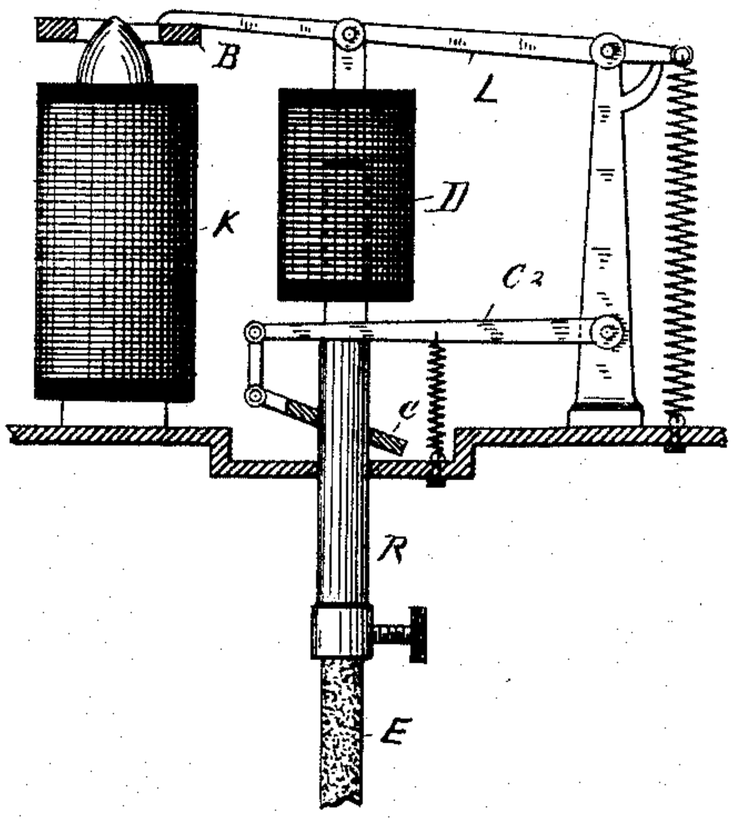
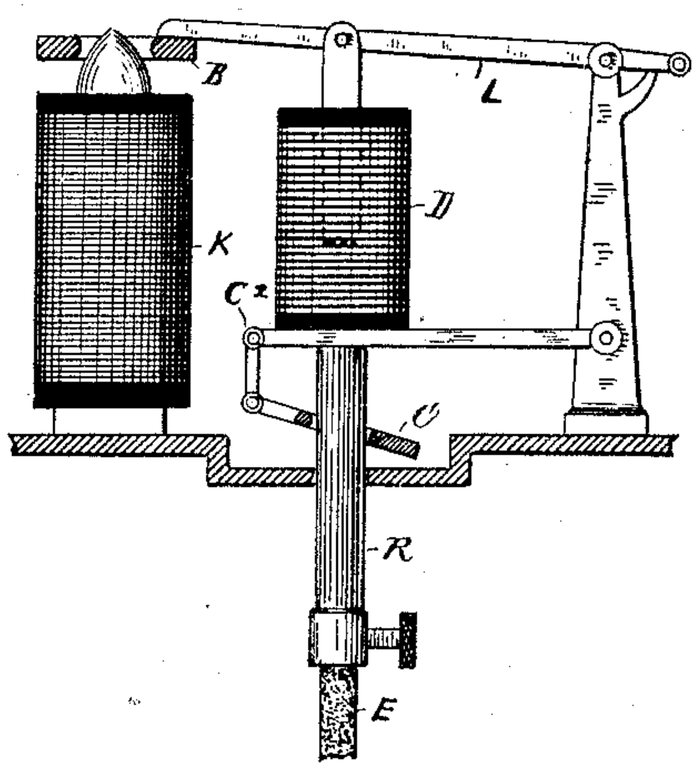


Fig. 5.



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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 356,903, dated February 1, 1887.

Application filed July 3, 1885. Serial No. 170,654. (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 the magnet system and associated mechanism in an electric-arc lamp whereby the proper control of the carbons in forming and maintaining an arc of the desired length is obtained.

My invention consists in a novel construction of electric lamp, in which the main-circuit magnet acts to lift the feed mechanism to form the arc independently of the derived-circuit magnet and through the magnetic influence of parts, one of which is mechanically connected with the feed mechanism, while the other is upon a movable support actuated by the derived-circuit magnet, the latter magnet being employed solely to move such support in a direction to cause the magnetically-suspended feed mechanism to be lowered, so as to effect a feed.

The particular combinations forming my invention will be specified in the claims.

My invention may be carried out by the employment of any desired feed mechanism; but I prefer to employ either a clock-work or clutch feed of the well-known construction mounted on or connected with a suitable movable support, and combined with the detent or releasing stop or catch in such way that a movement of the mechanism bodily in one direction will raise the carbon to form the arc, while a movement in the opposite direction will permit or cause the release of the mechanism and feed of the carbon.

I have for the sake of simplicity illustrated and described my invention as carried out in connection with an ordinary clamp or clutch engaging with the carbon or carbon-carrier.

Figure 1 of the accompanying drawings is a side elevation and partial section of a lamp embodying my invention. Figs. 2, 3, 4, and 5 illustrate modified dispositions of the magnets, all embodying the same invention.

Referring to the accompanying drawings, R indicates the carbon rod or carrier, with which the feed-controlling mechanism engages in any suitable manner, so as to raise the carbon-rod R to produce the arc, or, when moved in the opposite direction, to release the same to permit a feed to take place. The feed-controlling mechanism is here shown as consisting of the clutch C, of ordinary construction, which is suspended from or carried by a lever, C^2. The lever C^2 carries the armature A of a direct-circuit magnet, D, which latter, when energized, raises the armature A by magnetic attraction and lifts the clutch C, so that the latter engages with and in turn lifts the rod R. The magnet D is in turn suspended or supported by a lever, L, or other support, which is subjected to the action of an electro-magnet energized by the electric current in the derived circuit around the arc. Such electro-magnet is indicated at K. B is the armature for said magnet, and S the retractor, which tends to raise the armature and at the same time to elevate the direct-circuit magnet D.

The magnets D and K are preferably constructed so that they may exert a uniform pull upon their armatures for the same strength of current in all positions of the armatures. This may be attained by the expedient of perforating the armature and making the pole of the electro-magnet conoidal or tapered in form, as shown.

The retractor S for the derived-circuit magnet is so adjusted that it may hold the lever L against downward movement under the pulling action of the magnet D in lifting the clutch C and the rod R to form the arc; but that it will give way to the increased counteracting pull produced when the magnet K pulls upon the armature B with the increased power due to lengthening of the arc and consequently increased flow of current in the coils of K.

The parts described are suitably mounted and supported in a frame, as indicated. Any desired adjustment may be provided for the magnet D. Such adjustment may be effected by shunting it more or less through a short high-resistance wire, (indicated at Z,) which is connected to the terminals of the magnet. The magnet D is also provided with a parallel-motion link, D^2, or other suitable guiding device, so that its pole, acting on the armature A, may be caused to move in a nearly vertical line, and may not greatly change its

relation to the armature. A restraining-spring might be applied to the part supporting the armature A.

The magnet D may be energized by a current taken in any way from the main circuit, but is preferably placed in the direct main circuit leading to the upper carbon, as usual. The derived circuit for the electro-magnet K is here shown as taken from a point between the magnet D and the upper carbon, so that with a suitable regulator applied to the source of electric current the power of the magnet D will be practically constant, despite any fluctuation in the length of the arc in the lamp to which it is applied, and yet the derived-circuit magnet will be responsive to such fluctuations, so as to produce a feed at the proper time.

The operation of the lamp is as follows: When no current is passing, the retractor S holds the magnet D up and the armature B retracted to its extreme position. As the magnet D is not energized, the armature A is down and the clutch or other carbon supporting and feed regulating device is down, so that the rod R is disengaged and the carbons are together. When the current is turned on, the magnet D is energized in an obvious manner and raises the armature A, the magnet being prevented from downward movement through the superior retracting power of the retractor S, which, as before stated, is adjusted above the influence of the parts, excepting when the magnet K acquires increased power through the lengthening of the arc beyond the normal. As the armature A rises it carries with it the clutch C, which latter, engaging with the rod R, lifts the upper carbon and forms the arc at E E', thus causing the magnet K to become energized and to begin to exert an attraction upon its armature B. When the arc becomes lengthened to a sufficient degree to require a feed of the carbon, the magnet K overcomes the retractor S, and the clutch C, being thereby depressed, is caused to release the rod R, after the usual manner, so as to permit the latter to feed. As soon as the arc becomes of normal length the magnet K is so weakened that the retractor reasserts its influence, so as to slightly lift the magnet D, armature A, and clutch C, and to thus stop a further feed until a lengthening of the arc requires a recurrence of the operation.

In Fig. 2 the parts are shown arranged in a slightly-different relative position, but the action would be substantially the same as with the devices of Fig. 1. The clutch shown in this figure is of the form hitherto employed by me, and shown in various of my prior patents. It consists simply of a clutch-body encircling the rod and a pivot-clamping toe or lever pivoted on the body and engaging with the rod.

The magnet D is hung on pivots from the derived-circuit lever L, and is provided at its lower end with a guide-pin, D^3, working in a guide-opening in a suitable bracket.

It is obvious that the parts by whose magnetic influence the clutch or similar device is suspended may be transposed without affecting the operation—that is to say, the magnetic element A, instead of being attached to the movable parts carrying the clutch, might be carried by the lever or other support subject to the influence of the derived-circuit magnet, the coils and core of the magnet D being in such instance made to take the place of the armature A, in Fig. 1. Such a transposition of parts is illustrated in Fig. 3. The operation is, however, obviously the same.

I do not limit myself to any particular form or construction of magnet for holding the clutch C suspended by magnetic influence, one or the other parts of the magnetic element being at the same time subjected to the influence of the derived-circuit magnet, as before described.

It is obvious that instead of a fixed core for the magnet a movable core might be used, such movable core taking the place of the armature, after the manner well known in the art. Such a modification is illustrated in Fig. 4, where the core of the electro-magnet D is shown connected to the lever C^2, or other movable support carrying or imparting movement to the devices, by whose movement in opposite directions the arc is formed and the feed of the carbon regulated or goverened.

The coil and movable core might be transposed without essentially changing the action, as indicated in Fig. 5, the coils D being in this instance supported on the lever C^2 and the core attached to the lever L or other device that is moved to and fro with the variations of a current in the derived circuit around the arc.

My invention is not limited to any particular form or construction of magnets, the essence of the invention consisting in so combining the mechanism with the main and derived circuit magnets that the lever or other part moved by the latter, instead of having any direct mechanical connection with the part supporting or carrying the feed-controlling devices, shall have a control through a magnetic influence of the electro-magnet whose coils are preferably in the main circuit and whose two magnetic elements are connected, respectively, one with the feed-controlling mechanism and the other with the lever or other support moved by the varying influence of the derived-circuit magnet.

In a prior patent granted to me August 14, 1883, No. 283,168, I have shown a magnet system for arc-lamps in which the main and derived-circuit magnets act on the same support for the feed mechanism of the lamp. The devices of that patent, however, differ from those of my present invention in that the derived-circuit magnet of the present application imparts movement to the devices through a second magnet whose magnetic influence holds the mechanism suspended and takes the place of the mechanical connecting-link, while in the prior patent the movement is communi-

cated through mechanical connections, the armature and magnet making the main-circuit electro-magnet being in the latter instance maintained in fixed position, and neither of them being moved in the act of communicating movement to the mechanism.

I am aware of English Patent No. 3,821 for the year 1881, and do not desire to be understood as claiming any invention disclosed in said patent.

What I claim as my invention is—

1. The combination, with a derived-circuit magnet and a support, C^2, sustained thereby in position dependent upon the strength of current in said derived circuit, of an intermediate magnet by whose magnetic influence the part C^2 is mechanically connected to the derived-circuit magnet, so that movements of the armature or equivalent portion of the latter may be communicated through the intermediate magnet to the support C^2.

2. The combination of a lever, C^2, a lever, L, for a derived-circuit magnet, and an intermediate magnet by whose magnetic influence the lever C^2 is sustained, so that movement of the lever L may be communicated to it.

3. The combination of the lever or support C^2, a lever or support, L, controlled by a derived-circuit magnet, and an intermediate main-circuit magnet by whose magnetic influence the support C^2 is kept in mechanical connection with support L, so that movements of the latter will be communicated to lever C^2.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 29th day of June, A. D. 1885.

ELIHU THOMSON.

Witnesses:
W. O. WAKEFIELD,
E. W. RICE, Jr.