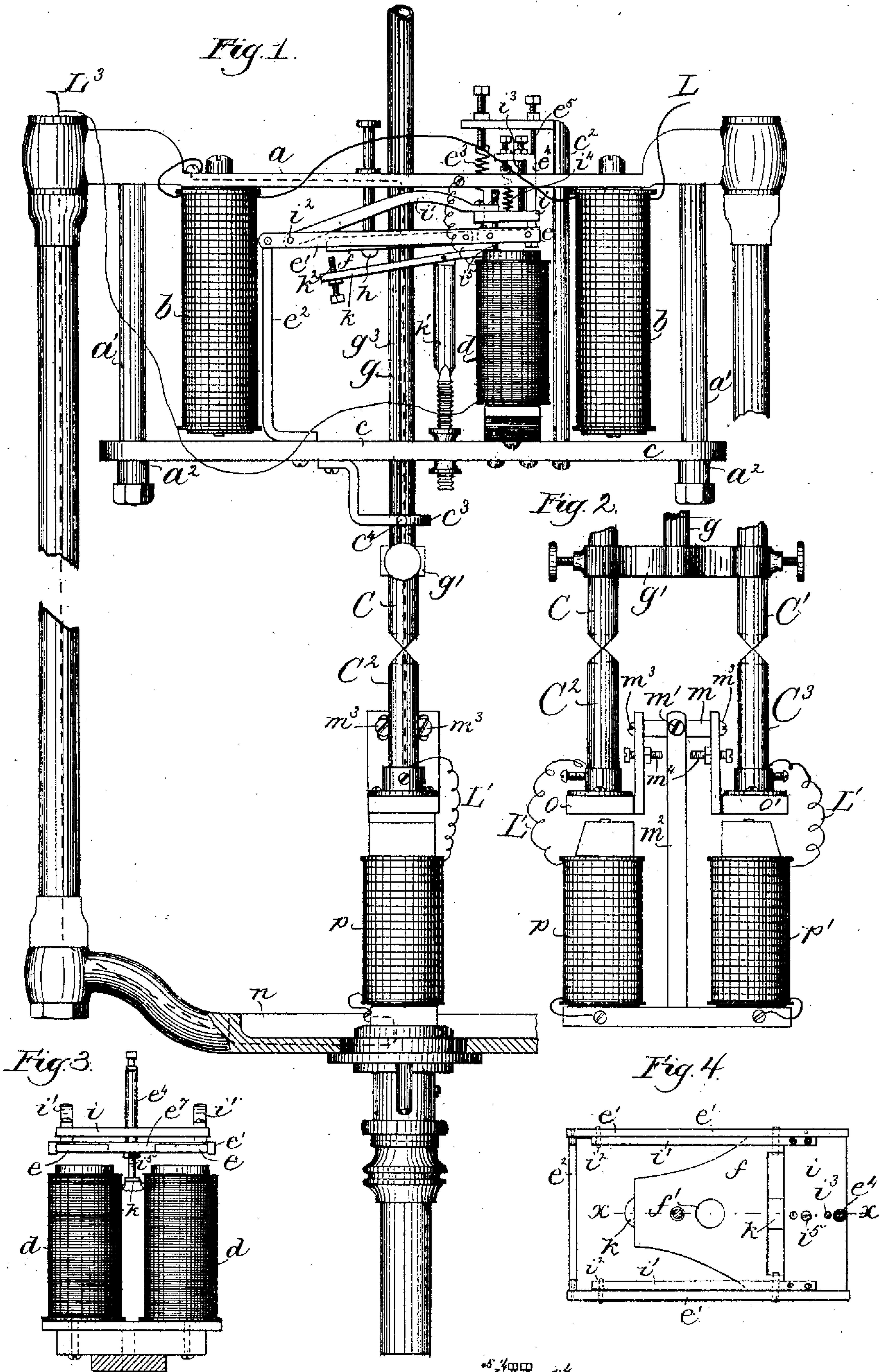
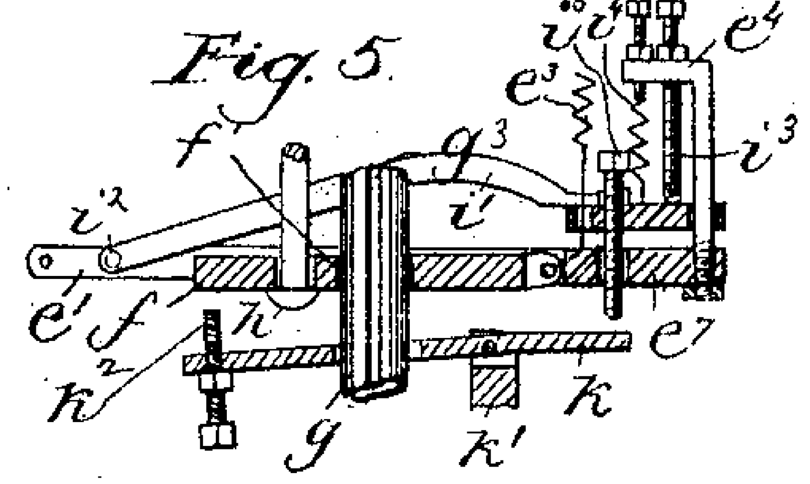
(No Model.)

J. J. SKINNER.

ELECTRIC LAMP.

No. 370,424. Patented Sept. 27, 1887.





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UNITED STATES PATENT OFFICE.

JOSEPH J. SKINNER, OF BOSTON, MASSACHUSETTS.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 370,424, dated September 27, 1887.

Application filed June 21, 1886. Serial No. 205,784. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. SKINNER, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Electric Lamps, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is embodied in a double lamp, or one in which two carbon pencils are controlled by a single feed mechanism, so that the lamp burns about twice as long as a lamp giving the same amount of light and having but a single carbon pencil of each polarity.

In double lamps as heretofore commonly made the two upper carbons are fed separately—one being wholly consumed before the feed of the other begins, and although controlled by a feed mechanism common to both, the two carbons are not fed simultaneously, but one is retained subtantially stationary while the other is feeding, and in another class of double lamps the two upper carbons are fed simultaneously, but burn intermittingly, the arc being first at the end of one and then transferred to the other. In the present invention the two upper carbons are fed simultaneously, and by proper adjustment they may be made to burn either simultaneously or each to burn intermittingly, the one alternating with the other. When arranged to burn simultaneously, the two upper carbons and their corresponding lower ones may be in multiple-arc or parallel circuit, and the two arcs may each be shorter and less brilliant than the single arc, and the consumption of the carbons slower, so that the lamp will burn a greater length of time than a single lamp taking the same current and having carbons of the same size and length. The lamp is shown as having a feed controlled by an electro-magnet independent of the one by which the carbons are separated to establish the arc when the lamp begins to burn. The said feed-controlling magnet may be either in the main circuit or in a shunt or branch around the arc, according as the lamp is is to burn in a circuit by itself or in circuit with a number of other lamps, being shown in this instance as in a shunt.

In another application, Serial No. 197,846, filed April 5, 1886, I have shown and described a lamp in which the carbon-controlling clamp is operated by two electro-magnetic devices affected by the same changes in current and acting on two different parts of the clamp, the said devices consisting specifically of two electro-magnets and of an armature having one part movable toward one of the said magnets, while the other magnet is movable toward another part of the said armature, and in another application, Serial No. 200,311, filed April 27, 1886, I have shown a clamp having the same general principle of operation, but being acted upon at two different points by a single electro-magnet and armature. In the present invention the clamp controlling the feed of the carbon-supporting rod is acted upon at two different points by two different armatures belonging to a single feed-controlling electro-magnet.

Figure 1 is front elevation of an electric lamp embodying this invention, a portion of the frame-work being broken away and shown in section; Fig. 2, a side elevation of the carbons and devices controlling the two lower carbons; Fig. 3, an end elevation of the feed-controlling devices; Fig. 4, a plan view thereof, and Fig. 5, a sectional detail on line $x\ x$, Fig. 4.

The operative parts of the lamp are supported on the cross-bar a, constituting the main frame-work, and having connected with it magnet-cores provided with coils, forming, with the said cross-bar a, the lifting-magnet b, that is included in the main circuit and operates to separate the carbons and establish the arc in starting the lamp. The armature c of the said magnet is shown as guided by rods a', of a non-magnetic material, connected with the cross-bar a, the said armature being retracted by gravity and having its downward movement limited by shoulders a^2 at the ends of the rods a', and its upward movement limited by non-magnetic stops in the poles of the lifting-magnet b.

The armature c supports and constitutes the frame-work for the feed mechanism of the lamp, and the said armature is raised when the current first flows in the circuit, and remains in its uppermost position as long as the lamp remains in operation, the said armature c having no movement during the operation of the lamp except at starting.

The feed-controlling magnet d is fixed upon, but magnetically insulated from, the armature c, and is provided with an armature, e, carried by an armature-lever, e', pivoted on an arm or bracket, e^2, fixed upon the armature c of the lifting-magnet. The said armature-lever e' has pivotally connected with it near the armature e one end of the clamp f, shown as the usual ring-clamp—that is, a plate having an opening, f', slightly larger than the carbon-supporting rod g—so that when the plate or clamp is at right-angles to the rod the latter can slide freely through the opening f'; but when the said plate is sufficiently inclined it will bear against the rod g at the diagonally-opposite edges of the opening f', and when in this position a very slight angular movement of the clamp will vary the pressure on the rod, so as either to hold it tightly and prevent longitudinal movement of the rod or to permit the rod to slip through the clamp, and thus feed the carbon or carbons C C′, connected with the said rod. The armature e is acted upon by a retractor, e^3, connected with an arm, c^2, fixed upon the armature c, and the said armature e is provided with an arm or bracket, e^4, fixed to it, the purpose of which will be hereinafter described. A stop, e^5, (shown as engaging the arm e^4,) limits the retractive movement of the armature e. The arm c^2 moves in an opening of the bar a as a guide, while the other stops and springs of the feed mechanism move freely through a large opening in the said bar. When no current is flowing, the armature e is retracted as far as permitted by the stop e^5 and the end of the clamp f, pivotally connected with the said armature, is in its highest position with relation to the armature c; but the said armature c is itself in the lowest position with relation to the frame-work of the lamp, and the opposite end of the clamp f then rests on a stop, h, connected with the frame a, which holds the said end of the clamp sufficiently high to just release the carbon-supporting rod g, so that the latter can slip down by gravity until the carbon or carbons C C′, connected therewith, rest in contact with the lower carbons, C^2 C^3, so as to afford a path for the current when the lamp is to be operated. When the current is applied, the armature c is attracted, and lifts with it the magnet d (which is at this time but slightly energized) and the armature e thereof and adjacent end of the clamp f, which first grips the rod g and then lifts the same bodily, the said clamp rising from the stop h. This lifting of the carbon rods separates the upper from the lower carbons and establishes the arc, and at the same time causes more current to pass through the magnet d, which is here shown as in a shunt around the arc, the lamp being intended to burn in the same circuit with other lamps. The increase in strength of the magnet d will cause its armature to be attracted, moving the adjacent end of the clamp f down relative to the armature c, without, however, at first changing the angular position of the clamp or causing it to release its grip on the rod g, which is thus moved down bodily with the clamp relatively to the armature c.

As the carbons burn away, instead of continuing a downward movement of the clamp until it is engaged by the stop h, (the common mode of operation in electric-arc lamps,) the end of the clamp f opposite that pivoted to the armature-lever e' is acted upon by a second armature, i, fixed on a lever, i', (shown as pivoted at i^2 upon the armature-lever e'.) The said armature i is provided with a back-stop, i^3, and retractor i^4, connected with the arm e^4 and armature e, and the armature i is also provided with a projection, i^5, which passes freely through the armature e and acts on one arm of the lever k, pivoted upon an upright, k', fixed upon the armature c, and having its other arm provided with an engaging projection, k^2, which, when the armature i is attracted, comes in contact with the under side of the free end of the clamp f, tending to lift the same, and thus to change the inclination of the clamp and to relieve its pressure on the rod g, which is thus permitted to slip through the clamp and feed the carbons.

In order that the magnetic effect on both armatures e and i may properly follow from the changes of strength of the magnet d, the said armature e is made of two separate pieces of magnetic material, as shown in Fig. 3, rigidly fixed in a bar, e^7, of brass or non-magnetic material, so that they do not complete a magnetic circuit for the magnet d; but are attracted by each pole of the said magnet and themselves attract the armature i, which is continuous over both poles and is practically affected proportionally to changes in strength of the magnet d.

This feed mechanism is capable of controlling a lamp having a single upper and lower carbon. As shown in this instance, the rod g is provided with a cross-piece, g', (see Fig. 2,) having two carbons, C C′, rigidly connected therewith, and thus both rising and falling simultaneously. The carbon-supporting rod g passes without contact through an opening in the frame-piece a, and is guided solely by the clamp f and a guide, c^3, connected with the lifting-armature c. The said rod g has a longitudinal groove, g^3, as shown, engaged by a projection, c^4, which prevents it from turning and retains the cross-piece g', with the carbons supported therein, in line with the lower carbons. The guide c^3 may be the opening in the armature c, through which the rod g passes.

Co-operating with the two upper carbons, C C′, are two corresponding lower carbons, C^2 C^3, shown as fixed on a tilting lever, m, pivoted at m' on an upright, m^2, connected with the lower member, n, of the lamp-frame in any usual manner. The tilting lever m is provided with two armatures, o o', for electro-magnets p p', supported on the lower member, n, of the lamp-frame, and the sockets in which the lower carbons, C^2 C^3, are clamped are respectively connected to and movable with the said armatures o o'. The circuit L on coming to the lamp passes through the lifting-magnet b and frame a to the carbon rod g and both upper carbons, C C′, and continues to the lower carbons, C^2 C^3, which are insulated from their support and each connected by a flexible conductor, L′, as shown, with one terminal of the corresponding magnet, p or p', the other terminals of which magnets are connected together and with the other terminal L^3 of the lamp. By this arrangement, when the upper carbons are simultaneously raised, if one separates from the lower carbon before the other the current will pass entirely through the carbons that are not yet separated and through the corresponding magnet, p or p', and, assuming, for instance, that the right-hand carbons, C′ C^3, as seen in Fig. 2, are the first to separate, the current will pass through the magnet p, attracting the armature o, and thus separating the carbons C C^2, corresponding to the said magnet p, and establishing the arc between them; and a sufficient range of movement should be given to the swinging lever m to cause the other lower carbon, C^3, which will be raised by the tilting of the lever to overtake and come in contact with its upper carbon, C′, when the magnet p' will receive a stronger current than the magnet p, and will tilt the lever m in the opposite direction, establishing an arc between the pair of carbons C′ C^3 corresponding to the magnet p', and as the current will now divide about evenly between the magnets p p', both arcs may be maintained, as any increase in the length of arc on one side will force more current through the magnet on the other side, which will immediately act to equalize the two arcs. The armatures o o' are vertically adjustable on the central portion of the tilting lever m, being connected therewith by screws m^3 passing through elongated openings, as shown in Fig. 1, and the amount of rocking movement of said lever may also be limited and adjusted by stop-screws m^4. (See Fig. 2.)

When both arcs are to burn simultaneously, the adjustment of the tilting lever m is preferably such that the upward movement of one of the lower carbons produced by the tilting lever is greater than the lift of the upper carbons in establishing the arc, and in practice I have found the lamp to burn well in this manner with a comparatively short arc, so that the two lights are of moderate intensity, and the carbons consume quite slowly and last much longer than in an ordinary single-arc lamp. When, however, it is desired to maintain a single arc, but to consume both sets of carbons, so that the lamp can burn without replenishing double the time of single lamps, the tilting lever m may be so adjusted that the maximum movement that it can give to one of the lower carbons is considerably less than the normal length of the arc or upward movement of the upper carbons in establishing the arc; or, if desired, the lower carbons may be stationary and the magnets p p' omitted. Then the operation will be as follows: At the start one of the upper carbons may separate from the corresponding lower one slightly before the other and the current will all pass through and the arc be established at the pair last separated. Then the upper carbon will feed, preserving the distance equal to the length of the arc between the carbons that are consuming, until finally the other carbons will come in contact and will thus take all the current and destroy the arc that has been previously maintained. The contact of the carbons will also momentarily remove the current almost entirely from the feed-controlling magnet d, so that the retractor e^3 of its armature will raise the latter, and with it the clamp and upper carbons, a sufficient distance to establish the arc between the carbons that have just come in contact, while the other carbons will be separated by a distance of twice the length of the arc. Then the feed will go on as before until the latter pair of carbons again come in contact, and each pair of upper and lower carbons burn intermittingly, alternating with the other pair at intervals of time equal to that required for the consumption of the length of the carbons, equal to about twice the normal length of the arc. The breaking of one arc and establishment of the other is almost instantaneous, making only a slight flicker in the light, and as this may occur only at intervals of several minutes, it usually is not objectionable. The adjustment may be such that in some cases the rise of the upper carbons, produced by the retraction of the armature e, is somewhat less than the normal length of the arc, and when this is the case the tilting lever m and magnets p p' should be employed, and so adjusted that the rocking movement produced when the current is transferred from one to the other of the magnets p p' by one pair of carbons coming in contact while the other pair is burning shall be about equal to the difference between the normal length of the arc and the amount of upward movement produced by the retraction of the armature e, so that by the combination of the upward and downward movements of the upper and lower carbons the arc will be instantaneously drawn to its full length and the interruption in the light be practically insensible.

It is obvious that, if desired, a larger number of carbons might be employed, either burning intermittingly or simultaneously, the upper carbons being all connected together and moving simultaneously in the feed movement that compensates for the consumption of the said carbons, either one at a time, successively, or all simultaneously, and in claiming two carbons arranged to operate in this manner I wish it to be understood that it makes no difference whether two alone are used or the two are used in connection with a third, or others arranged to operate in the same manner.

I claim—

1. The combination of two carbons or elec-

trodes of one polarity, and a movable support common to both the said electrodes, which are mechanically connected with but electrically insulated from said support, and two electro-magnets in circuit, respectively, with said carbons and controlling the position of their support, and two corresponding carbons or electrodes of the other polarity held in fixed relation to each other, and feed mechanism governing the movement of the last-named carbons, substantially as described.

2. The combination, with a clamp, of an electro-magnet and two independently-movable armatures therefor, and connecting mechanism between said armatures and two different parts of the clamp, substantially as and for the purpose described.

3. The combination of the feed-controlling magnet with two independently-movable armatures therefor, with a clamp engaged at one point with one of the said armatures, and a lever acting upon said clamp at another point, and itself operated by the other armature of the said feed-controlling magnet, substantially as described.

4. The combination of a feed-controlling magnet and two independently-movable armatures therefor, with a clamp connected at one point with one of said armatures, and a lever actuated by the other of the said armatures and acting on another part of said clamp, and a stationary stop for the said clamp, substantially as described.

5. The combination of a lifting-magnet and armature therefor, with a feed-controlling magnet supported on said armature, and two independently-movable armatures for said feed-controlling magnet, and a clamp and connecting mechanism between two different parts thereof and the said armatures of the feed-controlling magnet, substantially as described.

6. The combination of a clamp with an electro-magnet, and an armature extending across both poles of the said magnet, and a second armature interposed between the first one and the poles of the magnet, the said second armature consisting of two separate magnetic portions, and a connecting-piece therefor of non-magnetic material, and connecting mechanism between the said armatures and two different parts of the said clamp, substantially as and for the purpose described.

7. The combination of two upper carbons of an electric lamp with two lower carbons, and a tilting lever supporting said lower carbons and provided with two armatures corresponding to the said lower carbons, and two electro-magnets in circuit with the said carbons, respectively, and acting on said armatures to attract the same, and each tending to move the corresponding lower carbon downward when the portion of the current passing through said carbon increases with relation to that passing through the other carbon, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH J. SKINNER.

Witnesses:

JOS. P. LIVERMORE,

H. P. BATES.