(No Model.)

J. J. SKINNER.

ELECTRIC ARC LAMP.

No. 444,154. Patented Jan. 6, 1891.

Fig. 1

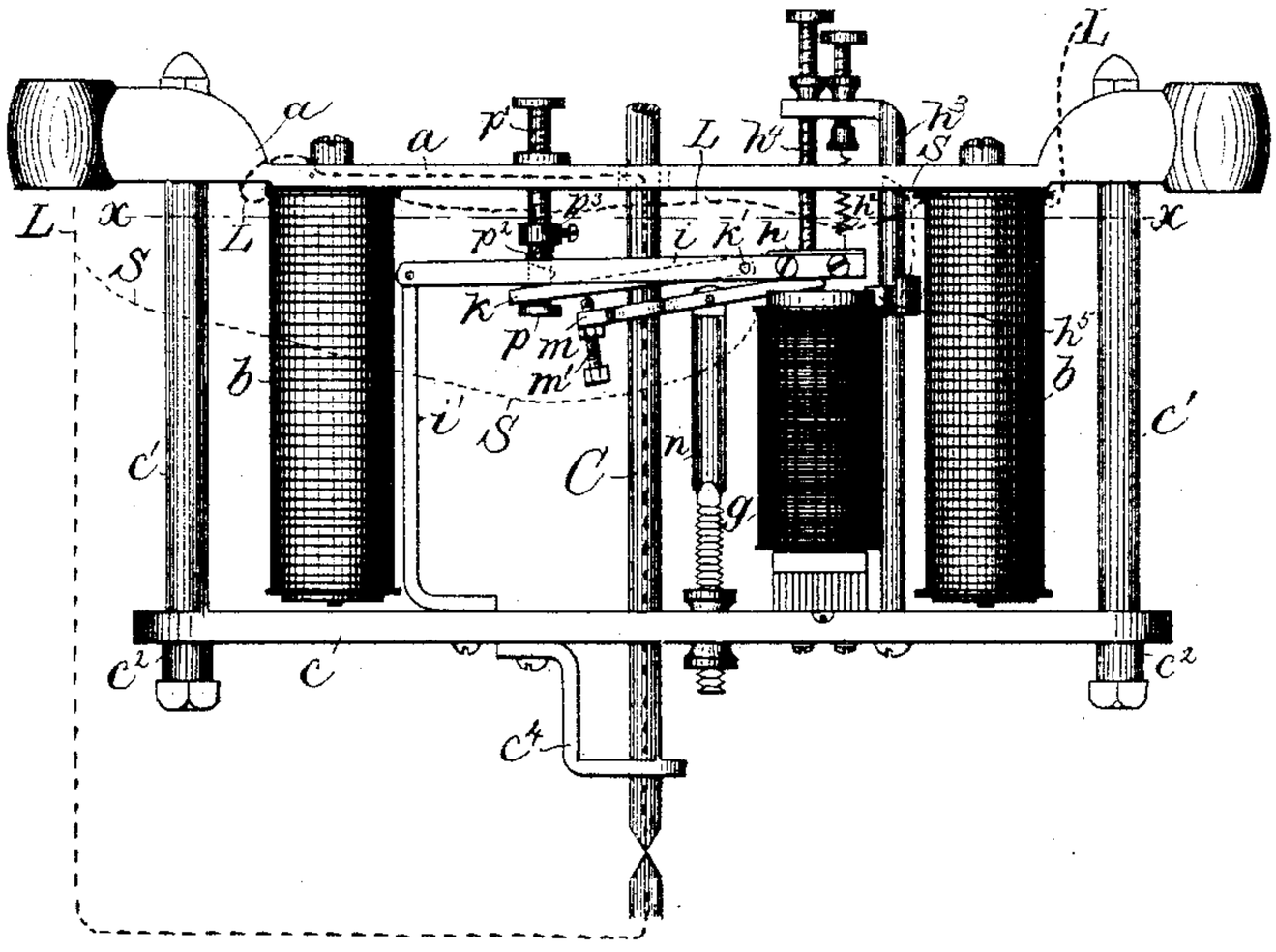
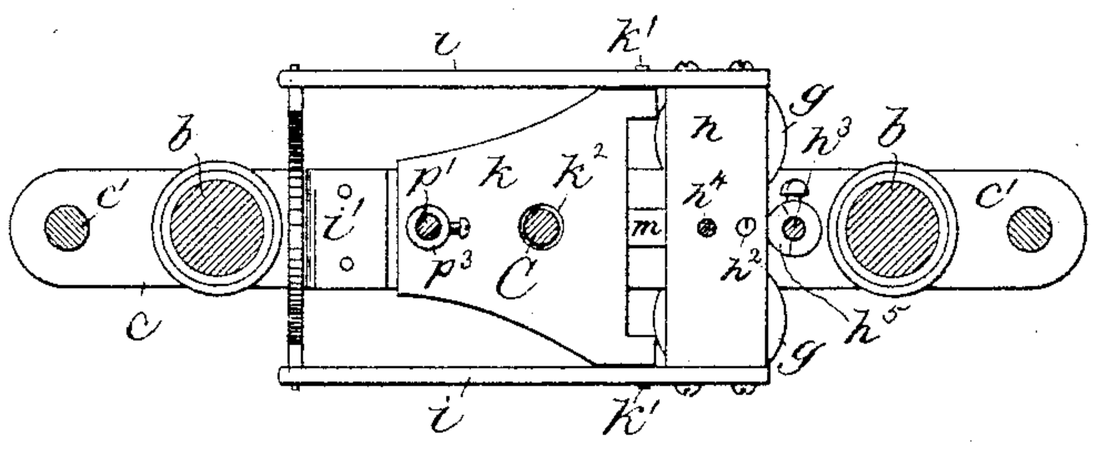


Fig. 2.



Witnesses

Jas. J. Maloney.

H. P. Bates.

Inventor,

Joseph J. Skinner.

by Jos. P. Livermore

Atty.

UNITED STATES PATENT OFFICE.

JOSEPH J. SKINNER, OF BOSTON, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 444,154, dated January 6, 1891.

Application filed April 27, 1886. Serial No. 200,311. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. SKINNER, of Boston, in the 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 relating to electric lamps is embodied in a lamp of that class in which the feed of the carbons is 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 being either in the main circuit or in a shunt or branch around the arc, according as the lamp is to burn in a single circuit by itself or to form one of a series of lamps included in the same circuit.

In another application, Serial No. 197,846, filed April 5, 1886, I have shown and described a lamp having a clamp that engages the carbon or its holding-rod, and is itself acted upon at different points by two electro-magnetic devices, each one of which, when acting independently of the other, is capable of operating the clamp to increase or decrease its hold on the carbon.

The present invention consists, mainly, in the combination of the clamp with an electro-magnet and its armature, constituting an electro-magnetic device, one member of which, pivotally connected with the clamp at one side of the carbon-rod, tends to move relatively to the other upon changes in the magnetic strength of the said magnet, and a lever fulcrumed at an intermediate point of its length, having one arm in position to be engaged by the movable magnetic member (in this instance the armature) and its other arm in position to engage the free portion of the clamp, so that the operation of the feed-magnet that carries one end of the clamp in one direction, tending to draw down the carbon, causes a movement of said lever that carries the opposite end of the clamp in the opposite direction, tending to relax its grip on the carbon-rod, and the reverse operation of the feed-magnet of itself tending to increase the grip of the clamp and raise the rod, also causes a movement of the free end of the clamp, tending to increase its grip, the action of the lever on the clamp in each case being of the same kind as that of the armature alone, so that the lever assists, as it were, the armature in controlling the clamp, thereby producing a more delicate feed than when the free end of the clamp is acted upon only by a stationary stop.

The invention also consists in various details of construction and combinations of devices, which will be hereinafter pointed out, some of which combinations are applicable to other apparatus than an electric-arc lamp.

Figure 1 is a side elevation of an electric lamp embodying the invention, the parts being shown in the position occupied when the lamp is not in operation; and Fig. 2, a horizontal section thereof on line $x\,x$, Fig. 1.

The entire operative mechanism of the lamp may be supported on a cross-bar a, that forms the stationary frame-work of the lamp, and that may be of iron, so as to form the back strap for two magnet-cores provided with the usual coils, constituting 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 lifting-magnet b is shown as guided by rods c', fixed to the bar or frame-work a, being retracted from the magnet b by gravity and having its retractive movement limited by adjustable enlargements or shoulders c^2 on the rod c, and its movement, when attracted, limited by coming in contact with the usual non-magnetic stops on the poles of the magnet b. The armature c is attracted when the current is first applied to the circuit, and as long as the current continues to flow the said armature c remains stationary in its attracted position, and thus practically constitutes a portion of the stationary frame-work of the lamp while the latter is in operation, the said armature moving only at the beginning and at the termination of the operation of the lamp.

The armature c supports or constitutes the frame-work for the feed mechanism, which comprises an electro-magnet g, fixed on the said armature c, but preferably not in magnetic connection therewith, and the armature h for the said magnet g, preferably fixed upon a lever i, pivoted on a bracket or upright i', fixed upon the armature c.

The armature-lever *i* consists of two bars or an open frame, as best shown in Fig. 2, and has pivotally connected with it at *k'* a clamp *k*, (shown as the usual ring-clamp,) the said clamp consisting of a rigid plate having an opening k^2 of sufficient size to permit the carbon or its supporting-rod C to move freely through it when the said plate is in a position nearly at right angles to the length of the rod C; but when inclined sufficiently to the said rod the opposite edges of the opening in the clamp will bite the rod *c* between them, so that the gripping action or hold of the clamp on the rod is varied by changes in its angular position with relation to the rod.

A lever *m*, pivoted upon an upright *n*, fixed on the armature *c*, has one arm extended beneath and in position to be engaged by the armature *h* and its other arm adapted to engage the clamp *k* at a point on the opposite side of the rod C from that at which the clamp *k* is pivoted to the armature-lever *i*. The said lever *m* thus constitutes a mechanical connection between the armature *h* and one part of the clamp, while the other part of the clamp is in direct mechanical connection with the armature through its pivot *k'* on the lever of the said armature. An adjustable contact-piece *m'* on the lever *m* or on the clamp determines the position at which the lever and clamp come into engagement with one another.

The frame-piece *a*, lever *m*, and armature *c* have openings indicated in dotted lines, Fig. 1, of sufficient size to permit the rod C to move freely through them without contact, and the armature *c* is provided with an arm or bracket c^4, having an opening that fits the rod C sufficiently close to prevent lateral movement thereof, although permitting it to move freely through the said opening. The bracket c^4 thus constitutes one guide for the rod C, and the only other guide that it requires is afforded by the clamp *k*, which has no appreciable lateral movement with relation to the frame-work of the lamp. The bracket c^4 might be omitted, and the opening in the armature *c* might then serve as the lower guide for the rod C. The armature *h* is acted upon by a retractor h^2, connected with an arm h^3, fixed upon the armature *c*, and the retractive movement of said armature is limited by a stop h^4, connected with the arm h^3. When no current is flowing, the armature *h* is retracted against the stop h^4, and the pivoted end of the clamp *k* is in its highest position with relation to the armature *c;* but the latter is in its lowest position with relation to the main frame-work *a* of the lamp, and the end of the clamp *k*, opposite its pivotal point *k'*, is then supported on a stationary stop *p*, shown as an enlargement or nut on the end of a rod *p'*, fixed on the frame *a*, but preferably made adjustable with relation thereto.

A spring p^2 may be interposed between the clamp *k* and a collar or shoulder p^3, shown as adjustable on the rod *p'*, the said spring tending to hold the adjacent end of the clamp down toward the stop *p*, and thus increase the inclination of the clamp and cause it to grip the rod C when the opposite pivoted end of the clamp is raised by the attraction of the armature *c* in starting the lamp.

The lamp is shown in this instance as arranged to operate as one of a series in the same circuit, and the main circuit of the lamp passes through the lifting-magnet *b* and the arc, as indicated by the heavy broken line L, while the magnet *g* is included in a shunt around the arc, as indicated by the fine dotted line S.

The operation of the parts is as follows: When no current is flowing, both magnets *b* and *g* are demagnetized and the armature *h* held by its retractor h^2 against its back-stop h^4, with the pivoted end of the clamp in its highest position relative to the armature *c;* but this armature *c* and the clamp are in the lowest position with relation to the main stationary frame-work *a* of the lamp, and to the stop *p*, which is adjusted to hold the adjacent end of the clamp high enough to release its grip on the rod C, permitting the upper carbon to rest by gravitation in contact with the lower carbon. When the current begins to flow, the magnet *b* is energized and raises the armature *c* and devices supported thereon, thus lifting the pivoted end of the clamp, while its opposite end is held down by its weight and by the spring p^2 until the inclination becomes sufficient to grip the rod C, after which, in the further upward movement of the armature *c* and clamp *k*, the rod C will also be lifted, and the carbons thus separated and the arc established. Up to this time the magnet *g* is only slightly energized; but as the arc increases toward its normal length more current is caused to pass through the magnet *g*, and its armature is attracted, drawing down the pivoted end of the clamp *k*, and thus drawing the rod C down with it relatively to the armature *c* and tending to shorten the arc. The first part of this relative downward movement of the armature *h* and pivoted end of the clamp does not release the grip of the clamp, as its opposite end has been lifted off the stop *p* and moves down together with the pivoted end; but before the magnet *g* attains its normal strength its armature *h* engages the lever *m*, turning the same on its pivot until the stop *m'* comes in contact with the adjacent end of the clamp *k* and receives a part of the weight of the carbon and rod and the parts remain in this relation during the normal feed of the lamp. This feed is controlled by the action of the armature *h* directly on the pivoted end of the clamp and indirectly through the lever *m* on the opposite end of the clamp. A slight increase in the length of the arc increases the strength of the magnet *g*, tending to move the armature *h* downward, and thus depresses the pivoted end of the clamp *k*, and at the same time, through the lever *m*, raises the opposite

end of the clamp *k*, so that by the combined action the grip of the clamp is relaxed, the rod C permitted to slip more freely or feed more rapidly until the normal length of the arc is restored, and the shortening of the arc tends to decrease the strength of the magnet *g*, and thus raise the pivoted end of the clamp, and at the same time lower the opposite end that rests on the point *m'*, thus increasing the grip of the clamp and preventing the rod C from slipping so freely, and thus preventing the arc from further shortening. In case of a sudden or considerable slip of the rod C the retractor h^2 would act to cause the clamp to first grip and then bodily raise the rod C and hold it until the arc reaches its normal length, and the normal operation of feeding is resumed. By causing a movable magnetic device (in this instance the armature *h*) to act simultaneously on both ends of the clamp, as hereinbefore described, a much more sensitive and delicate feed is produced than when a magnetic device acts only on one end of the clamp in co-operation with a stationary stop engaging the other end, and the lamp constructed as herein shown and described is superior to what it would be if the lever *m* were omitted and the feed produced by a movement of the armature *h* and pivoted end of the clamp alone, while the other end of the clamp was engaged by a stationary stop, as commonly practiced in differential-arc lamps. The rod h^3, that supports the retractor h^2 and back-stop h^4 of the armature *h*, may have a working fit in an opening in the bar *a*, and thus serve as an additional guide for the armature *c*, and the said rod may be provided with an adjustable stop h^5 to limit the movement of the armature *h* toward the magnet *g*.

The invention is not limited to any particular form of clamp, as it is obvious that the controlling-magnet might be used with clamps of various kinds in which a movement of one part of the clamp relative to another part varies the gripping action of the clamp, the essential feature of this part of the invention being that the feed-controlling magnet acts through intervening mechanism on different parts of the clamp simultaneously. It is also not essential that the feeding mechanism should be supported on an armature of a lifting-magnet, and the invention is not limited to such arrangement, as other means might be employed for separating the carbons or establishing the arc in starting the lamp, and the operation of the feed mechanism is independent of the means employed for establishing the arc.

I claim—

1. The combination of the feed-controlling magnet and its armature with a clamp pivotally connected with the armature at one side of the carbon-rod and an independent lever connected at an intermediate point of its length with a fulcrum, and having one arm in position to be engaged by the armature of the feed-magnet and its other arm in position to engage with the free portion of the clamp, whereby the movement of the feed-magnet armature that carries one end of the clamp in one direction causes a movement of the lever that carries the opposite end of the clamp in the opposite direction, substantially as and for the purpose described.

2. The combination of the feed-controlling magnet and its armature with a clamp pivotally connected with the armature at one side of the carbon-rod and a stationary stop in position to engage another part of said clamp, and an independent lever connected at an intermediate point of its length with a fulcrum, and having one arm in position to be actuated by the armature of the feed-magnet and its other arm in position to engage with the free portion of the clamp, whereby a movement of the feed-magnet armature that carries one end of the clamp in one direction causes a movement of the lever that carries the opposite end of the clamp in the opposite direction, substantially as and for the purpose described.

3. In an electric lamp, a lifting-magnet and armature therefor, combined with feed mechanism supported on said armature, consisting of a feed-controlling magnet and its armature, and a clamp and connecting mechanism between the latter and the armature of the feed-magnet, whereby the clamp is acted upon simultaneously at different points, substantially as described.

4. In an electric lamp, the lifting-magnet and its armature, combined with feed mechanism supported on said armature, comprising a clamp and actuating devices therefor, the armature of the lifting-magnet being provided with a guide for the carbon or its holding-rod, and the clamp constituting the sole other guide therefor, substantially as described.

5. The combination of the feed-controlling magnet and its armature with a clamp pivotally connected at one point with the armature and an independent lever interposed between the armature and another point of the clamp, and a spring acting on said clamp in opposition to said lever, 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.