(Model.)

A. L. AREY.

ELECTRIC LIGHT.

No. 253,826. Patented Feb. 14, 1882.

Fig. 1

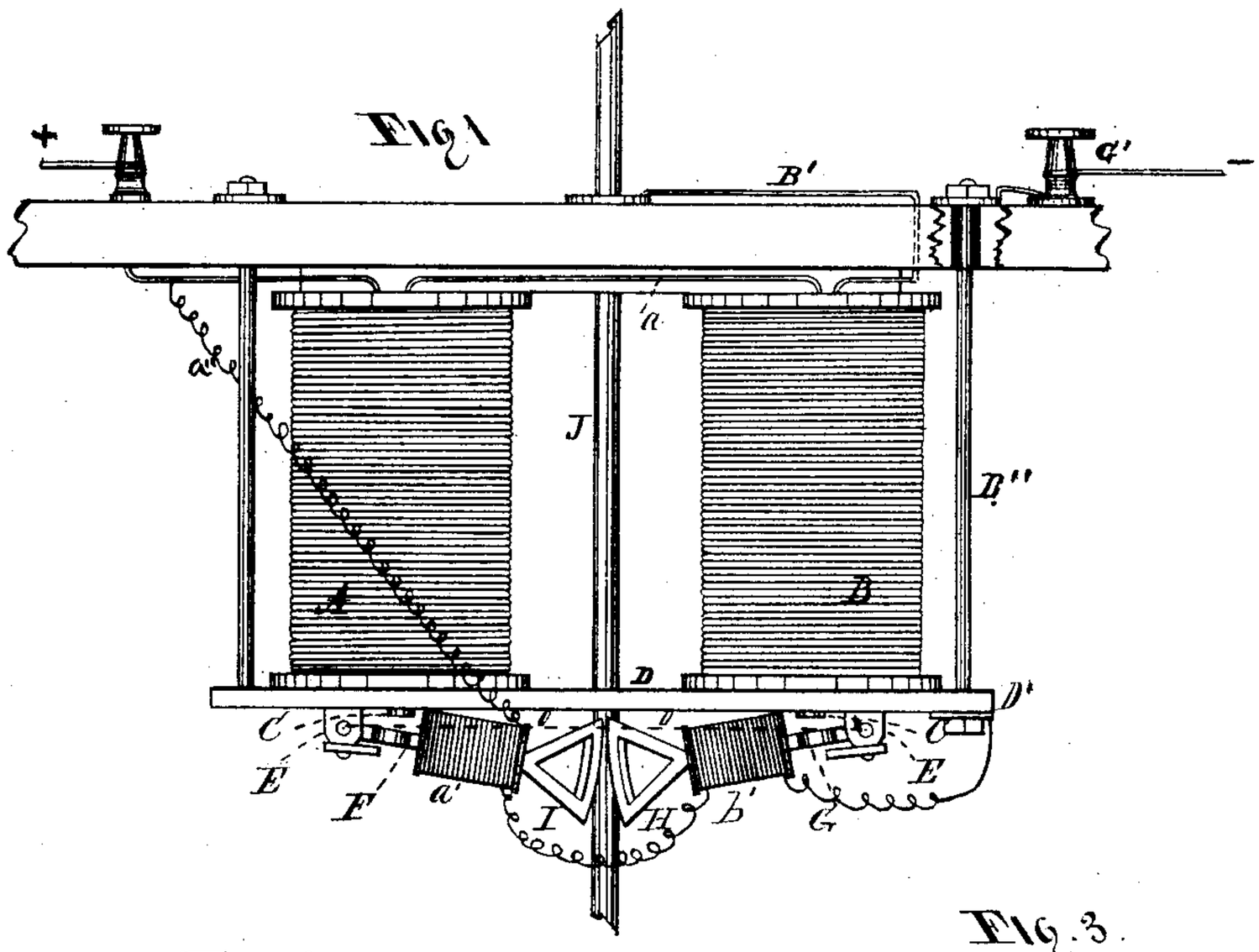


Fig. 2.

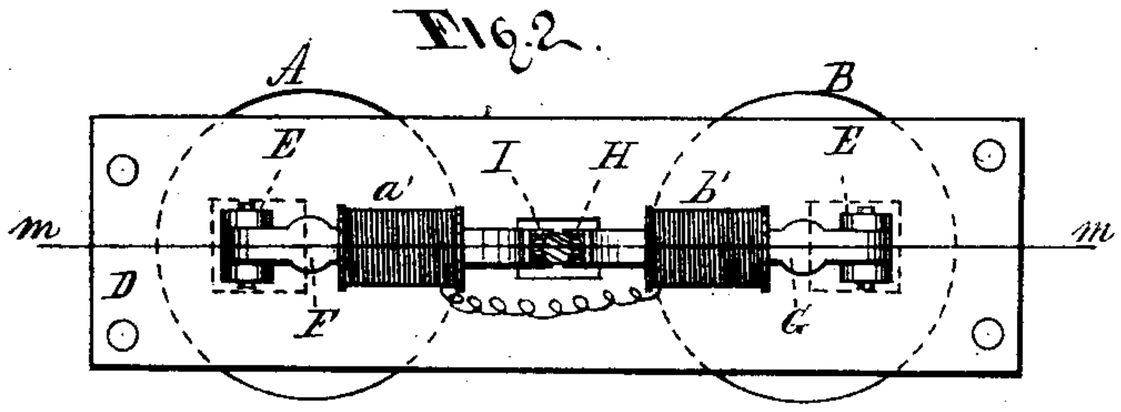


Fig. 3.

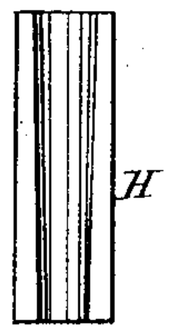
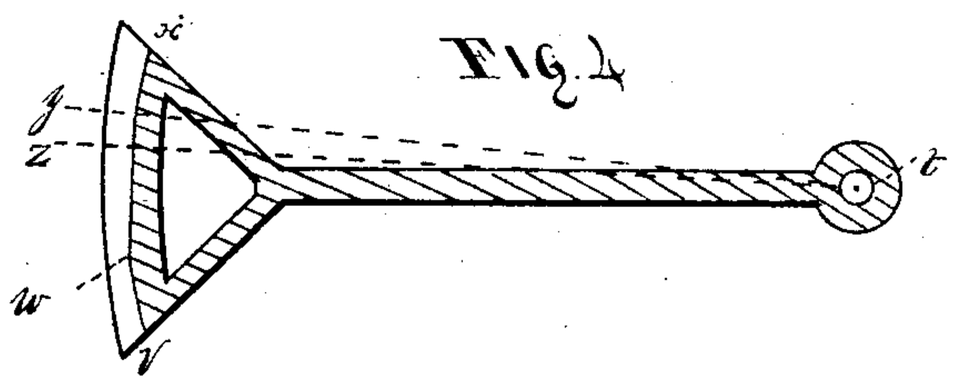


Fig. 4.



Witnesses.

J. H. Burridge

M. L. Deming

Inventor.

A. L. Arey

W. H. Burridge

Atty

UNITED STATES PATENT OFFICE.

ALBERT L. AREY, OF CLEVELAND, OHIO.

ELECTRIC LIGHT.

SPECIFICATION forming part of Letters Patent No. 253,826, dated February 14, 1882.

Application filed May 23, 1881. (Model.)

To all whom it may concern:

Be it known that I, ALBERT L. AREY, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and Improved Electric Lamp; and I do hereby declare that the following is a full, clear, and complete description thereof.

This invention relates to certain improvements on that class of electrical lights in which the voltaic arc is used as the source of light.

The object of the invention is to avoid the flickering common to such lights, and to make a lamp that shall be sensitive enough to allow any number of them to be operated in one circuit. This is effected by means of a peculiar device for feeding the positive to the negative carbon at such rate that the ratio between the rate of motion of the points F and G of the armatures respectively before the poles of the electro-magnets shall equal the ratio between any given change in the length of the arc and the corresponding change in the position of said points F and G of the armatures—that is to say, suppose that for some cause the length of the voltaic arc is increased one-eighth of an inch, and that the increased resistance allows the points F and G of the respective armatures to move away from the poles of the magnet a given distance, the length of the armatures is such that the motion of the points F and G through that given distance will cause the segment on the ends of the armatures and the rod J and its carbon point to move down exactly one-eighth of an inch, thus exactly compensating for the increased length of the arc. This device, above alluded to, for approximating and separating the carbon points and maintaining them a proper distance apart for the desired voltaic arc, consists of a pair of armatures pivoted below the respective poles C C of an electro-magnet. The free end of each of the armatures is a segment, the peripheries of the two being juxtaposited, and each of which is provided with a peripheral groove adapted to receive and clasp the rod carrying the upper or positive carbon point or pencil.

A further improvement consists in placing upon each of the armatures a small helix, the purpose of which will be explained in the following more complete description of the aforesaid improvements, and illustrated by the annexed drawings, making a part of this specification, in which—

Figure 1 represents a side elevation of the electro-magnet, having arranged in connection therewith the armatures for adjusting the carbon points. Fig. 2 shows a view of the under side of the same. Fig. 3 shows a view of the periphery of the segment of one of the armatures enlarged, and showing the groove therein. Fig. 4 is a longitudinal section of one of the armatures, taken through the line *m m* in Fig. 2.

Like letters of reference refer to like parts in the several views.

A and B represent the electro-magnet above referred to. Said magnet is like the electro-magnet in ordinary use; hence a special description thereof will not be essential in this place, as it forms no part of this invention. The two helices are connected to each other and to the poles of a battery, or to a dynamo-electric machine, by the ordinary wire connections, and are mounted in a suitable frame, as the nature of the case may require, to adapt them to practical use. From the under side of the plate D, and directly below the magnet A, depends a pair of ears, E, in which is pivoted one end of an armature, F, immediately under the pole of the magnet. A similar armature, G, is pivoted in the same manner to the under side of the plate below the pole of the magnet B, and holds the same relation to said magnet that the armature F holds to the magnet A. The free end of each of the armatures terminates in a segment, respectively H and I, provided with a peripheral groove, as shown in the enlarged view, Figs. 3 and 4. Said grooves are symmetrical—that is to say, the one is the counterpart of the other, and are so formed that their point of contact with the rod J is at all times in the right line, forming the pivotal centers of the armatures, as indicated by the dotted line *o o* in Fig. 1.

On referring to Fig. 4, *v w x y z* show a longitudinal section of the groove through the entire length. The nature of the groove is such that the line from *x* to *y* is a curve having a shorter radius than the radius of the segment, whereas the line from *y* to *z* is a curve paral-

lel with that of the segment—that is to say, its center is the pivotal point of the armature, as indicated by the dotted lines. The distance from *z* to *w* is straight, or nearly so—that is to say, it may be a curve having a longer radius than that of the segments H and I. The distance from *w* to *v* is also a curve having a shorter radius than that of the segments H and I.

It will be obvious from the above peculiar form of the segmental grooves that when the points *y* are below the bearing-line *o o* the rod J will not be in contact with the grooves, hence the rod will fall freely through the grooves. When the points *y* are in the bearing-line *o o* the rod is just in contact with the grooves, and by virtue of that part of the grooves between *y* and *z* being a curve having its center at *t* of the armatures, the rod will be carried upward by the impingement of the curves upon it, acting as two grooved wheels, one on either side of the rod as the armatures are attracted upward by the magnets. This upward movement of the rod continues until the points *z* reach the bearing-line *o o* of the armatures. At this point its tops, for the reason that the distance from *z* to *w* is a straight line, or of such a shape as to clamp or bind the rod in the grooves of the armatures, which prevents it from being carried farther upward, and a consequent further separation of the upper from the lower carbon point. The length of the arc from *y* to *z* is determined by the desired length of the voltaic arc.

The segments of the armatures may be used without a groove. It is preferred, however, to have them with a groove, as they will have a larger bearing-surface on the rod.

Practically the operation of the above-described device for adjusting the upper carbon point to the lower one is thus: The carbon terminal of the rod having been previously adjusted to the lower or negative pencil to produce the luminous arc, the distance between them gradually lengthens by the burning away of the points, causing a corresponding weakening of the current by the opposing resistance offered by the increased distance between the two points, until at a certain distance the electro-attractive force of the magnets A and B becomes insufficient to retain the armatures in their clamping-point with the rod, said point, as above said, being at the lines *z y*, Fig. 4, so that the segments gradually loosen their hold upon the rod, which slips gradually down to the negative carbon. The energy of the current being again established by the approximation of the two points, the armatures are attracted upward until the points *y* of the armatures impinge upon the rod and move it upward the distance from *y* to *z* by virtue of the curve between the two points *y* and *z*, as above described. At the point *z* the armatures bind upon the rod and prevent it from moving farther upward, the distance from *y* to *z* being the length of the voltaic arc required. Again, as the carbon points burn away, the electro-current weakens, hence a consequent relaxation of the hold of the armatures upon the rod J, which, as before, gradually falls to the negative carbon point, causing a re-establishment of the luminous or voltaic arc, as above described. The circuit enters at + through the binding-post, thence through the magnets A B, and by the connection B′ to the rod J and the carbon terminal points. The shunt-circuit *a″* passes through the helices *a′ b′* to the frame at D′, and through the rod or bolt D″ and binding-post at G′, as seen in the drawings.

The helices *a′* and *b′* upon the armatures constitute a shunt-circuit of high resistance independent of the voltaic arc and are wound with fine wire, so that when a current passes through them the armatures themselves become magnets, having their positive poles nearest the positive poles of the larger electro-magnets, and their negative poles nearest the negative poles of the larger electro-magnets, thereby causing the poles to repel each other, and when by reason of a greater resistance of the voltaic arc a greater portion of the current passes through the shunt-circuit the like poles repel each other, and their mutual repulsion causes the carbons to approach each other. The advantage of this method over a shunt-circuit wound around the large magnets is that when the shunt-helix is about the coil of the large magnet it acts as an induction-coil and induces a secondary current in the original coil, thereby in part counterbalancing the current in the shunt-coil and rendering the mechanism of the lamp less sensitive than when wound as above described. Again, supposing the point *z*, Fig. 4, to be in the bearing-line at the time of the increase in the current through the shunt-circuit, this repulsion will then cause the armatures to move gradually below their former position, thus feeding the upper carbon toward the lower one. If, however, the point *y* is on the bearing-line at the time of the increased current in the shunt-circuit, the repulsion will then cause the armatures to drop slightly, thereby allowing the rod to fall freely toward the lower carbon point.

I do not herein claim to be the inventor, broadly, of an electro-magnet in the main circuit of an electric lamp having its armature wound with a helix of fine wire of high resistance in a shunt-circuit in such a manner that when an increased resistance of the main circuit diverts the electric current into the shunt-circuit it will tend to convert the armature into a magnet with poles similar to the opposite poles of the electro-magnet; nor broadly of a solid electro-magnet having its helix composed of wire forming the main circuit, and the armature encircled by the shunt-circuit of high resistance compared to the main circuit, the wire of said shunt-circuit being wound around the armature in such a manner that the electric current will flow through the helix of the electro-magnet, and through that of the armature in opposite directions; nor broadly of the combination of an electro-magnet whose helix is in the main circuit, having an armature with

a helix thereon in a shunt-circuit, the main and subsidiary circuits passing through said helices in opposite directions, with suitable mechanism for connecting the free end of the armature with the upper carbon; but

What I do claim, and desire to secure by Letters Patent, is—

1. In lamp-structures for electric lights, a pair of armatures pivoted respectively below the helices A B, and having the free ends of the armatures terminating in a segment provided with a peripheral groove, a section of which from *y* to *z* is an arc of a circle having its center at the pivotal point of the armatures, and the section of the groove from *z* to *w* a straight line, or nearly so, at right angles to the radius *z* to *t* of the segment of the armature, and the section of the groove from *y* to *x* formed or shaped so as to allow the rod J to pass freely through the grooves of the segment when the said segments are approximated to each other and the rod between *x* and *y*, substantially as and for the purpose set forth.

2. In combination with the rod J, carrying the upper carbon point of an electric lamp and an electro-magnet, a pair of armatures surrounded with coils in a derived circuit, as described, below the helices of said magnets, the opposite or free end of the armatures terminating in a segment, with or without a peripheral groove adapted to clamp said rod between them for regulating and controlling the carbon point, substantially as set forth.

3. The helices A and B of an electro-magnet, and rod J, carrying the carbon point, in combination with the vibrating armatures having free segmental ends, provided respectively with a peripheral groove adapted to and arranged in relation to said rod so as to clamp the same, and the said armatures having thereon respectively shunt-magnets operated by a portion of a divided main circuit, substantially as described, and for the purposes set forth.

4. In electric lamps, the combination of the electro-magnets A B, the rod J, and the vibrating segmental armatures with a shunt or subsidiary circuit passing through the helices wound around said armatures, substantially as described, and for the purpose set forth.

5. In an electric lamp, the combination, with the rod J, carrying the carbon terminal point, of a pair of armatures forming vibrating electro-magnets pivoted to the apparatus below the magnets A B, as described, and operated by one portion of the main circuit and the said electro-magnets A B, substantially as herein set forth.

6. In electric lamps, a pair of vibrating armatures having helices arranged thereon connected with the shunt-circuit, and a rod for carrying the electrode in the main circuit and between the segmental terminals of the armatures and in connection with the magnets A B, the latter being in the main circuit with the carbons, and the said helices in a derived circuit, substantially as described, and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT L. AREY.

Witnesses:
J. H. BURRIDGE,
A. L. CHAMPION.