(No Model.) 3 Sheets—Sheet 1.

F. M. NEWTON.

ELECTRIC ARC LAMP.

No. 307,062. Patented Oct. 21, 1884.

Fig. 1.

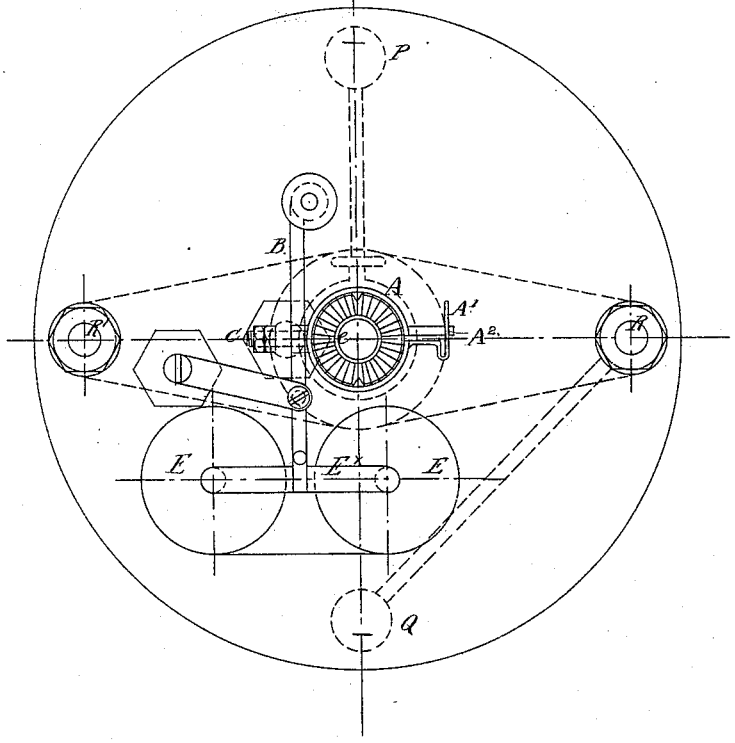
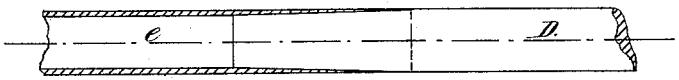


Fig. 4.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

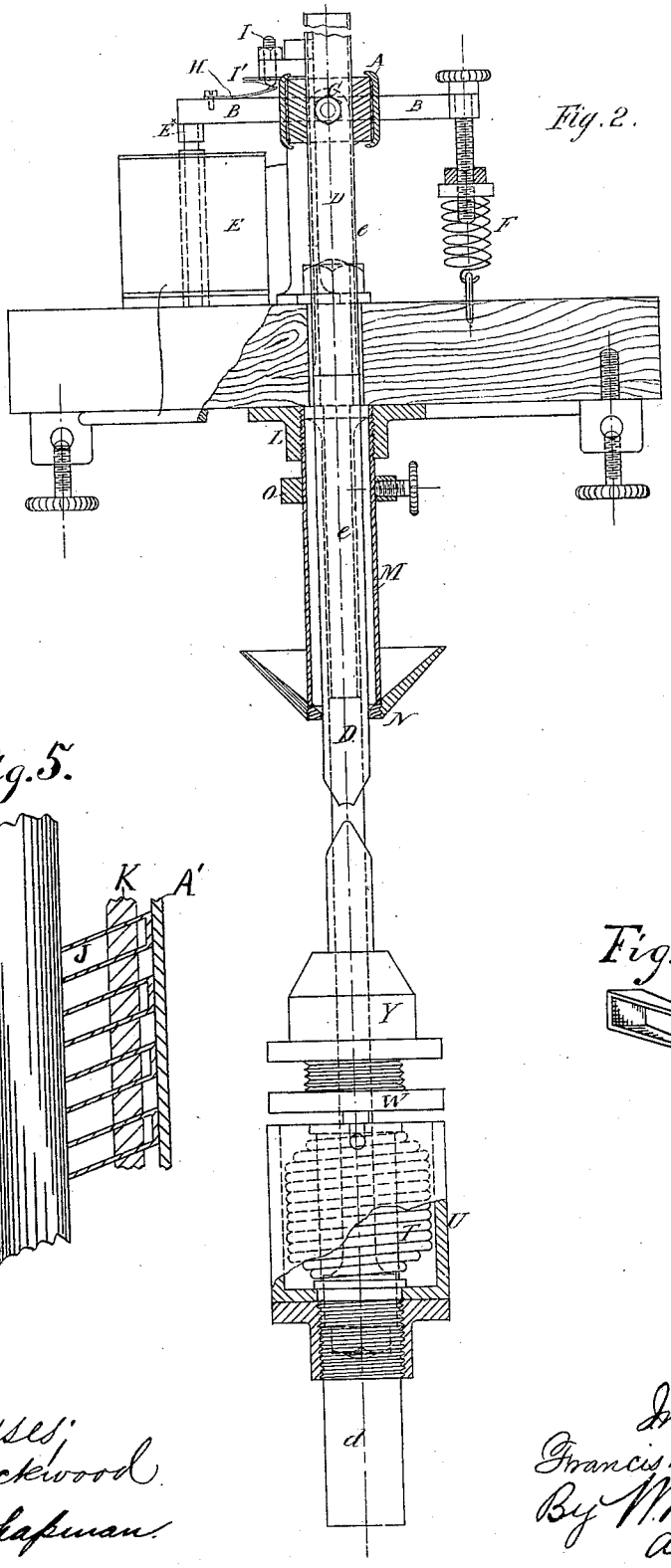

Fig. 5.

Fig. 6.

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(No Model.). 3 Sheets—Sheet 3.

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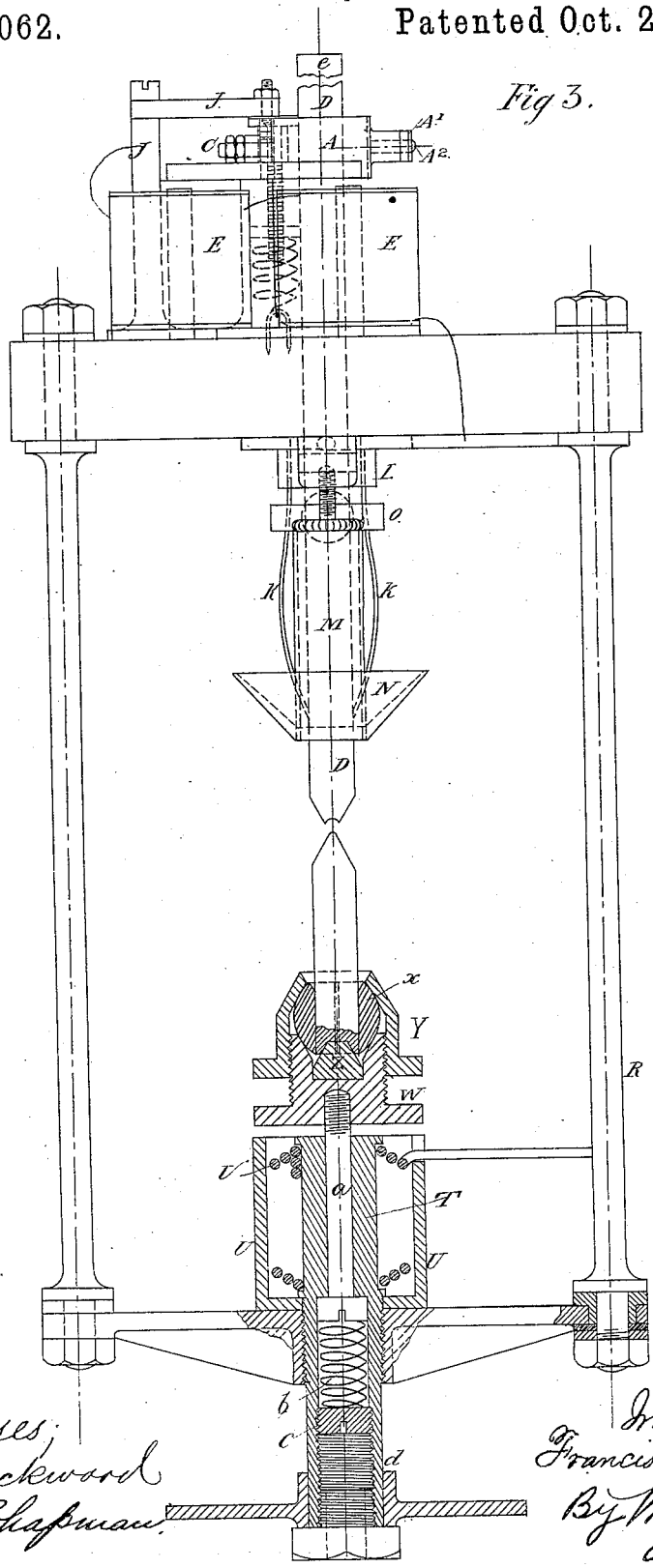
Fig 3.



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UNITED STATES PATENT OFFICE.

FRANCIS MURRAY NEWTON, OF BELFAST, COUNTY OF ANTRIM, IRELAND.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 307,062, dated October 21, 1884.

Application filed November 28, 1883. (No model.) Patented in England July 9, 1883, No. 3,392; in France November 2, 1883, No. 158,335; in South Australia April 21, 1884, No. 446; in India July 31, 1884, No. 35, and in Belgium August 28, 1884.

To all whom it may concern:

Be it known that I, FRANCIS MURRAY NEWTON, a subject of the Queen of Great Britain and Ireland, residing at Belfast, in the county of Antrim, Kingdom of Great Britain and Ireland, have invented a new and useful Improved Electric-Arc Lamp, of which the following is a specification.

In an electric-arc lamp according to my invention the feeding of the carbon or of its holder, or it may be of both carbons or holders, is effected by a device moving with a rocking or vibrating motion, which motion continues after it has been set up until the arc is reduced to its normal length. The feeding of the carbon is effected both on the forward and backward strokes of the device, one portion of the device propelling the electrode when it is rocking in one direction and another portion when it is rocking in the other direction, the device serving, when not vibrating or rocking, to retain the carbon or holder firmly in position. The device is provided with elastic fingers or feelers (arranged radially round the carbon or holder, but having a slight permanent set or inclination in the direction of the arc) whose points abut on the carbon or its holder and take a frictional hold upon it. When one portion of the device is moved in the direction of the arc, the feelers in that portion take a firmer grip of the carbon or holder, carrying it forward with them. The feelers in the opposite portion, which is moving away from the arc, slide freely up the carbon or holder, owing to their set or inclination, and vice versa. The vibrating device derives its motion from an electro-magnet or solenoid in the main circuit, or in a derivation thereof, or in a shunt-circuit round the arc, according as the lamp is intended to be used alone or in parallel circuit or in series. This magnet or solenoid acts upon an armature or core, which in the course of its motion operates a make-and-break arrangement, by which some or all of the convolutions of the conductor on the magnet or solenoid are short-circuited or cut out of circuit; hence the power of the magnet is, so long as the vibrating motion is kept up, alternately increased and diminished. The arc is struck either by lowering the negative carbon by an electro-magnet or solenoid, or the whole of the previously-described feed arrangement may be raised by similar means.

Referring to the accompanying sheet of drawings, Figure 1 is a plan of an arc lamp embodying my invention, the cover being supposed to be removed. Fig. 2 is an elevation, partly in section. Fig. 3 is an elevation at right angles to Fig. 2. Fig. 4 is a sectional view of the carbon-holder, consisting of a thin tube, *e*, of the same diameter as the lower part of the carbon externally, but having the lower end coned internally for a short distance to fit a corresponding cone on the end of the carbon D. Fig. 5 is a sectional view of the device A, showing the manner in which the fingers or feelers are fixed in the foundation K, and how they make contact with the clasp A′, which surrounds them. Fig. 6 shows the manner in which the fingers shown in the device A are made, and it illustrates a pair before being put in place.

A is a vibrating device connected to the arm B, which is pivoted at the point C, about which it can freely rock. The interior of the device A, which surrounds the carbon or electrode, is provided with fingers or feelers, (arranged radially round the carbon or its holder, but having a slight permanent set or deflection in the direction of the arc,) here shown as elastic wires fixed in a foundation of metal, leather, or india-rubber, after the manner of wire-card filleting. The feelers thus constructed and arranged, as well as some other features herein shown, are described and claimed in my pending application No. 113,015, filed November 28, 1883. The points of these wires normally inclose a cylindrical space rather less in diameter than the carbon D, (or holder.) Said wires or fingers are made in pairs, each pair being joined together in such a manner as to resemble a staple such as shown in Fig. 6. The fingers can also be made single. They are intended to grasp, and hence when the carbon D (or holder) is passed through them from above they are deflected, and thus form a series of toggle-like arms, which oppose but a very slight resistance to the motion of the device A (relatively to the carbon or holder) in one direction, but take a firm grip on the

carbon or holder when moved forward in a direction approximately parallel to the axis of the carbon or holder.

A′ is a spring catch or clasp similar to a book-clasp, by means of which the spring clip device A is opened or closed. When A′ is pressed outward, the pin A^2, which catches in a hole in A′, is released, and the clip flies open sufficiently to allow the carbon-holder, when necessary, to be slid upward. The clasp may be provided with a set-screw to enable the pressure of A on the carbon or holder to be adjusted.

c c is a carbon-holder, consisting of a thin tube of the same diameter as the lower part of the carbon externally, but having the lower end coned internally for a short distance to fit a corresponding cone on the end of the carbon. (See Fig. 4.) This form of holder is used where it is important to have as short a lamp as possible, for, being the same diameter as the carbon, it may be made to follow it down through the device A and guide at N, thus enabling a longer piece of carbon to be burned than would be possible in a lamp having a holder which could not be pushed up above N.

The vibration or rocking of the device A is effected by the electro-magnet E, which is situated in the shunt-circuit around the arc, in a manner which is well understood. This magnet attracts an armature, E^x, connected to the vibrating device A; but so long as the arc does not exceed its normal length the attraction is not sufficient to overcome the power of the spring F. When, however, the length of the arc increases beyond the determined amount, the attraction of the magnet overcomes the spring, and the armature is drawn down, rocking the device A on its centers or pivots. The wires on one side of it advance toward the arc in a direction approximately parallel to the carbon, carrying the carbon or its holder with them, while those on the other side retreat from the arc, sliding over the carbon or its holder. Those wires which from their situation near the pivots neither approach toward nor recede from the arc during the rocking motion do not, of course, aid in effecting the feed. After a very slight motion the shunt-circuit is broken where it crosses the contact-points at I′. The magnet loses its power and the armature rises, rocking the device in the opposite direction, whereupon the wires which in the previous motion slid over the carbon or its holder take a frictional hold of it, feeding it forward, while those which gripped it slide over it, ready for their next stroke. In a short time the contact is again made, and if the arc is not already reduced to its normal length the rocking action is continued until it is.

H is a small contact-spring making contact with a platinum point in the screw I, supported by the arm and column J. This spring serves to vary the length of the stroke of the rocking arm B, for by raising or depressing the screw I the distance through which B must travel before the spring H is carried out of contact with I may be diminished or increased.

K K are contact-springs attached to the socket L, which also carries the tube M and shield N, the lower end of the tube M being reduced in diameter, and serving as a guide for the carbon or holder.

O is a ring which allows adjustment of the pressure of springs K K to be made by sliding O up or down and securing it by set-screw.

The course of the current through the lamp is as follows: It enters at the terminal P, passes by a wire to the socket L, thence through the contact-springs K K to the upper carbon, across the arc to the negative carbon, and from its holder to the core T of the electro-magnet. One end of the coil surrounding T is connected to the core, and hence it receives the current, which is conveyed from the other end of the core by a wire to the rod R, and thence by a second wire to the other terminal, Q. The shunt-circuit passes up through the positive carbon from the contact-springs K K to the device A, thence to the pivoted arm B, and through the contact-pieces I to the column J, and through the electro-magnet E to the terminal Q.

When the pins or fingers in the device A are mounted in rubber, leather, or other non-conducting foundation, they are extended through such foundation, so as to make contact with the spring catch or clasp A′, to permit the shunt-current to pass through said device.

The arc-striking electro-magnet consists of a central iron core, T, forming one pole, and a cylindrical sheath of iron, U, connected at the lower end to T, whose upper end forms the other pole, of the magnet. The wire V is wound, as shown, between T and U, one end of the coil being connected to T, and the other passing through a slot in U to R.

W is an iron keeper of circular form, whose upper end is coned to receive the split ball *x*, and screwed externally to fit the conical socket Y, by screwing down which the carbon is clamped in any desired position. Z is a small conical piece inserted below the ball X to prevent its getting far out of position when the carbon is changed or removed. The armature W is secured to the non-magnetic screw or pin *a*. Said pin acts as a guide and support to the carbon-holder, and the armature is pressed up against the attractive force of the electro-magnet by the spring *b*, whose tension can be adjusted by the screw-plug *c*. The spring *b* is inclosed within the cylindrical sheath of iron F, which is pressed up against the attractive force of the magnet by the spring *b*, whose tension can be adjusted by the screwed plug *c*. The core T is extended to *d*, and serves to support the glass globe, if required, by means of any suitable device attached thereto. The object of N is to shield the lamp from the rising gases.

What I claim is—

1. In an electric-arc lamp, a vibrating or

rocking device set in motion when the arc exceeds its normal length, and which continues in motion until it has restored or reduced the arc again to its normal length, said device being formed of elastic fingers or feelers, which, when moved forward in a direction approximately parallel to the axis of the carbon or holder, take a frictional hold of the carbon or its holder, feeding it forward, the fingers or feelers at the opposite sides of the axis of the rocking or vibrating device being advanced and withdrawn alternately, substantially as described.

2. In an electric-arc lamp, a vibrating or rocking device set in motion when the arc exceeds its normal length, and which continues in motion until it has restored or reduced the arc again to its normal length, said device being formed of elastic fingers or feelers, which, when moved forward in a direction approximately parallel to the axis of the carbon or holder, take a frictional hold of the carbon or its holder, feeding it forward, the fingers or feelers at the opposite sides of the axis of the rocking or vibrating device being advanced and withdrawn alternately, substantially as described.

3. An electric-arc lamp having a vibrating or reciprocating feeding device formed of elastic fingers or feelers, substantially as described.

4. In an electric-arc lamp, an electro-magnet, in combination with a non-magnetic pin or screw which passes through the core of said magnet and acts as a guide and support to the carbon-holder, and a spring and tension-adjusting device whereby said non-magnetic screw is pressed up against the attractive force of the magnet, substantially as described.

5. In an electric-arc lamp, the armature or keeper W, in combination with a carbon-clutching device, the non-magnetic screw or pin *a*, the spring *b*, operating in the cylinder F, adjusting-plug *c*, extended core *d*, and electro-magnet T, substantially as described.

6. In an electric-arc lamp, the electro-magnet E, in combination with rocking arm B, supporting-column J, contact-spring H, having an adjusting-screw I, and the vibrating carbon-holder A, having a clasp, A′, with pin A^2, substantially as described.

7. In an electric-arc lamp, the electro-magnet E, in combination with pivoted arm B, contact-spring H, carbon-feeder A, and tube *e*, coned internally to receive the carbon D, substantially as described.

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