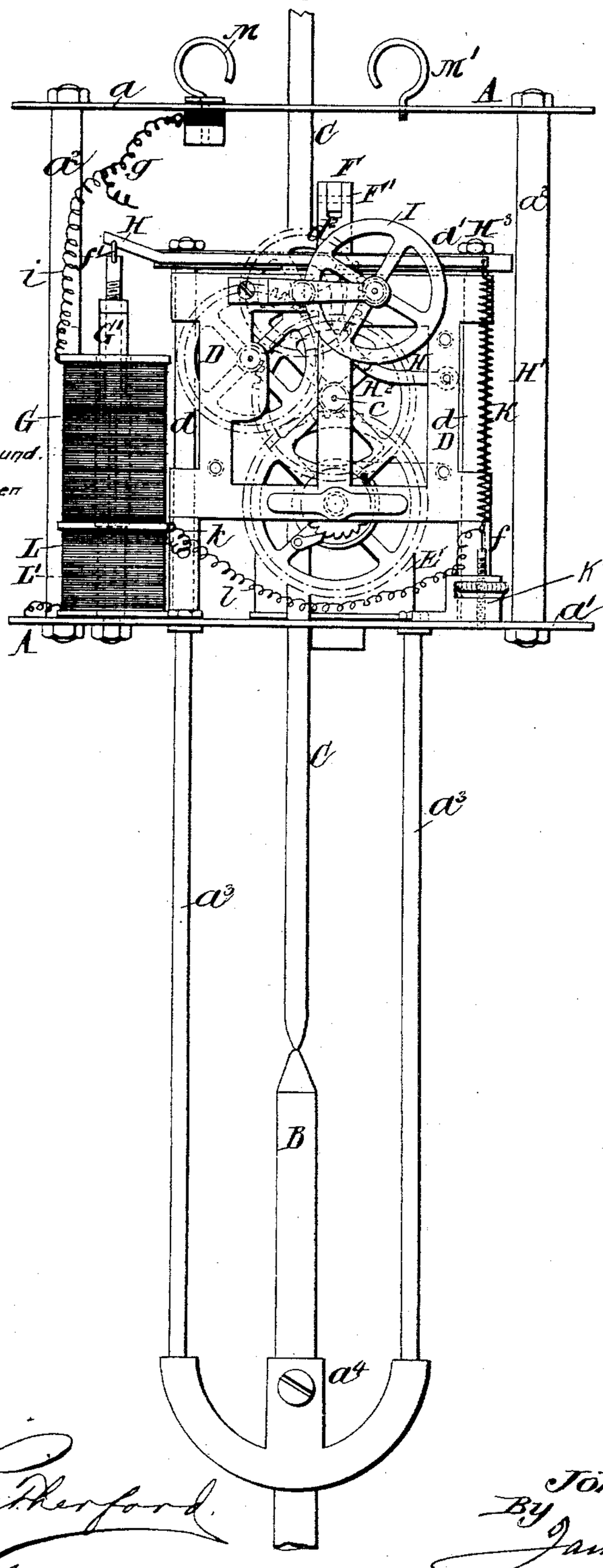
(No Model.) 5 Sheets—Sheet 1.

J. LEA.

ARC LAMP.

No. 388,697. Patented Aug. 28, 1888.

Fig. 1.



G & L are oppositely wound.

L. is short-circuited when lamp is not feeding.

Witnesses,
J. A. Rutherford.
Robt Ewalt.

Inventor.
John Lea.
By James L. Norris.
Atty.

(No Model.)

5 Sheets—Sheet 2.

J. LEA.

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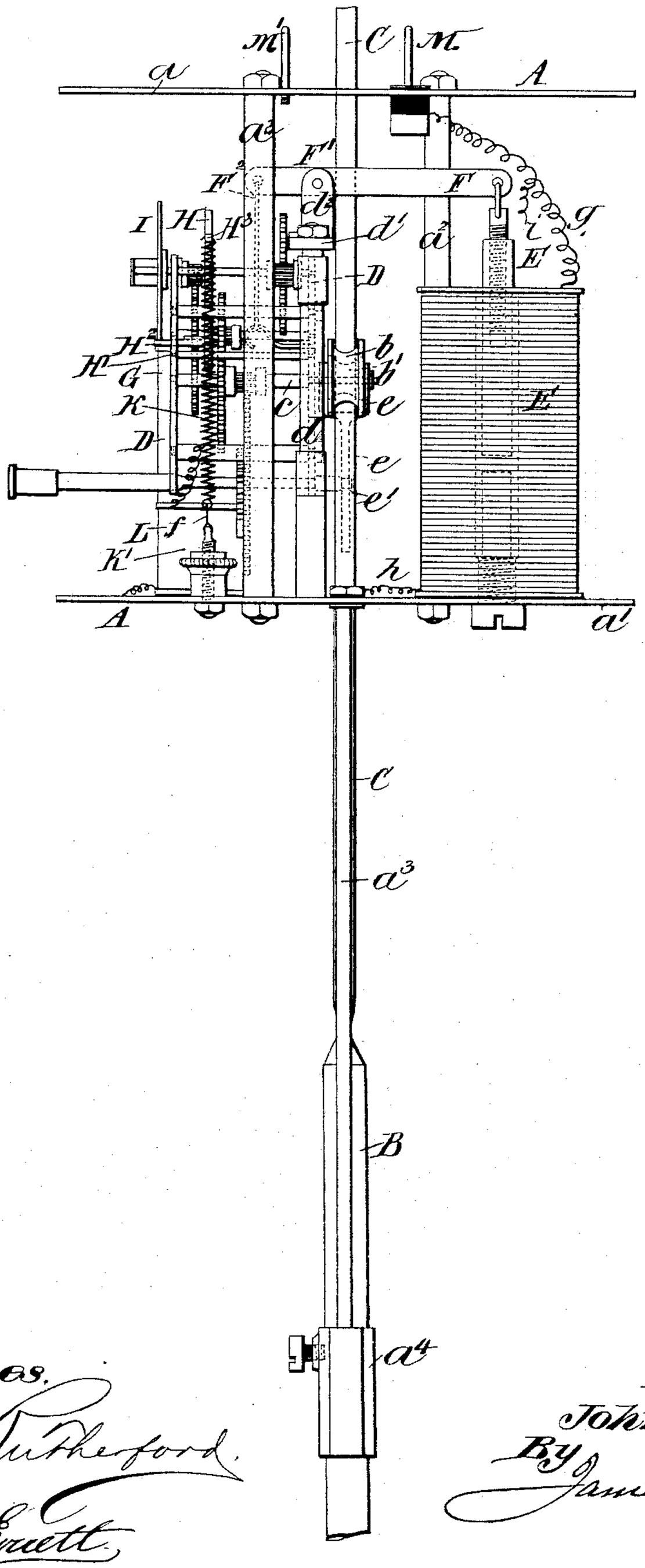
Fig. 2.



Witnesses.
J. C. Rutherford.
Robert Ewett.

Inventor.
John Lea.
By James L. Norris.
Atty.

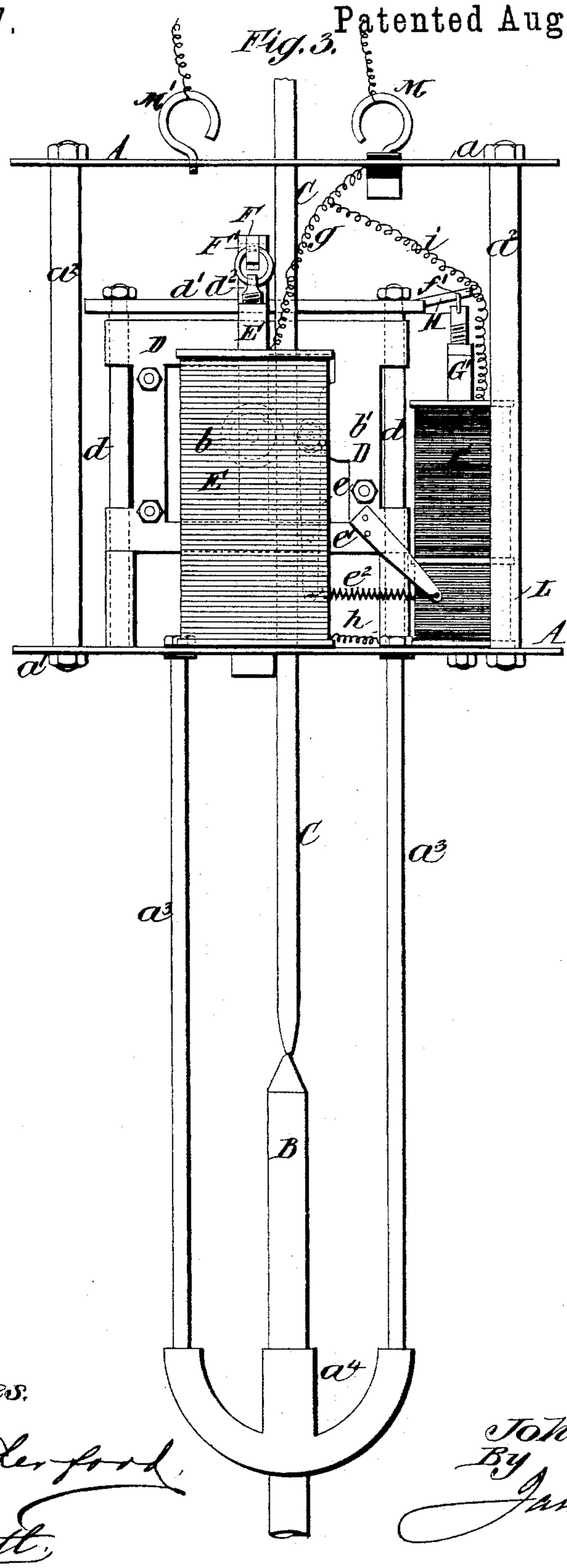
(No Model.) 5 Sheets—Sheet 3.

J. LEA.

ARC LAMP.

No. 388,697. Patented Aug. 28, 1888.

Fig. 3.



Witnesses:
J. A. Rutherford.
Albert Orrell.

Inventor:
John Lea.
By James L. Norris.
Atty.

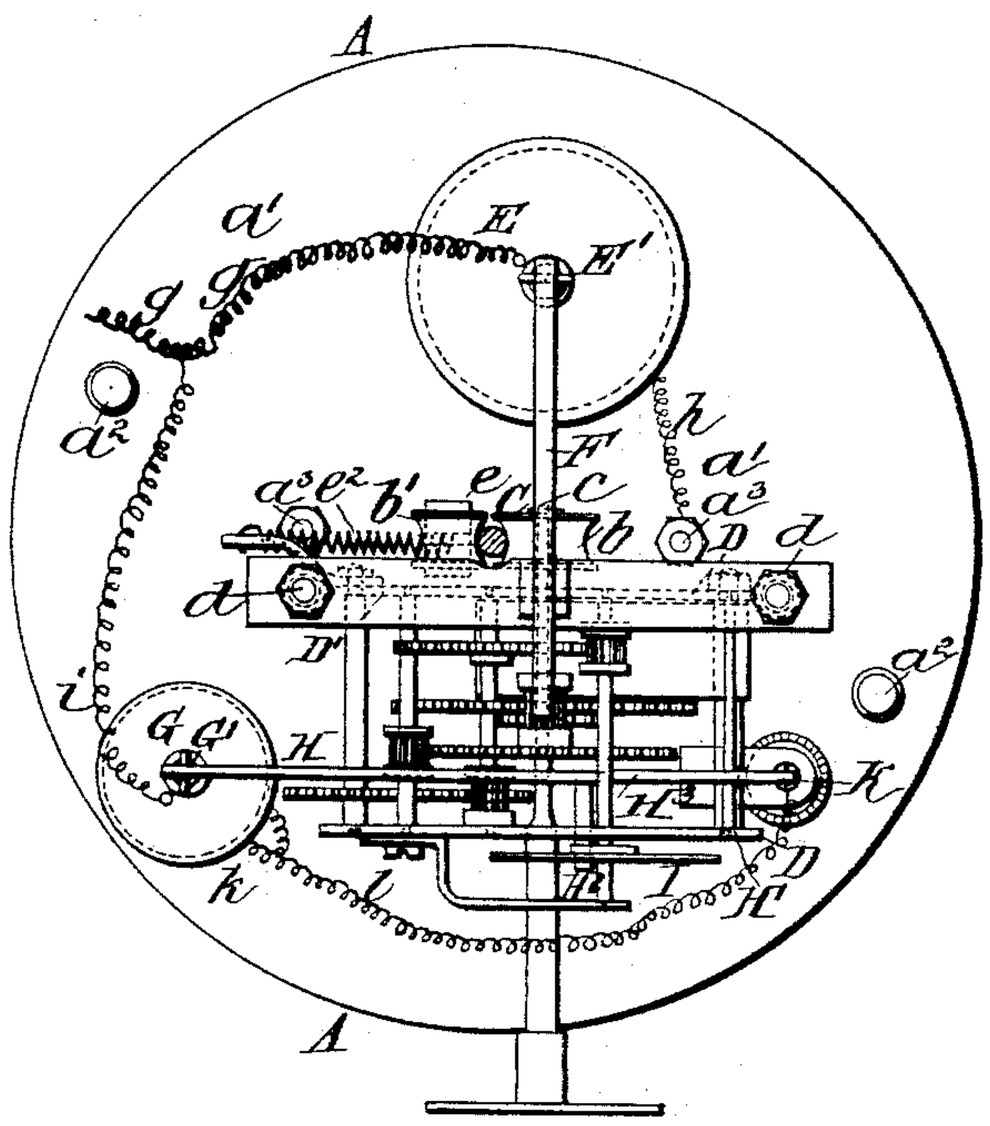
(No Model.) 5 Sheets—Sheet 4.

J. LEA.

ARC LAMP.

No. 388,697. Patented Aug. 28, 1888.

Fig. 4.



Witnesses.
J. A. Rutherford
Robt Burnett.

Inventor:
John Lea.
By James L. Norris.
Atty.

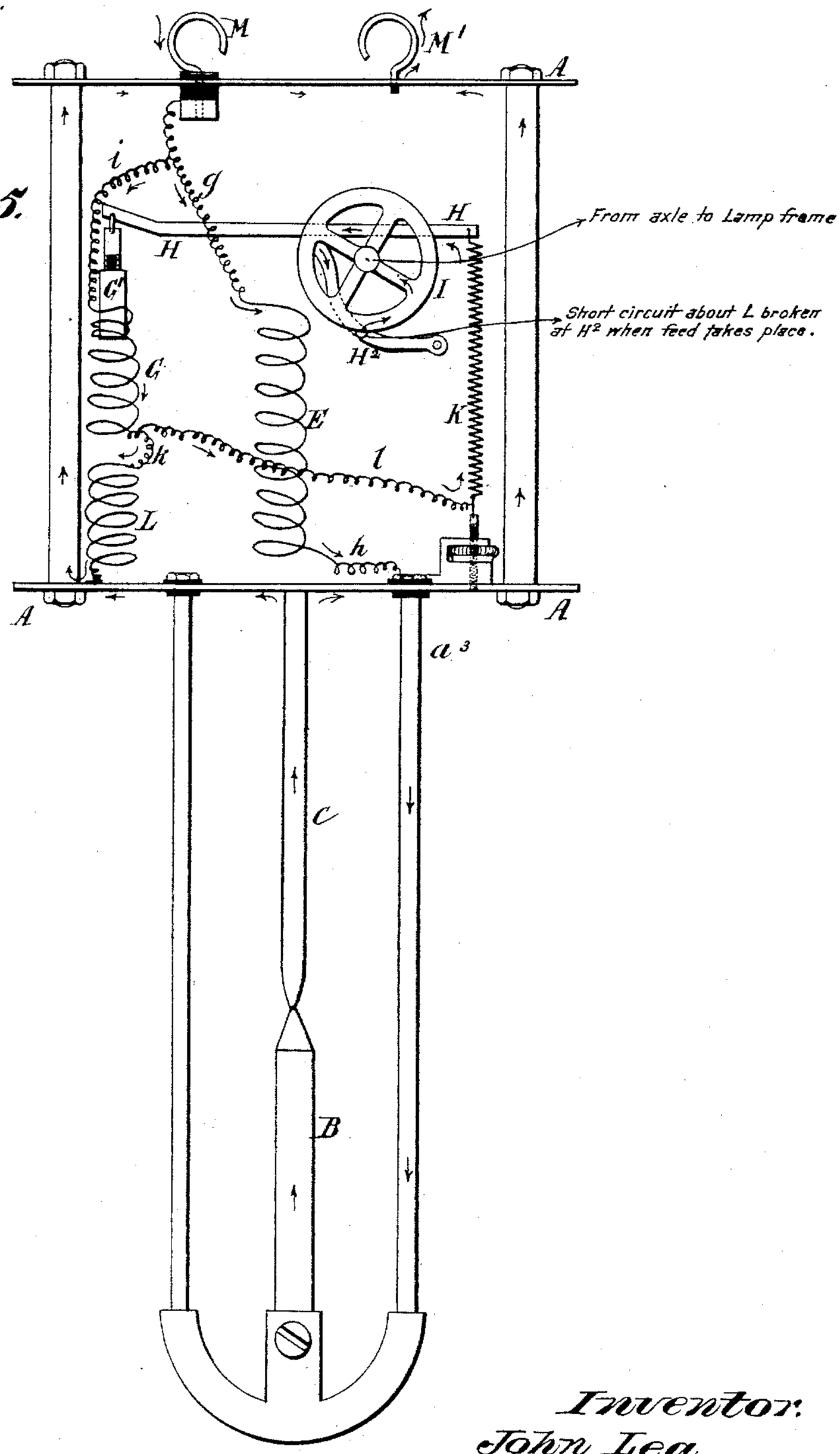
(No Model.) 5 Sheets—Sheet 5.

J. LEA.

ARC LAMP.

No. 388,697. Patented Aug. 28, 1888.

Fig. 5.



Witnesses.
Geo. W. Rea.
Robert Everett.

Inventor:
John Lea.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

JOHN LEA, OF LONDON, ENGLAND, ASSIGNOR TO HUGH WATT, OF SAME PLACE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 388,697, dated August 28, 1888.

Application filed January 19, 1888. Serial No. 261,261. (No model.) Patented in England March 12, 1887, No. 3,767.

To all whom it may concern:

Be it known that I, JOHN LEA, electrical engineer, a subject of the Queen of Great Britain, and a resident of London, England, have invented a new and useful Method of Checking or Arresting the Feed of an Arc Lamp and Appliances for the Purpose, (for which I have obtained a patent in Great Britain, No. 3,767, bearing date March 12, 1887,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to electric-arc lamps or lighting apparatus, and is chiefly designed to provide apparatus of this kind or class which is very compact, and can be advantageously used in rooms and other places where lights of low candle-power are required, and where it has hitherto been customary to employ incandescent electric lamps.

By my said invention I insure great regularity in the feed of the carbon or carbons and the maintenance of a very small arc. My said invention therefore provides for a greater subdivision and more economic use of the electric current than is practicable with the arc lamps hitherto generally used.

In the specification of former British Letters Patent, dated April 22, A. D. 1882, No. 1,919, I have described an arc lamp wherein the feeding of the carbon is effected by mechanism driven by means of a solenoid included in a shunt from the main circuit. In this lamp there is provision for automatically increasing the resistance in the said shunt when required to diminish the pull of the solenoid upon its core, the additional resistance being obtained by the intercalation of a coil so wound that it will counteract the attraction of the solenoid, thus avoiding any slowness of action of the parts which might be caused by residual magnetism in the said solenoid, and insuring regularity in the feeding of the carbon.

Now my present invention is based upon the principle of varying the resistance in a shunt in which a solenoid is included by the intercalation of a coil acting in the reverse manner to the said solenoid, substantially as described in my said former specification. Instead, however, of applying this principle to the feeding of the carbon or carbons, I now apply it to the regulation or control of the feed, which in my improved lamp is effected by means of clock-work or any other suitable motor. Moreover, an important feature of my present invention is the provision of means whereby the same movement which releases the clock-work and permits the feeding of the carbon or carbons will effect the requisite breaking or variation of the electrical contact for putting the extra resistance into the aforesaid shunt.

My said invention comprises other improvements, hereinafter set forth.

In the accompanying drawings I have shown how my said invention may be conveniently and advantageously carried into practice.

Figure 1 is a front elevation, Fig. 2 a side elevation, and Fig. 3 a rear elevation, of one form of my improved lamp or lighting apparatus. Fig. 4 is a plan of the said apparatus, the top plate, hereinafter referred to, being removed; and Fig. 5, a view similar to Fig. 1, omitting the clock-work, except the brake, to clearly show the electric connections.

Like letters indicate corresponding parts throughout the drawings.

A is the lamp-frame, which comprises two plates or disks, *a a'*, firmly connected by rods or posts a^2, and having connected therewith by rods or posts a^3 a socket, a^4, for the lower carbon, B. C is the upper carbon, which is passed through holes in the top and bottom plates, *a a'*, and is held between roller, *b b'*. The roller *b* is fixed upon an arbor, *c*, carried in bearings in a frame, D, which is fitted upon upright bars or posts *d*, so that it can move up and down thereon through a short distance. The bars or posts *d* are firmly connected by a cross-bar, *d'*. The roller *b'* is carried by a lever, *e*, which is pivoted at *e'* to the frame D, and is acted upon by a spring, e^2, so that it presses the said roller *b'* against the carbon C. This carbon is thus gripped between the two rollers with sufficient force to prevent its descending by gravitation and to enable it to be fed or moved downward by the rotation of the roller *b*. This roller is arranged to be driven by means of suitable clock-work carried by the frame D.

E is a solenoid, which is coarse wire and has a core, E', which is coupled to one arm of a lever, F, pivoted at F' to a bracket or lug, d^2,

on the cross-bar *d'*. The other arm of this lever is coupled by means of a link, F^2, to the frame D. Therefore, when the carbons are in contact and the required current passes through the solenoid E, the lever F will be operated to raise the frame D and the upper carbon, C, and thus form the arc.

G is another solenoid, which is formed of fine wire and has core G', which is coupled to but insulated from a bent lever, H, pivoted at H' to the frame D. A pin or stud, H^2, fixed in this lever, is adapted to bear against the periphery of a wheel, I, forming part of the clock-work. A spring, K, is attached at one end to a tail-piece or extension, H^3, of the lever H, and at its other end to an adjusting-screw, K', fitted in the frame A. This spring tends to hold the stud H^2 on the lever H against the wheel I, so that the said stud acts as a brake to arrest or retard the movement of the clock-work. The said lever also affords the means for making and breaking or varying electrical contact, for the purpose hereinafter specified. The lever H must be insulated from the frame A. For this purpose a piece of insulating material is placed between the said lever and its pivot-pin H', and the spring K is connected with the screw K' and the lever H with the core G' by means of silk threads *f f'*, or other suitable insulating material.

L is a coil of wire wound in the reverse direction to the solenoid G. A core, L', is fixed within this coil, thus forming an electro-magnet, which, when the electric current passes through the coil L, as hereinafter described, will repel or tend to repel the core G'.

M M' are the lamp-terminals, which are to be connected with the two poles of a battery, or other electric generator. The terminal M is connected by a wire, *g*, with one end of the solenoid E, the other end of which is connected by a wire, *h*, with one of the rods or posts a^3, and through this rod or post with the lower carbon, B. The terminal M' is in electrical connection, through the frames A D and rollers *b b'*, with the upper carbon, C. The solenoid G and magnet-coil L are in a shunt from the main circuit—that is to say, one end of the solenoid is connected by a wire, *i*, with the wire *g*. The other end of the said coil is connected by a wire, *k*, with one end of the coil L, and the other end of this coil is connected with the frame A. The coil L, when the carbon is not feeding, is short-circuited through a wire, *l*, connecting the wire *k* with the spring K, and through this spring the brake and the frames A D with the terminals. Therefore, when contact is broken by the withdrawal of the brake H^2 from the wheel I, a considerable amount of resistance will be put into the aforesaid shunt.

The operation of the improved apparatus is as follows, viz: Assuming the carbons to be so far apart that the current cannot pass through them, then as soon as the apparatus is connected with the generator the current will pass through the shunt, thus energizing the solenoid G, so that it draws down the lever H, and thus removes the brake H^2 from the wheel I and extends the spring K. The clock-work being thus set free, feeds down the upper carbon, C. As soon as this carbon comes in contact with the lower carbon the current passes through the said carbons and through the solenoid E, which, being thus energized, acts upon the lever F and lifts the frame D, thereby raising the upper carbon, C, and forming the arc. As the carbons are consumed and the resistance through the arc increases, the current will again pass through the shunt, energizing the solenoid G, so that it draws down or tends to draw down the lever H, and thus removes the brake from the wheel I, or diminishes its pressure thereon. When the brake is taken off, the coil L is included in the shunt, thus introducing additional resistance therein and diminishing the attraction which the solenoid G exerts upon its core G'. Moreover, the current passing through the coil L magnetizes the core L' in such a manner that it has a repelling effect upon the core G'. The spring K then reacts and again applies the brake. It will be seen, therefore, that the breaking of the contact between the brake H^2 and wheel I produces conditions favorable to the remaking of the said contact. By this arrangement I avoid any defective action of the feeding devices, which might be caused by residual magnetism, and I provide for feeding the carbon through very small distances, so that a small arc will be maintained. I have, moreover, found in practice that the pressure of the brake upon the wheel I is sometimes dimished to such an extent that without actually breaking the contact it will permit the said wheel to rotate, the periphery of the said wheel slipping or sliding in contact with the said brake. The resistance through the contact is thus varied, as in a microphone, with the result that part of the current passes through the coil L, as above described. When the carbons are too far apart for the current to pass through the main circuit *g* E *h* a^3 B *c* A, the current will pass through the shunt *i* G *l* K H H^2 I A. The solenoid G being energized, will remove the brake H^2 from the wheel I, and the clock-work being released, will feed down the upper carbon, C, the current, when the brake is thus removed, passing through *i* G *k* L A. As soon as the carbons are in contact the current passes through the main circuit, energizes the solenoid E, and lifts the clock-work, together with the upper carbon, C, thus forming the arc, and the brake H^2 is again applied by the reaction of the spring K. As the carbons are consumed and the resistance through the arc increases, the current, again passing through the shunt *i* G *l* K H H^2 I A, energizes the solenoid G, which, acting upon the brake, permits the movement of the clock-work to again feed down the upper carbon, C.

It is obvious that I can, if desired, use electro-magnets, instead of the solenoids above-mentioned.

What I claim is—

1. In an electric-arc lamp wherein the feeding of the carbon or carbons is effected by means of clock-work, a brake which acts upon a wheel of the said clock-work to control the movement thereof, and through which the current flows to and through the said wheel when the arc is normal, and which is actuated by a magnet or solenoid in a shunt from the main circuit, so that as the resistance through the arc increases the pressure of the brake upon the said wheel will be diminished, or the brake will be taken off, substantially as and for the purposes set forth.

2. In an electric lamp wherein the feeding of the carbon or carbons is effected by means of clock-work, the combination, with a brake which is actuated by a magnet or solenoid in a shunt from the main circuit to control the movement of the said clock-work, of a resistance-coil which will be switched into the said shunt when the brake is taken off, and will be short-circuited when the said brake is applied, substantially as and for the purposes set forth.

3. The combination, with the magnet or solenoid G, arranged in a shunt from the main circuit for actuating the brake H^2, of a resistance-coil, L, wound in the reverse direction to the said magnet or solenoid and having a core within it, so that the extra resistance switched into the said shunt will energize the said core and counteract the said controlling-magnet or solenoid G, substantially as and for the purpose set forth.

4. The combination, with the clock-work for feeding the carbon or carbons and the magnet or solenoid E, for raising the said clock-work to form the arc, of the magnet or solenoid G, arranged in a shunt from the main circuit, the lever H, carrying the brake H^2 and connected with the armature or core G′, the spring K, the coil L, arranged to be included in the said shunt to increase the resistance therein, or to be short-circuited by means of the said brake, and provided with the core L′, arranged to act upon the said armature or core G′, all substantially as and for the purposes set forth.

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

JOHN LEA.

Witnesses:
J. B. Cox,
J. Montagu Pates.