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D. HOUGHTON.

ARC LAMP.

No. 403,671. Patented May 21 1889.

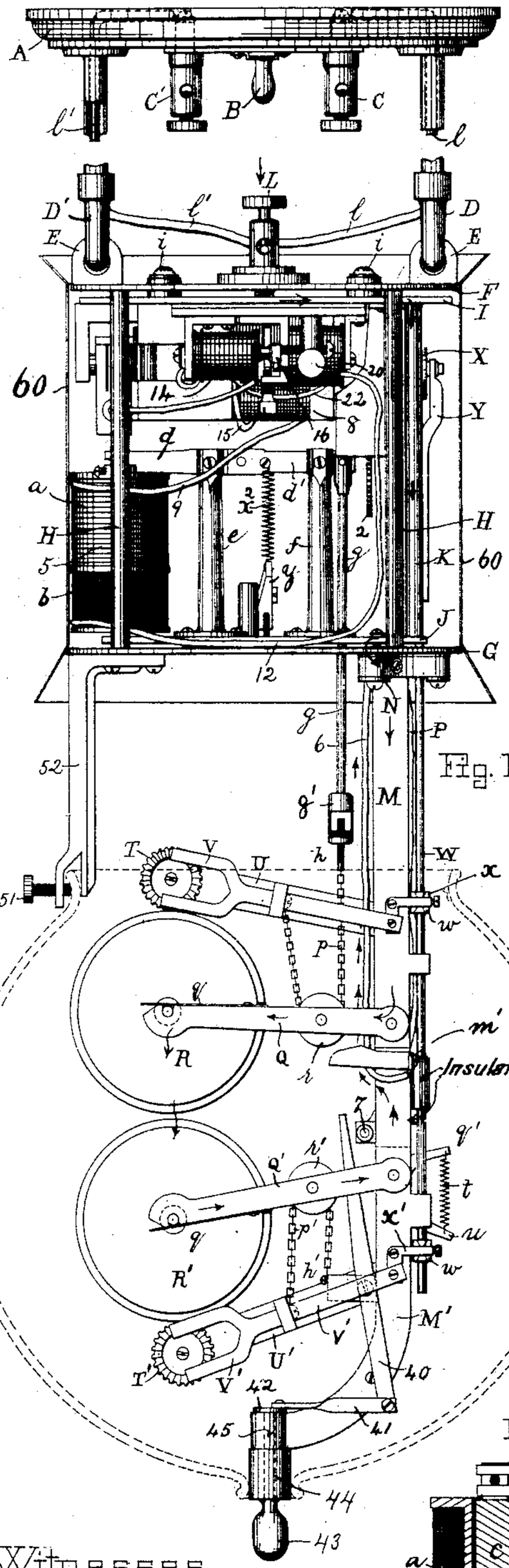

Fig. 1.

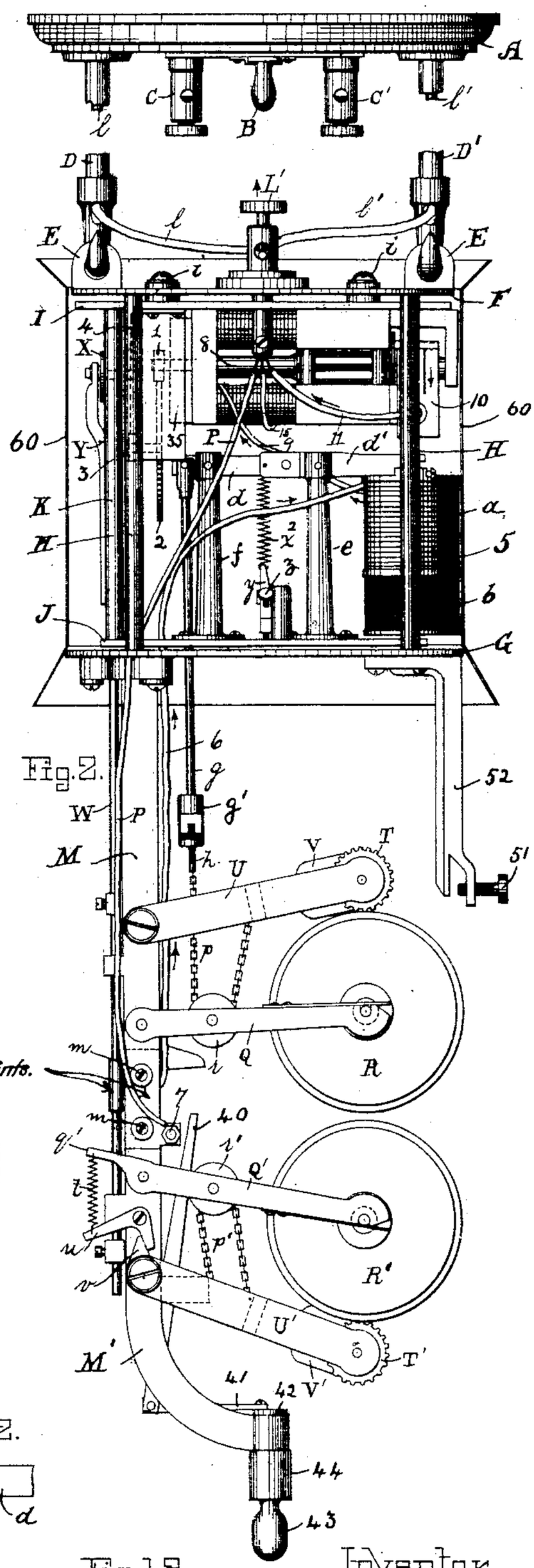

Fig. 2.

Fig. 12.

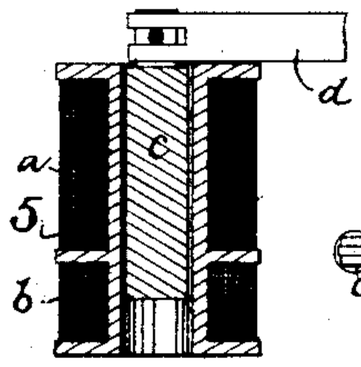

Fig. 13.

Witnesses.

J. George Pettzer

T. O'Connell

Inventor.

Darius Houghton

by C. Planta

Attorney

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

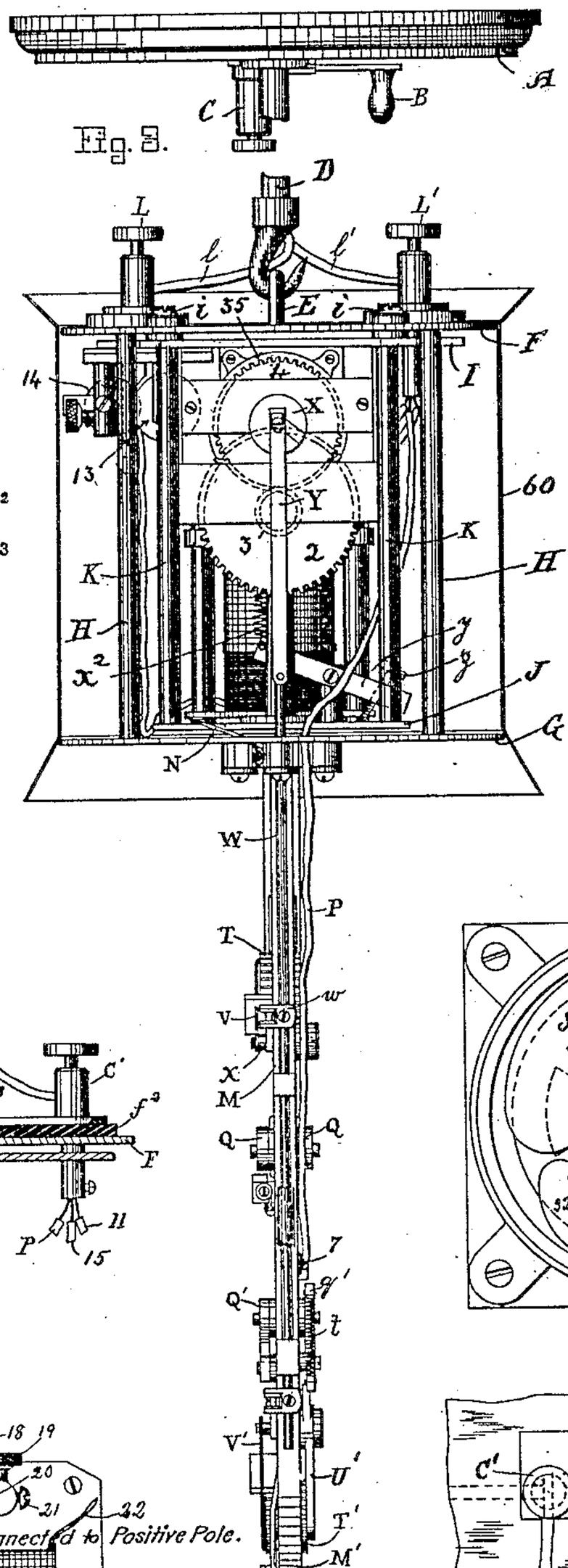


Fig. 9.

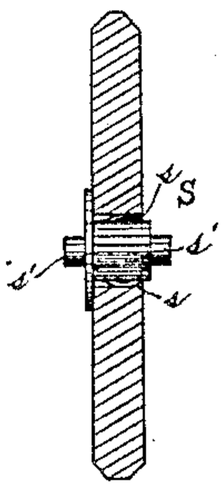


Fig. 5.

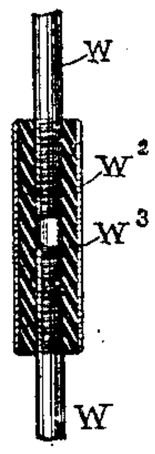
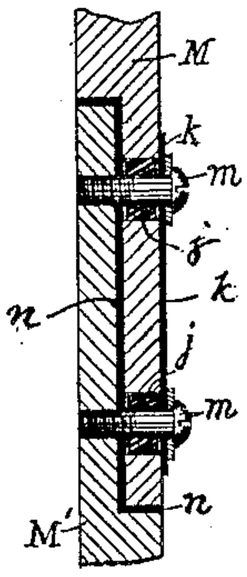


Fig. 4.



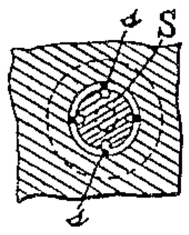


Fig 10

Fig. 11

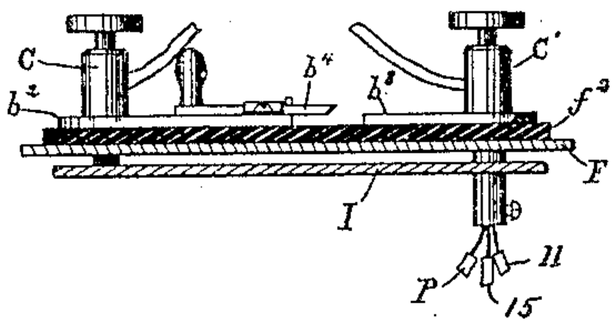


Fig. 6.

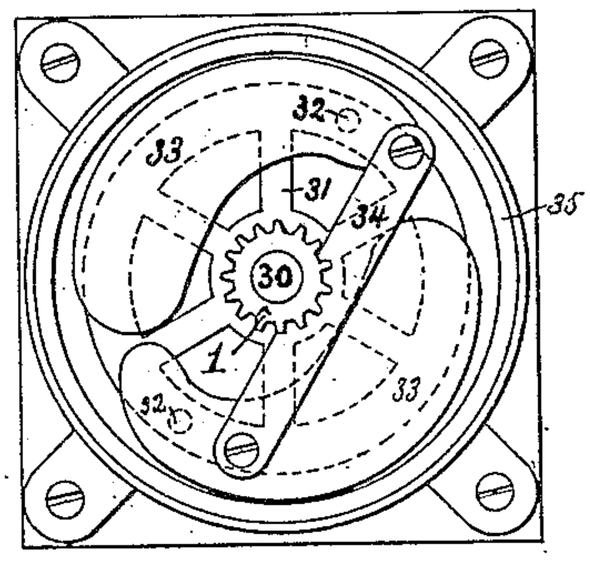


Fig. 8.

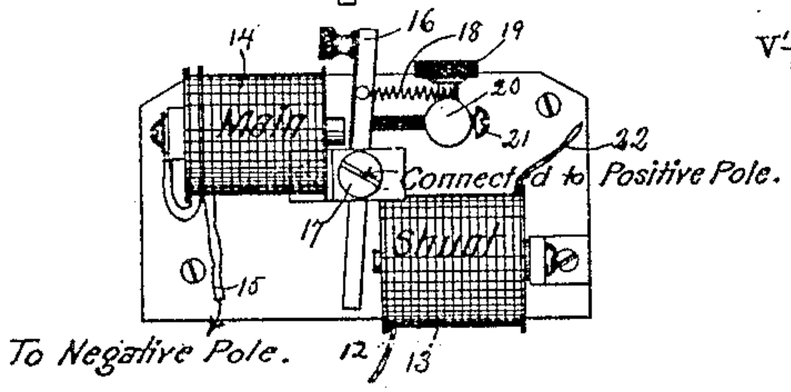
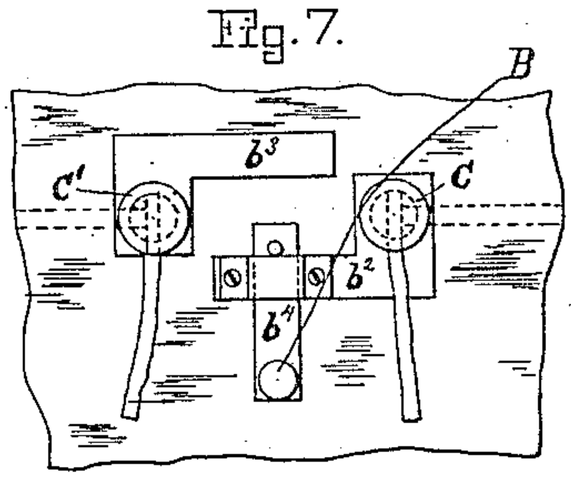


Fig. 7.



Witnesses.

J. George Seltzer

T. O'Connell

Inventor.

Darius Houghton

by E. Planta

Attorney

UNITED STATES PATENT OFFICE.

DARIUS HOUGHTON, OF SKOWHEGAN, MAINE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 403,671, dated May 21, 1889.

Application filed December 15, 1888. Serial No. 293,687. (No model.)

To all whom it may concern:

Be it known that I, DARIUS HOUGHTON, a citizen of the United States, residing at Skowhegan, in the county of Somerset and State of Maine, have invented certain new and useful Improvements in Arc Lamps, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention has reference to that class of electric lamps known as "arc" lamps, and the object is to produce a lamp in which the light will always be in the same position, and which will burn for a much longer time and at much less expense than with arc lamps as now usually constructed; and the invention consists in certain details of construction, as hereinafter fully set forth, and pointed out in the claims.

Referring to the accompanying drawings, Figure 1 represents a view of one side of an arc lamp embodying my invention. Fig. 2 is a view of the other side. Fig. 3 is an end view. Figs. 4 to 13 are detail views of various parts.

A represents the hanger-board, provided with a switch, B, and binding posts C C′ for connecting the main wires with the lamp, which is supported from the hanger-board A by rods D D′, provided at their lower end with hooks that are passed through eyes in ears E E′, connected to the top of plate F, which latter is connected to the bottom plate G by connecting-rods H.

I is a top and J a bottom plate, connected together by rods K, and insulated from the outer plates, F G. These plates are supported from the top plate, F, by means of screws *i i*.

L L′ are the positive and negative binding-posts, secured to the top plate, F, and connected by wires *l l′* to the binding-posts C C′, the post L being insulated from the plate F and connected to the positive portion of the hanger-bar M through plate I, rods K, plate J, and wire N, and the binding-post L′ is connected to the negative portion of the hanger-bar M′ by means of wire P. The hanger-bar is formed in two parts—the positive part M and the negative part M′—which are connected together so as to form a continuous bar by means of screws *m*, a layer of insulating material, *n*, being placed between the joint, as shown in Fig. 4, and the screws *m* being insulated from the portion M by means of insulating-rings *j* and plate K.

On each side of the hanger-bar M M′ are pivoted arms Q Q′, to the outer ends of which are secured carbon disks R R′, that are mounted upon the carbon-holders S, (see Figs. 9 and 10,) consisting of a small cylindrical piece of metal fitted with four small springs, *s*, and provided on each side with journals *s′*, that run in the bearing in the outer ends of the arms Q Q′, and held in place by springs *q*.

The carbon disks R R′ are each provided in the center with a circular hole, into which the carbon-holder S fits, the small springs *s* causing it to adjust itself centrally in the hole in the carbon.

The carbons R R′ revolve in the same direction, which causes their contact-edges to move in opposite directions, and they are caused to rotate by means of feed-rollers T T′, roughened on their peripherical face and mounted on the ends of arms U U′, pivoted to the hanger-bar M M′, motion being imparted to the rollers T by pawls formed on the ends of forked bars V V′, taking into ratchet-teeth formed on one side of the feed-rollers T T′, as shown. A reciprocating motion is imparted to the forked bars V V′ from a rod or bar, W, through bell-crank levers *x x′*, fulcrumed on the hanger-bar M M′, one arm of each of the bell-crank levers being pivoted to the forked bars V V′, and each of the other arms are connected to the rod W by a forked clamp, *w*, secured to the rod by a set-screw. A reciprocating motion is imparted to the rod W from a crank or disks X through connecting-rod Y, the shaft upon which the crank or disks X is mounted being driven from the motor 8 through a suitable train of gears, 1 2 3 4.

The rod W is made in two parts and connected together by a sleeve, w^2, fitted with insulating material, w^3, as shown in Fig. 5.

The upper or positive carbon is separated and held the proper distance from the lower or negative carbon by means of the magnet *a* of the combined solenoid magnet and shunt 5, the upper portion, *a*, of which is coiled with coarse wire, which, when the current passes through, forms a very powerful magnet which draws up the plunger *c* (see Fig. 12) on the end of lever *d*, fulcrumed on a post *e*. (See

Figs. 1, 2, 12, and 13.) The lever d is connected to an auxiliary lever, d', fulcrumed on a post, f, and to the outer end of the lever d' is connected one end of a rod, g, the lower end of which is formed with a head, g', having an open space, as shown, in which a small eyebolt, h, is secured, and to the latter is connected one end of a small chain, p, that passes round a small pulley, r, on arm Q, the other end of the chain being connected to the arm U. It will be seen by this arrangement that the lower edge of the carbon R is always on the same level when the lamp is burning, for the eye h is always in the same position, (when the lamp is burning,) and the feed-roller T rests upon the top of the carbon, consequently as the latter is consumed the feed-roller falls, and with it the arm U, thereby shortening the distance between the arm U and pulley r, thus allowing the arm Q to fall in proportion.

The distance that the rod g is raised to regulate the space between the carbons to produce the arc is adjusted by means of a spiral spring, x^2, connected at one end to the lever d', and at the other end to a bar, y, fulcrumed on a small post secured to the inner lower plate, J, the tension of the spring being regulated by a screw, z, passing through the bar y. (See Fig. 3.) A wire, 6, connects the magnet 5 to the point m' of the negative portion of the hanger-bar M'.

The upper edge of the lower carbon is always held on the same level by the following arrangement: One of the arms, Q', is provided with an extension, q', to which one end of the coil-spring t is secured, the other end being secured to one arm of a bell-crank lever, u, fulcrumed on the hanger-bar M'. The other arm of a bell-crank lever bears upon a small projection, v, formed on one side of the arm U'. One end of a chain, p', is secured to a fixed point, h', on the hanger-bar. The chain then passes over the pulley r', secured to the arm Q', its other end being secured to the arm U', so that as the carbon R' is burned away the springs t, keeping the feed-roller T' and carbon R' in contact with each other, causes the chain p' to slacken, and consequently allow the arm Q' to rise just the amount that the carbon has been consumed, and as the tension of the spring t is lessened as the carbon grows smaller the upper edge of the carbon is not raised above the desired point.

The upper portion, a, of the solenoid-magnet 5 is connected to the motor 8 by a wire, 9, (the motor is of ordinary construction and therefore does not need to be particularly described,) and the brush 10 is connected to the binding-post L' by a wire, 11.

The lower portion, b, of the combined solenoid magnet and shunt 5 is wound with fine wire and forms a shunt, the wire being connected at one end to the core of the magnet, and the other end is connected by a wire, 12, to a coil, 13, of the cut-out, the coarse wire on the upper portion, a, being insulated from the fine wire on the lower portion, b.

The cut-out (see Figs. 1 and 8) consists of coarse and fine wire magnets and an armature, the fine-wire magnet 13 being connected to the shunt 6 by wire 12, and the coarse-wire magnet 14 is connected to the negative binding-post L' by a wire, 15, to which is also connected the wire 22 from the shunt-magnet 13. The armature 16 is fulcrumed upon the screw 17, which connects with the positive plate I. The armature 16 is held back out of contact with the core of magnet 14 by means of a spiral spring, 18, one end of which is connected to a screw, 19, in post 20, so that by turning the screw 19 the tension of the spring 18 is increased or diminished, as required. A screw, 21, also passes through the post 20 and regulates the distance the armature 16 is drawn back from the core of the magnet 14. The speed of the motor is controlled by a governor, as shown in Fig. 6, in which 30 is the shaft upon which is mounted the pinion 1 and a wheel, 31. To this wheel are pivoted at 32 32 two arms or levers, 33, connected together by a bar, 34, as shown, so that should the motor be running too fast the arms or levers 33 will be thrown out and come in contact with the rim or ring 35, whereby the frictional contact will lessen the speed of the motor; but when the motor is running at its normal speed the arms 33 will not come in contact with the ring 35, and no restraint is exerted thereon.

To put out the lamp I employ a switch, 40, (best seen in Fig. 1,) fulcrumed to the negative portion M' of the hanger-bar, the switch being connected by an arm, 41, to a disk, 42, on the end of a rod, 45, that passes through the lower end of the hanger-bar M', the other end of the rod being provided with a knob, 43, by which the switch-bar 40 is turned so as to come in contact with the point 7, or out of contact, as shown. A rubber washer, 44, is placed upon the rod between the knob 43 and the hanger-bar M'. This rubber washer fits into a hole formed in the lower end of the glass globe 50, (shown in the dotted lines,) the upper end of the globe being held by a single screw, 51, passing through an arm, 52, secured to the bottom plate G.

In Fig. 7 I have shown the construction of the switch B, which consists of two plates, b^2 b^3, connected to the binding-posts C C', a plate or slide, b^4, being fitted in the plate b^2, so that it can be pushed forward and be placed in contact with the plate b^3, thereby preventing the current from passing through the lamp or drawn back, as shown, so as to allow the current to pass through the lamps.

In Fig. 11 I have shown a modification of the top plate F, in which the plate is fitted with a switch similar to that just described, the switch being insulated from the plate by

a layer of insulating material, f^2, as shown. 60 is a case or cover for inclosing the operating mechanism of the lamp.

The operation is as follows: The electric current enters the lamp from the main line-wire by binding-post C, passes through wire l to binding-post L, thence through plate I, rods K, plate J, and wire N to the positive portion M of the hanger-bar; thence through arms Q and carbon R to carbon R′, through arms Q′ to the negative portion M′ of the hanger-bar, through wire 6 to solenoid-magnet a, which draws up the plunger c on lever d, and through lever d' raises the rod g and draws the carbons R R′ apart, thus producing the arc. The current then passes from the solenoid-magnet a by wire 9 to motor 8, and thence through brush 10 to binding-post L′, and through wire l' to binding-post C′, which is connected to the negative main-line wire. When the motor is started, it turns the train of wheels 1 2 3 4 and causes the crank or disk X to rotate, which, through connecting-rod Y, imparts a reciprocating motion to the rod W, that operates the bell-crank levers $x\,x'$, which, through the forked arms V V′, imparts a rotary motion to the feed rollers T, that, by reason of their roughened surface, causes the carbons R to rotate. It will be seen that by this arrangement the surface speed of the carbons is always the same, no matter whether the carbons are of full size or nearly burned out, the adjacent edges of the carbon being always in the same relative position, as before described.

A certain proportion—say about two or four per cent.—of the current passes through the shunt b to the shunt-magnet 13 by wire 12, so that if the arc increases in length it forces a greater per cent. of the current through the shunt, and causes the armature 16 to be attracted by the shunt-magnet 13, thus making connection between the armature 16 and the coarse-wire magnet 14, thereby making a short circuit through the lamp.

When it is desired to put out the light, the knob 43 is turned, thereby throwing the switch 40 into contact with point 7, which connects directly with the negative binding-post L′, thereby preventing the current from passing through the solenoid-magnet a. Consequently the plunger c falls and the carbons R R′ come into contact with each other.

If desired, this lamp may be placed in a vacuum.

What I claim as my invention is—

1. In an arc lamp, feed-rollers mounted with their peripherical face in contact with the edge of carbon disks, whereby the surface speed of the carbon disks will always be the same until the disks are burned out, substantially as set forth.

2. The positive carbon R, arms Q, pulley r, and hanger-bar M, in combination with feed-roller T, arm U, chain p, rod g, levers $d\,d'$, plunger c, and solenoid-magnet a, substantially as and for the purposes set forth.

3. The negative carbon R′, arms Q′, pulley r', and hanger-bar M′, in combination with feed-roller T′, arm U′, chain p', bell-crank lever n, and spring t, substantially as and for the purposes set forth.

4. The feed-rollers T T′, arms U U′, hanger-bar M M′, and forked bars V V′, with pawls on their ends, in combination with bell-crank levers $x\,x'$, clamps w, and rod W, to which a reciprocating movement is imparted, substantially as and for the purposes set forth.

5. In combination with a disk carbon, a carbon-holder, S, consisting of a small cylindrical piece of metal having journals s', and provided with springs $s\,s$, whereby it adjusts itself centrally in the hole in the carbon, substantially as shown and described.

6. The carbon R, arm Q, pulley r, feed-roller T, forked bar V, having pawls on its end, arm U, chain p, rod g, levers $d\,d'$, plunger c, and magnet a, in combination with the carbon R′, arm Q′, pulley r', chain p', bell-crank lever n, and spring t, substantially as and for the purposes set forth.

7. The switch 40, arm 41, disk 42, rod 45, and knob 43, in combination with the negative portion M′ of the hanger-bar, point 7, and wire P, leading to the negative binding-post, substantially as shown and described.

8. In combination with an arc lamp, a governor consisting of a rim or ring, 35, a wheel, 31, secured to the driving-shaft 30 of an electric motor, levers 33, each pivoted at one end to the wheel 31, and the bar 34, connecting the opposite ends of the levers 33, substantially as shown and described.

9. The combination of the lever d, fulcrumed on post e, auxiliary lever d', fulcrumed on post f, the inner ends of the levers $d\,d'$ being connected together, whereby, when the outer end of the lever d is drawn down by the magnet a, a corresponding downward movement will be imparted to the rod g on the end of lever d', the spring X^2, bar y, and regulating-screw z, for adjusting the length of the arc, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 6th day of June A. D. 1888.

DARIUS HOUGHTON.

Witnesses:
JOE. H. BACON,
WM. H. HANSON.