(No Model.) 2 Sheets—Sheet 1.

J. W. EASTON.

ELECTRIC ARC LAMP.

No. 445,546. Patented Feb. 3, 1891.

Fig. 2,

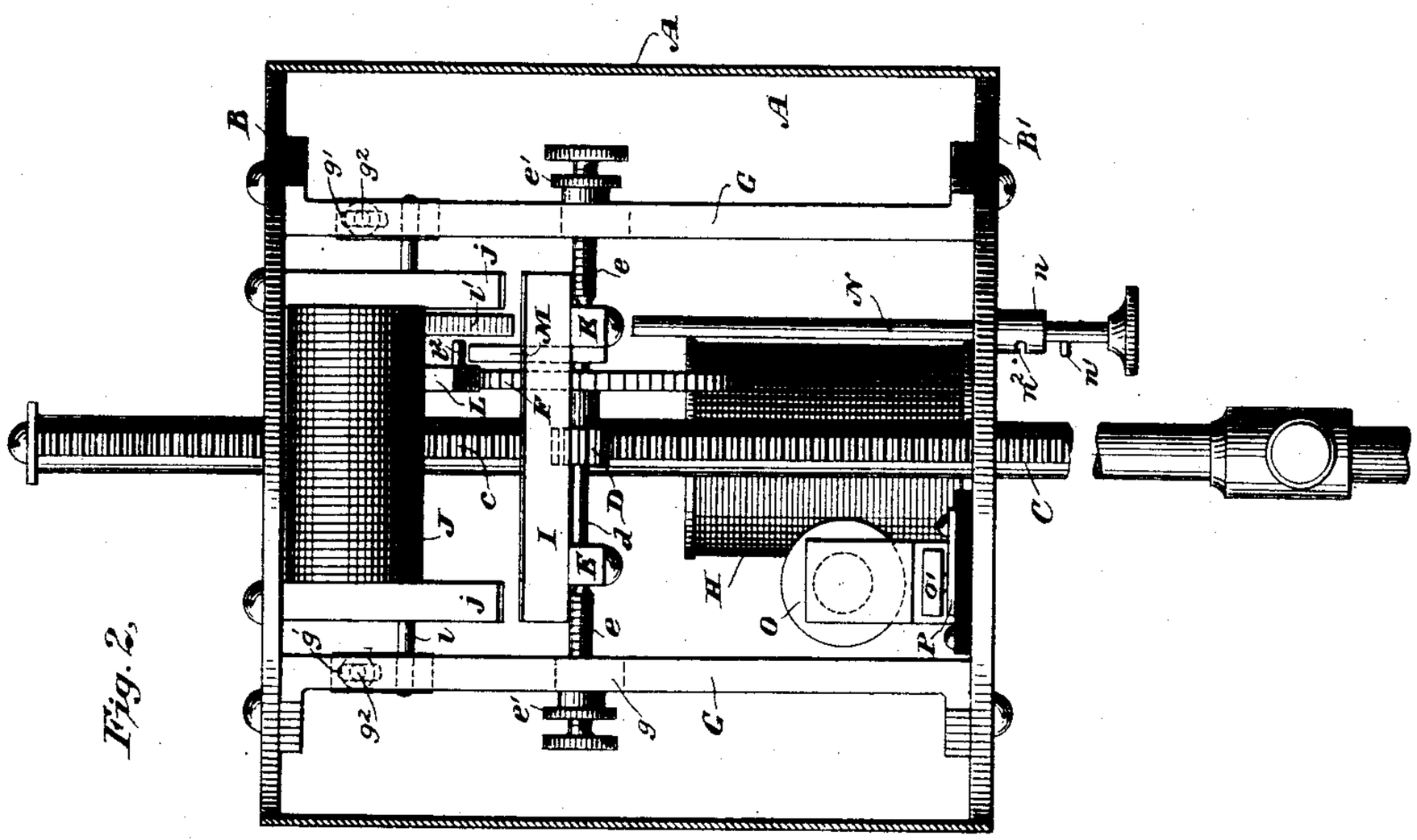
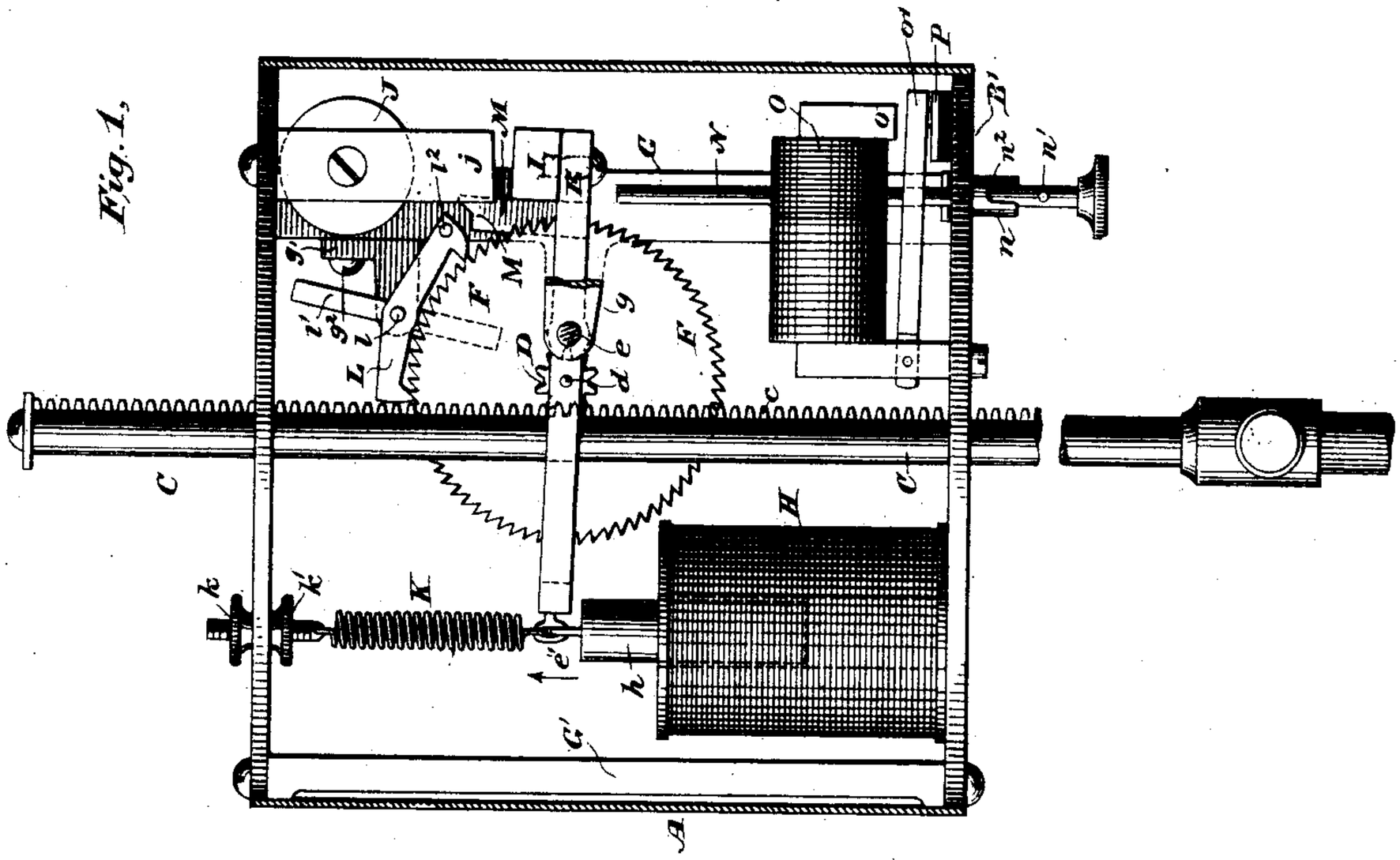


Fig. 1,



Witnesses
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Inventor
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(No Model.) 2 Sheets—Sheet 2.

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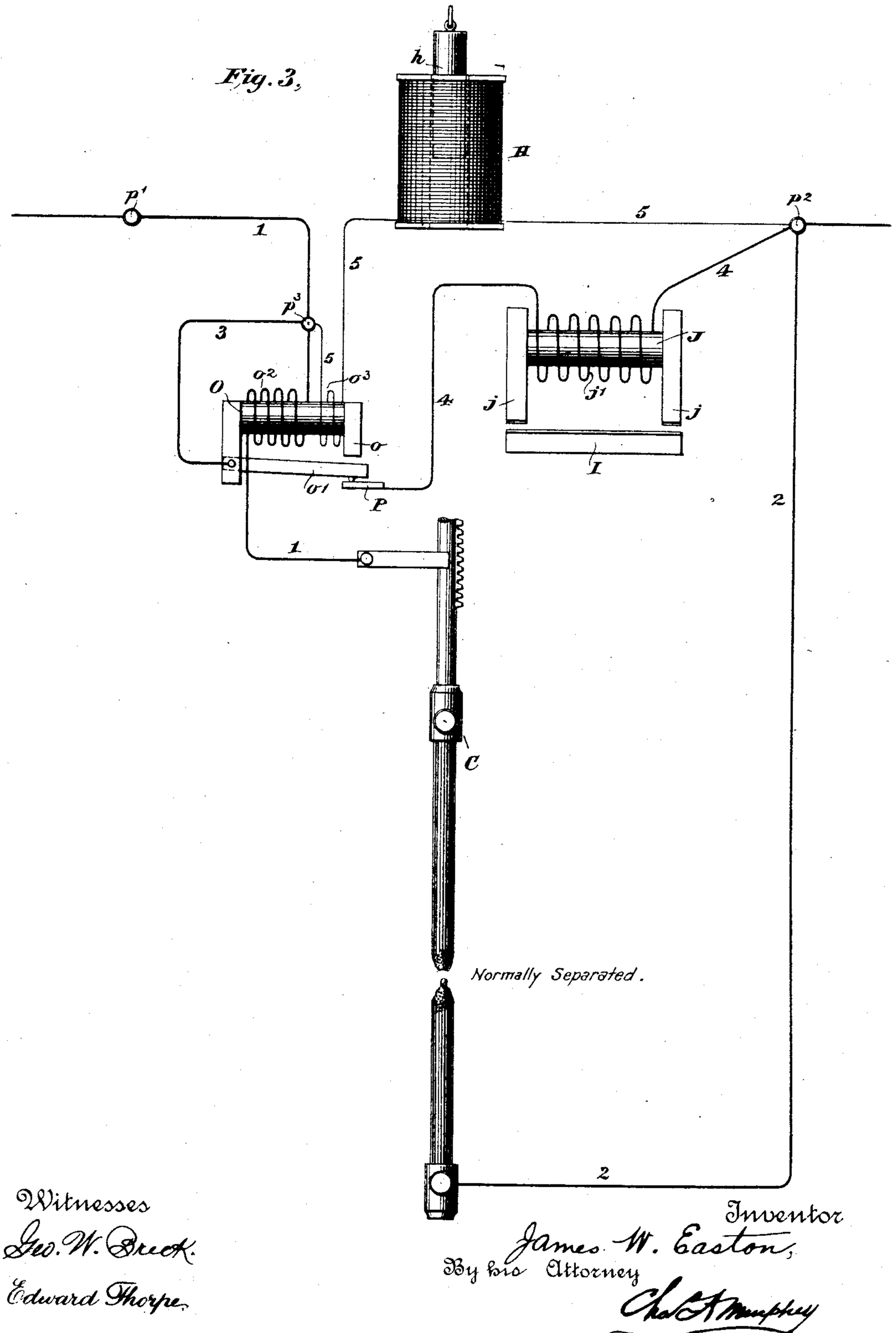
Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES W. EASTON, OF NEW YORK, N. Y., ASSIGNOR TO P. MINTURN SMITH, OF PLAINFIELD, NEW JERSEY, AND WILLIAM D. PERRY, OF BROOKLYN, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 445,546, dated February 3, 1891.

Application filed February 19, 1890. Serial No. 340,986. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. EASTON, of the city, county, and State of New York, have invented a certain new and useful Improvement in Electric Lamps; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to electric-arc lamps, and has for its object the production of an arc lamp simple in its construction, both in its electrical and mechanical features, positive and reliable in its operation, and capable of being cared for by comparatively unskilled persons.

To this end my invention consists in the novel electrical and mechanical features and in the arrangement, combination, and construction of devices, parts, and details hereinafter described, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, of the operating parts of a lamp embodying my invention. Fig. 2 is a side elevation thereof, and Fig. 3 is a diagram of the electric circuits.

The operating parts of the lamp are inclosed within a suitable casing A, and are secured to the top and bottom boards B B′ in any suitable manner. The carbon-carrying rod C is provided with a rack *c* and slides freely through holes in the top and bottom boards B B′. A pinion D, rigidly mounted upon the axle *d*, meshes with rack *c*. The axle *d* is journaled in a pivotally-supported frame E and carries the ratchet or escapement wheel F, rigidly secured to the axle. The frame E is pivotally supported by the bearing-screws *e*, which are carried by the lugs or arms *g*, projecting from the standards G, which, with the standard G′, form the frame-work of the lamp. The bearing-screws *e* may be adjusted and are held in place by the jam-nuts *e′*. The core *h* of a solenoid H is suspended or attached to one end of the frame E, and to the opposite end of said frame is secured a mass of magnetic material I, which is adapted to act as an armature to the electro-magnet J, which is provided with the downwardly-projecting pole-pieces *j j*. This weight of the armature I also tends to depress its end of the frame E when the solenoid H and magnet J are de-energized, as hereinafter described. This last-mentioned function of said armature may be conveniently assisted by the spiral spring K, the tension of which may be properly regulated by the thumb-nuts *k k′*, although of course, if the armature be sufficiently heavy, the spring K may be dispensed with.

An escapement L, engaging with wheel F, is journaled in bearings in the arms *g′*, which are secured to the standard G. These arms are provided with slots to receive the screws g^2, so that their position relatively to the escapement-wheel F may be adjusted as desired. To the axle *l* of the escapement L is secured the fan *l′* to govern the movement of the escapement, and from one end of said escapement projects the pin l^2, with which, under certain conditions, the upwardly-extending arm M, secured to frame E, is adapted to engage.

For the purpose of carrying the escapement-wheel F out of engagement with the escapement L, and thus permitting the carbon-rod C to be moved freely up and down, the rod N is provided. The rod N slides freely in the sleeve *n*, suitably placed in the bottom board B′. When it is desired to clean or trim the lamp or replace the carbons, the rod N is lifted up, carrying with it the end of frame E and lowering the escapement-wheel F out of engagement with escapement L. At the same time the arm M engages with pin l^2 and prevents that end of the escapement L from following the escapement-wheel F as the latter is lowered. When the escapement-wheel F is lowered sufficiently, the rod N is turned so that the pin *n′* enters the bayonet-slot n^2 of sleeve *n*, thus holding the wheel F and escapement L out of engagement and permitting the carbon-rod to be moved freely up and down until such time as the rod N is lowered, when the action of spring K and the weight of armature I will carry the wheel F and escapement L into engagement again.

A differentially-wound electro-magnet O,

having the pole-face *o* and the pivoted armature *o'*, is secured to the bottom board B'. When the magnet O is energized, the armature *o'* is attracted to the pole-face *o*, and when the same is de-energized said armature falls and comes into electrical contact with the contact-piece P, secured to the bottom board B'.

The foregoing description of my invention relates, chiefly, to the novel mechanical features comprised in the same, and I will now proceed to describe a novel arrangement of electro-magnets and electric circuits by means of which the same may be rendered operative, although I wish it clearly understood that I do not intend to limit my invention to any particular arrangement of said magnets and circuits, as the mechanical features of the invention may be used in connection with other and different electrical features.

The main or arc circuit of the lamp lies through a conductor 1 of low resistance, which leads from the binding-post p', to which one terminal of the working-circuit is connected to the carbon rod C, passing round the core of electro-magnet O and forming thereon the coil o^2. From the carbon-rod C the main circuit lies through the carbons to the conductor 2, of low resistance, and thence to the binding-post p^2, to which the other terminal of the working-circuit is connected. A conductor 3, of very low resistance, is connected with conductor 1 at p^3 and with the pivoted armature *o'* of magnet O, and the path of the current lies through said armature to the conductor 4, which passes around the core of magnet J, forming thereon the coil *j'*, and thence to the binding-post p^2. This circuit forms a shunt of very low resistance around the main circuit of the lamp. A second shunt-circuit, but of very high resistance, is formed by the conductor 5, which is connected with the conductor 1 at p^3, passes thence around the core of magnet O, forming thereon the coil o^3, to the solenoid H, and thence to the binding-post p^2.

The operation of my invention will now be readily understood, and is as follows: The carbon-rod C having been properly adjusted so that when no current is on the lamp the carbons will be separated, being held out of contact by the weight of the armature I, which tends to depress its end of frame E, thus raising the escapement-wheel F until it is locked by engagement with escapement L. If now the current be turned on, it finds a circuit of low resistance through conductor 1, armature *o'*, contact-piece P, conductor 4, and coil *j'*, and energizes the electro-magnet J, thus attracting the armature I toward the pole-faces *jj*. The escapement-wheel F is thereby lowered sufficiently to entirely release it from engagement with escapement L, and the carbon-rod C accordingly descends until the carbons come together. When the contact between the carbons is established, a current is completed through the main circuit of the lamp, which includes the coil o^2 of magnet O. This causes the magnet O to become energized, and the tongue or armature *o'* is attracted to the pole *o* of the magnet, thus breaking the shunt-circuit first described and de-energizing the magnet J, which permits the armature I to descend, and the carbon-rod C is thereby lifted sufficiently to separate the carbons and establish the arc. As the carbons are consumed the resistance of the arc and consequently of the direct circuit, is increased, and when such resistance becomes excessive a portion of the current will flow through the high-resistance shunt-circuit and will energize the solenoid H, the core *h* of which will be drawn into the coil. The end of frame E, to which the core *h* is attached, will thus be depressed sufficiently to permit the escapement L to vibrate, and thus permit the carbon-rod C to descend and bring the carbons nearer together. Should it descend more rapidly than the rate of consumption of the carbons will warrant, the resistance of the arc is decreased, the action of the solenoid is weakened, and the weight of the armature I will depress the opposite end of frame E, thus raising the rod C until the arc is of the proper length, when the feed is resumed, as before. On the other hand, should the feed be too slow the solenoid H will become stronger and the vibration of the escapement L, and consequently the rate of descent of the rod C, will be increased. By means of the slots in the supports *g'* of the escapement L the position of the escapement may be varied, so that the voltage at which the lamp will feed may be altered, as desired. Should the carbon-rod stick and refuse to descend at all, the resistance of the arc circuit will gradually increase as the carbons are consumed, and when it becomes so great that the potential necessary to force the current through the increased resistance increases the magnetizing power of coil o^3 so that it equals that of coil o^2 the coils will neutralize each other and the armature will fall into contact with the piece P, thus re-establishing the low-resistance shunt-circuit and depriving the main circuit and coil o^2, included therein, of current. As the resistance of this shunt-circuit is so low compared with that of the high-resistance shunt-circuit, the coil o^3, which is included in the latter, will receive only a negligible amount of current, and the magnet O will remain inactive, permitting the armature *o'* to remain in contact with piece P until the carbons come together again, when the act of lighting and the feeding of the carbons will proceed as before. When the carbons are not in the lamp and the current is turned on, the main circuit will be open and the current will flow through the low-resistance shunt-circuit.

It is obvious that an electro-magnet or other equivalent mechanism may, if desired, be substituted for the solenoid H without departing in the least from my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an arc lamp, the combination of the carbon-carrying rod, an escapement-wheel adapted to control the movement thereof, a pivoted frame on which said escapement-wheel is mounted, an escapement mounted on the fixed frame of the lamp for controlling the movement of said wheel, and means for adjusting the position of the axis of said escapement, whereby the lamp may be arranged to feed at any desired voltage, substantially as and for the purposes set forth.

2. In an arc lamp, the combination of the carbon-rod, an escapement-wheel connected therewith, a pivoted frame in which said escapement-wheel is journaled, an escapement controlling the movement of said wheel, and a stop on said frame adapted to engage with said escapement and prevent it from swinging into contact with the wheel when the latter is lowered beyond a certain point, substantially as and for the purposes set forth.

3. In an arc lamp, the combination of the carbon-rod, an escapement-wheel connected therewith, a pivoted frame in which said escapement-wheel is journaled, an escapement controlling the movement of said wheel, and a stop on said frame adapted to engage with said escapement and prevent it from swinging into contact with the wheel when the latter is lowered beyond a certain point, and a support N, substantially as and for the purposes set forth.

4. In an arc lamp, the combination of the carbon-rod, an escapement-wheel mounted on a pivoted frame or lever and adapted to control the movement of said rod, an escapement mounted on the fixed frame of the lamp for controlling the movement of said wheel, a high-resistance magnet arranged in a shunt of the main circuit for controlling the movement of the feeding mechanism, a low-resistance magnet also in a shunt of the main circuit and operating when energized to release the feeding mechanism and complete the main circuit of the lamp, and a magnet arranged in the main circuit for throwing said low-resistance shunt-magnet out of action when the main circuit is completed, substantially as and for the purposes set forth.

5. In an arc lamp, the combination, with the carbon-rod and feeding mechanism, substantially as described, for controlling the movement thereof, of a solenoid or electro-magnet arranged in a high-resistance shunt of the main circuit of the lamp, an electro-magnet provided with two coils wound in opposite directions to oppose each other's action, one coil being in permanent connection with the main circuit of the lamp and the other coil being in permanent connection with said high-resistance shunt-circuit, and a low-resistance shunt-circuit adapted to be closed when the action of one of said coils neutralizes the effect of the other, substantially as and for the purposes set forth.

6. In an arc lamp, the combination of the carbon-rod, the escapement-wheel and escapement controlling the movement thereof, a pivoted frame in which said escapement-wheel is journaled, a solenoid or electro-magnet arranged in a high-resistance shunt of the main circuit of the lamp and having its core or armature connected with said frame, an armature or electro-magnet arranged in a low-resistance shunt of the main circuit and having its armature attached to said frame, and an electro-magnet provided with a pivoted amature and with two coils wound in opposite directions, one coil being in the main circuit of the lamp and the other in the said high-resistance shunt-circuit, the armature of said last-mentioned magnet acting as a switch to close the said low-resistance shunt-circuit when the core of its magnet is de-energized, substantially as and for the purposes set forth.

7. In an automatic cut-out for arc lamps, the combination of a magnet having a differentially-wound core, one coil thereof being in the main circuit of the lamp and the other coil thereof being in a high-resistance shunt of said main circuit, and a pivoted armature and a contact-point, both in a low-resistance shunt of the main circuit, substantially as and for the purposes set forth.

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Witnesses:
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