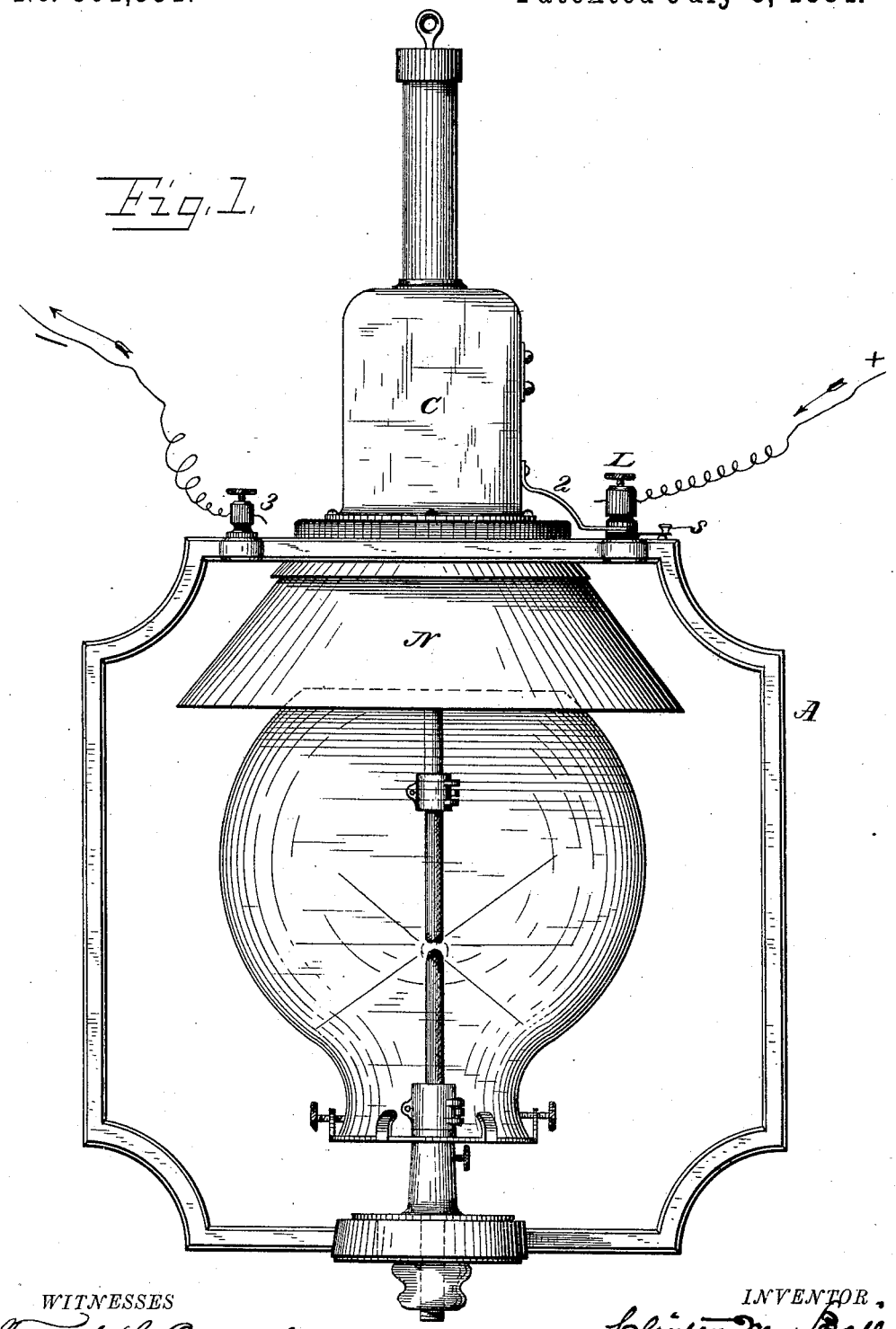
(No Model.) 2 Sheets—Sheet 1.

C. M. BALL.

ELECTRIC ARC LAMP.

No. 301,551. Patented July 8, 1884.

Fig. 1.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

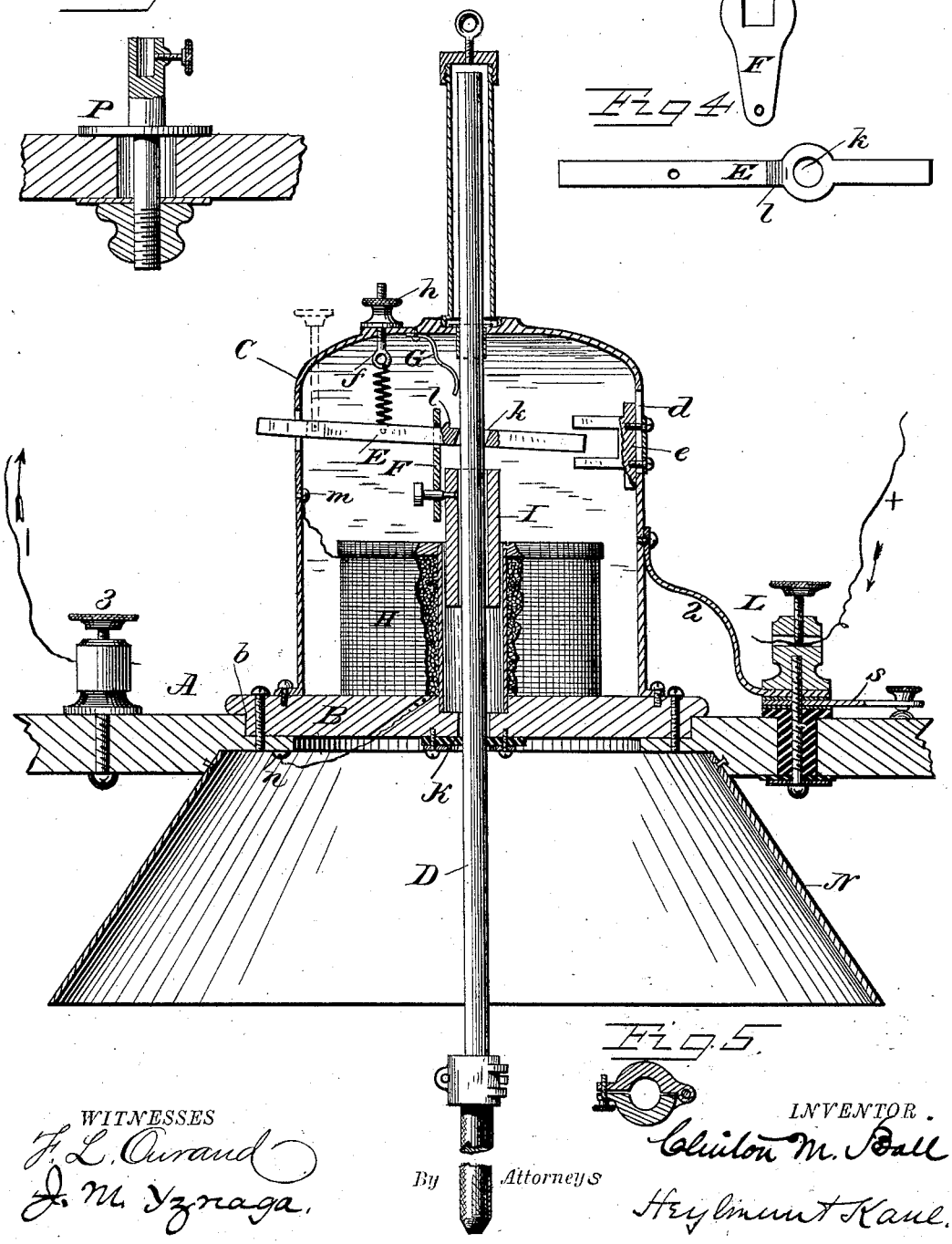

Fig. 3.

Fig. 4.

Fig. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

CLINTON M. BALL, OF TROY, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 301,551, dated July 8, 1884.

Application filed March 30, 1882. Renewed May 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, CLINTON M. BALL, a citizen of the United States of America, residing at Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Figure 1 of the drawings represents a front view of the lamp. Fig. 2 is a vertical sectional view of the upper portion of the lamp, and Figs. 3, 4, and 5 are detail views.

This invention relates to improvements in electric lights of that class known as the "arc" type of lamp.

The objects of my improvements are, first, to produce a cheap, simple, and substantial lamp of this class; second, to produce a simple and effective feed mechanism or means for the upper carbon; third, to produce a simple clamping means in combination with a movable core and solenoid for operating the bar carrying the upper carbon; fourth, to provide means for keeping the vertically reciprocating or sliding rod carrying the carbon clean and smooth, whereby the same is caused to work freely and easily without possible binding from corrosion or similar chemical action. To accomplish these and other objects, I have shown in the accompanying drawings a practical way of carrying out my invention.

In the annexed drawings, the letter A represents a frame adapted to be suspended, and may be of any desired shape or design. The top and bottom pieces or cross-bars of this frame are connected and separated at the desired distance by means of the side portions and their adjuncts. The upper piece or cross-bar of the frame is formed with a central opening and shoulder, *b*, (see Fig. 2,) for the reception and support of an insulating table or bed, B, made preferably of vulcanized fiber, hard rubber, or other firm insulating material. This insulating-bed is secured to the said piece or cross-bar by screws or equivalent fastening means. To the upper surface of this bed B is secured a casing or frame, C, of any design, inclosing the operative mechanism, as seen in Figs. 1 and 2 of the drawings. This casing (see Fig. 2) is traversed vertically by the upper-carbon holder, D, and serves, in connection with the insulating-bed to which it is fixed, as a guiding means for said holder. At one side of this casing is formed a vertical slot, *d*, or its equivalent, for the attachment and adjustment of a bracket, *e*, acting as a stop device, as will be hereinafter described. To the upper portion of the casing opposite the bracket *e* is attached a rod, *f*, by means of an adjusting thumb-screw, *h*, and from which is suspended the clamping bar or plate E through the intervening coil-spring *i*, substantially as shown in Fig. 2 of the drawings. This clamping plate or bar E (see Figs. 2 and 4) is formed with a suitable opening or hole, *k*, of a diameter little larger than the diameter of the carbon holder and carrier D, over which it is passed and works in conjunction therewith to effect the proper separation of the carbon points and insure their retention just far enough apart to produce the desired result, and is also formed with a shoulder or raised elevation, *l*, in close proximity to the opening. This shoulder or elevation *l* serves as an abutment against which the link or arm F rests, by which the clamping plate or bar is connected to the movable core of the helix. This clamping-plate, after being passed over the rod carrying the upper carbon and suspended from the rod *f*, should be of a length sufficient to engage at one end with and between the inward-extending arms of the bracket *e*, and the other end under some circumstances to extend through a slot formed in the casing, so that this end may be grasped and depressed for the purpose of releasing and permitting an upward movement of the carbon-carrier to allow the insertion of a new carbon when one has been exhausted.

The letter G represents the usual spring resting against the carbon-carrier for insuring good electrical contact therewith.

The letter H represents a solenoid or helix supported upon and secured to the bed B in any suitable manner. This solenoid or helix is made in the usual manner, and has one of its terminals fastened at *m* to the upper casing, and the other terminal fastened at *n* to the upper cross-bar of the frame, as seen in Fig. 2 of the drawings.

The letter I represents a soft iron hollow

core surrounding the bar of the carbon-carrier D, but is independent thereof and moves freely around the same, and is suspended from the clamping-plate E by the connecting-link F, so as to work freely within the cavity of the solenoid, as shown in Fig. 2 of the drawings. This mode of suspending the clamping means and the core maintains the latter in a direct vertical plane, and allows a free movement of the carbon-carrier rod within and through it, and an easy movement of the other parts in conjunction therewith. It will also be observed by reference to Fig. 2 of the drawings that the clamping plate or bar is acted upon in opposite directions by the downward attractive force of the core within the cavity of the solenoid, and the antagonistic force of the reaction-spring, by which the clamping-bar is suspended, and that the stop-device acts as a contact-stop for limiting the upward motion and determining the action of the clamping-plate.

To the under side of the insulating block or bed B, surrounding the central opening, and to engage with the carbon-carrier as a guide and wiper, is attached a washer, K, made of felt or other soft material, to keep the rod of said carbon-carrier clean and polished, thereby preventing the rusting or corroding of the metal, which has proved an objectionable feature in the working of this class of lamps.

The letter L represents a binding-post with a wire leading from a dynamo-machine or other source of electricity connected to the upper part of the frame, but insulated therefrom.

The character 2 indicates a metallic connection extending from the post L to the casing containing the operative mechanism, and *s*, a switch for throwing the light in and out of circuit.

Attached to a flange or downward projection of the top part of the frame is a shield or shade, N, so as to surround the upper end of the globe surrounding the light. The object of this shield, in connection with the outward flaring flange on the frame, is to shed off the rain, snow, and other matter, and to exclude the same from entering the lamp and affecting the quality of the light. The lower end of the carbon-carrier D (see Figs. 2 and 5) is provided with hinged jaws and fastening-screw for clamping and confining the carbon thereto.

The letter P (see Fig. 3) represents adjustable means attached to the lower or bottom piece of the frame in a suitable manner for holding and supporting the negative carbon in a proper position and relation to the positive carbon to complete the circuit.

The parts composing the lamp are arranged and organized for use substantially as shown.

It is obvious to those skilled in the art that the lamp embodying my improvements may be so organized as to be adapted for other positions than that of suspension.

From the forgoing description of the parts it will now be observed that the current from the dynamo-electric machine or other source of electricity enters the lamp through the binding-post L, which is insulated from the frame, but in metallic connection through the metallic strip 2 with the casing inclosing the operative mechanism. The wire of the helix being connected with the casing at *m* by one terminal, and with the cross-bar at *n*, a closed circuit is established between the binding-posts L and 3, as indicated. The helix, composed of a considerable length of very fine wire, when the lamp is in circuit, offers a path of high resistance between the poles of the source of electricity. On the passage of the current through the lamp the attraction of the coil for its core, by the force of the magnetism created, tends to draw the same downward within the cavity of the solenoid, thereby causing the clamping-plate to release its grip upon the rod of the carbon-holder, and thus allow the rod with the carbon to descend. The tension of the spiral spring (as already stated, acts in opposition to this attraction) raises or elevates the outer end of this clamping-plate, thereby causing a biting action or grip upon the carbon-carrier rod, and sustains the same, so that when no current is passing the points of the carbons are always separated. It will now be noted that the carbon-carrier is moved in one direction or the other—to wit., up or down—in a vertically-arranged lamp, in whichever direction the force predominates, except as limited in an upward direction by the stop means, and in a downward direction by the points of the carbons coming in contact, and when this latter takes place, a path for the current of low resistance is opened through the carbons and frame to the connections of the circuit, and as a greatly larger proportion of the current will then pass through this path, the attractive power or force of the coil is greatly weakened, and the retractile or coil spring is permitted or free to act in elevating the carbon-carrier to produce the voltaic arc. The electrical resistance of the coil of the solenoid is predetermined, so that when the arc shall be formed and maintained in normal proportions, a comparatively small percentage of the total current will pass through the helix, and this amount will continually vary in a certain proportion corresponding with variations in the length or dimensions of the arc. As the resistance between the carbon-points increases by reason of the wasting of the carbons the attractive force of the helix is increased, which causes the core and its connected clamping means to descend until arrested by the contact with the stop device. The clamping-plate then releases its grip upon the carbon-carrier and allows the carrier to feed automatically its carbon-point toward the opposite carbon-point, and when the contact or proper meeting is made to establish the arc, the tension-spring attached near the outer end of the clamping-plate will cause the same to be raised and again grip the carbon-carrier for the next downward movement.

In practice, after the lamp has been in operation for a few moments the antagonistic forces of the solenoid and the retractile or coiled spring will balance each other, thereby allowing the smallest degree of preponderance of either one or the other to effect or check the automatic feed of the carbon. This point of balance is susceptible of variation or adjustment by increasing or diminishing the tension of the spring, thus determining at will the length of the arc.

The means herein set forth and shown are very simple, and effective for forming and regulating the arc.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an electric lamp, the combination, with a carbon-carrier, of a solenoid in a shunt around the carbon, a core surrounding and moving independently of the carbon-carrier and within the cavity of the solenoid, a suspended clamping-bar with a retractile spring and a stop device, substantially as described.

2. In an electric lamp, the combination of a clamping-bar with an opening for the passage of the carbon-carrier, suspended at or near one end by a tension-spring capable of adjustment, and having suspended therefrom a core of soft iron surrounding the carbon-carrier, and a stop device for limiting the movement of the clamping-bar, substantially as described.

3. In an electric lamp, the combination of a clamping-bar with an opening for the passage of the carbon-carrier, an adjustable actuating-spring connected to the clamping-bar, and an adjustable stop device, substantially as described.

4. In an electric lamp, the combination, with a carbon-carrier and mechanism for feeding the same, of a washer composed of felt or similar material, as a wiper, and serving also the office of a guide for keeping the rod of the carbon-carrier clean and smooth, for the purpose stated.

5. In an organized electric lamp placed in electric connection, the combination of a solenoid included in a shunt, a carbon-carrier, to which one of the carbons is attached, a core surrounding the carbon-carrier and independent thereof, a connected clamping-bar for gripping the carbon-carrier, with a tension-spring and an adjustable stop device whereby the attractive influence of the solenoid will draw the core in one direction, thus causing the clamping-bar to release its grip upon the carbon-carrier, and allowing the same to move toward the opposite carbon, and a retractile spring connected with the clamping-bar, moving the carbon-carrier in a reverse direction coincidently with variations of resistance in the arc, substantially as described.

6. The combination, in an electric-arc lamp, of a carbon-carrier, a clamp acting on the same, a helix in a shunt around the carbons, and a core surrounding the carbon-carrier, and a spring acting in opposition to the attractive influence of the helix, and a stop for controlling the action of the clamp, substantially as specified.

7. The combination, with the carbon-holder, in an electric lamp, of a clamping bar and spring acting upon the carbon-holder, a stop to release the clamp, and a helix in a shunt around the carbons, and a core whereby the magnetism acting in opposition to the spring causes the carbon to be fed, substantially as specified.

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

CLINTON M. BALL.

Witnesses:

C. E. DAVENPORT,

R. M. TOWNSEND, Jr.