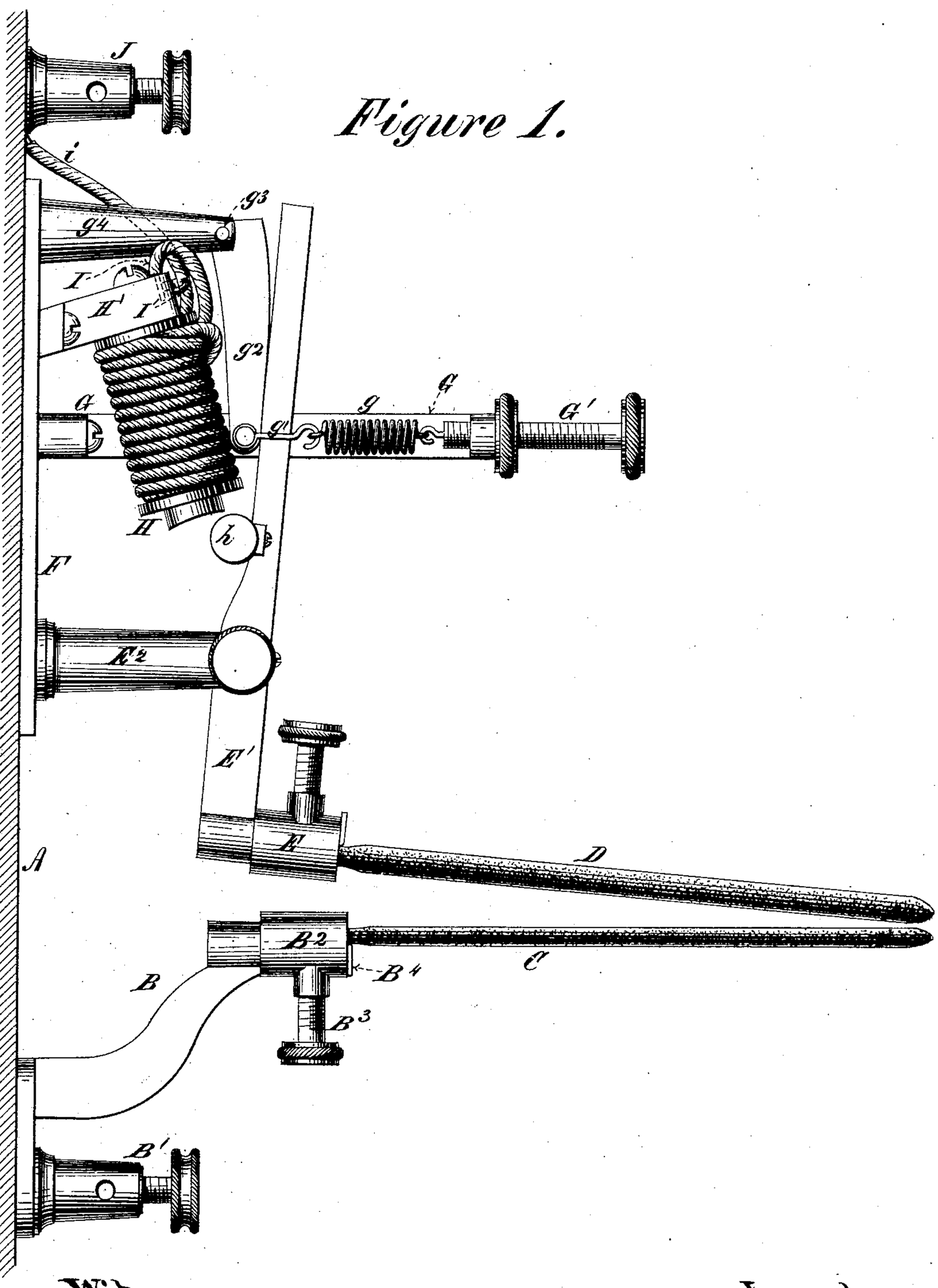
3 Sheets—Sheet 1.

E. WESTON.

Electric-Lamp.

No. 225,312. Patented Mar. 9, 1880.

Figure 1.



Witnesses:
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Edw'd Payson

Inventor:
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3 Sheets—Sheet 2.

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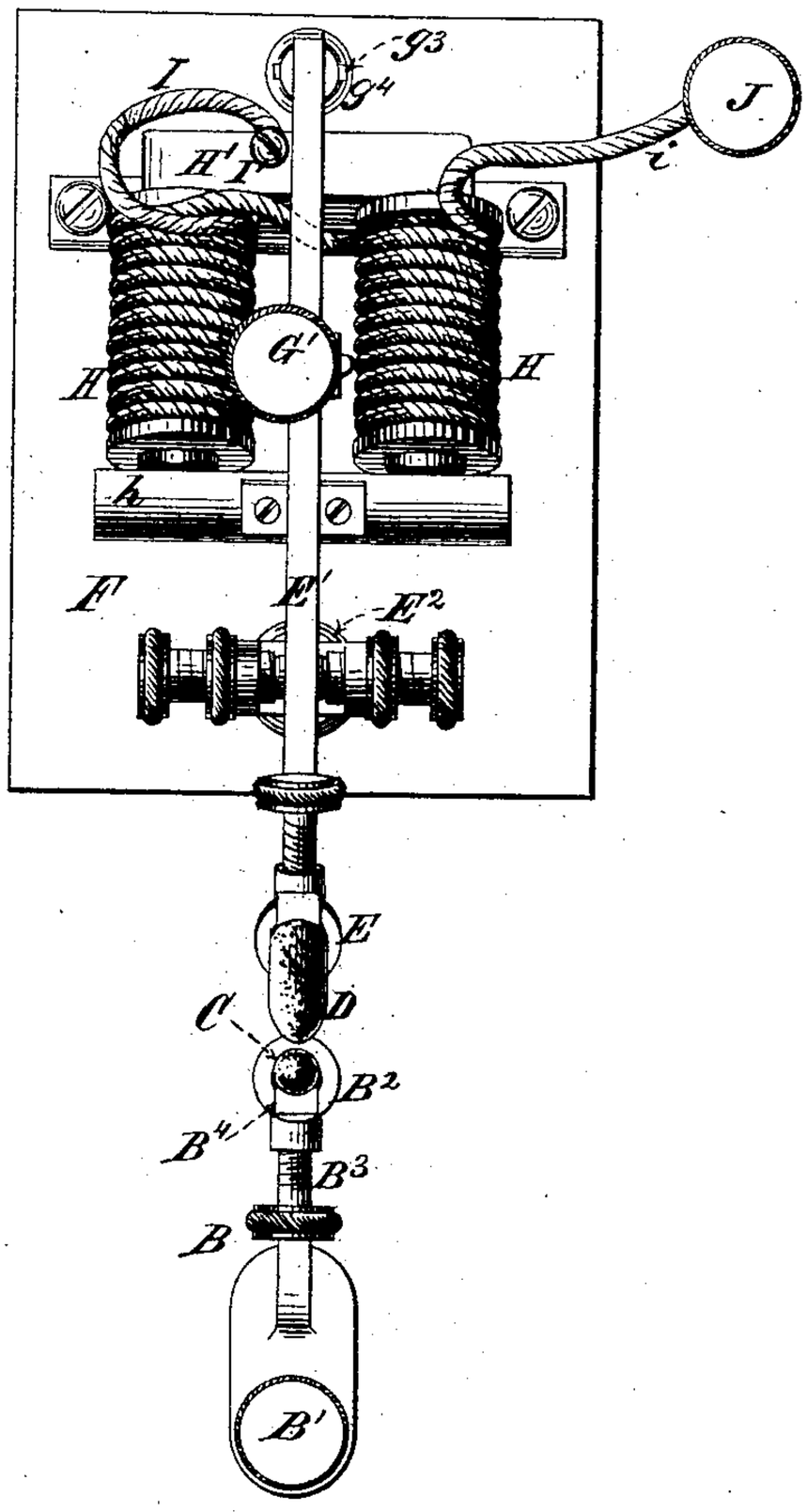

Figure 2.

Witnesses:

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3 Sheets—Sheet 3.

E. WESTON.

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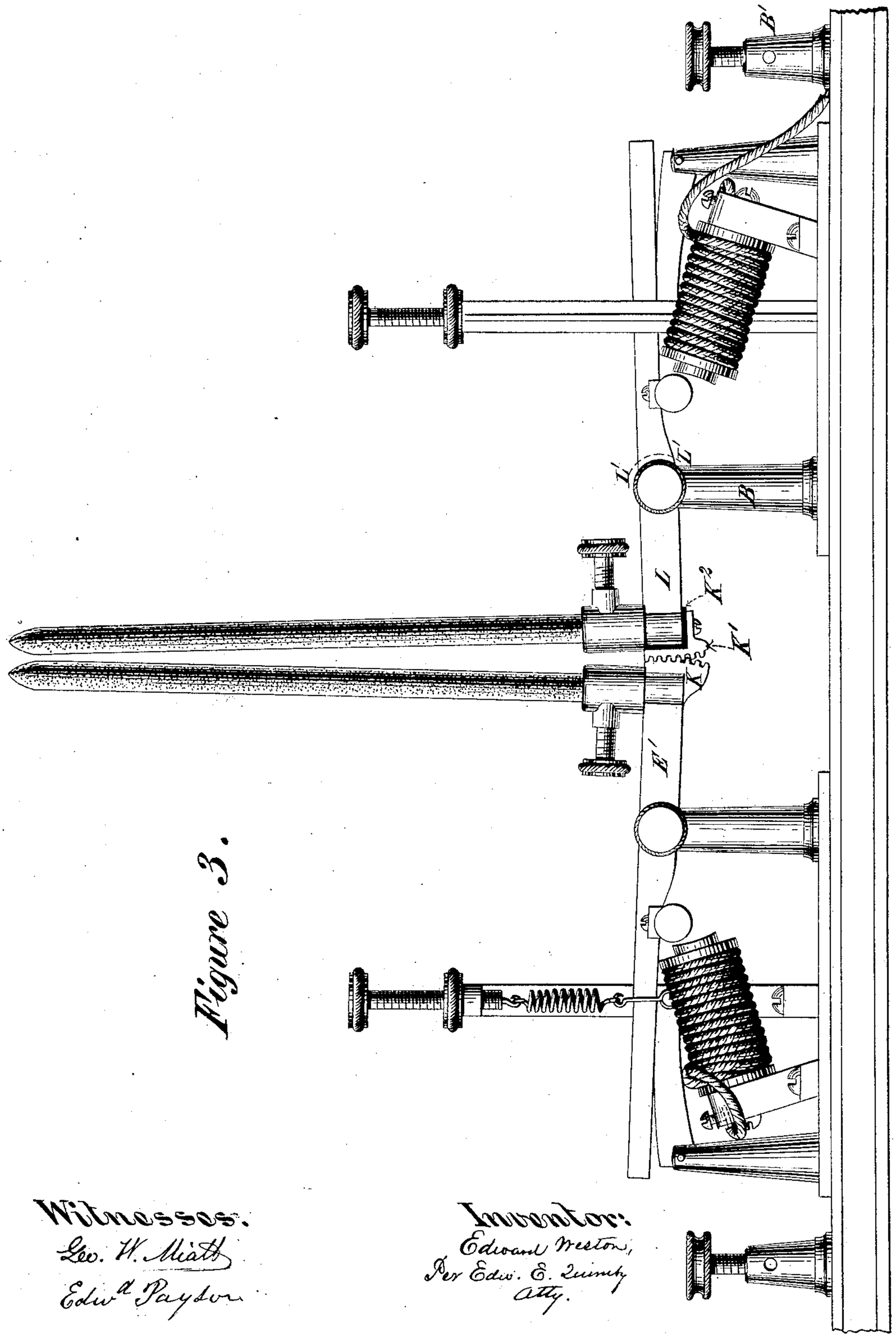

Figure 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, NEW JERSEY.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 225,312, dated March 9, 1880.

Application filed September 28, 1878.

To all whom it may concern:

Be it known that I, EDWARD WESTON, of Newark, New Jersey, (Case No. 1,) have invented certain Improvements in Electric Lamps, of which the following is a specification.

My improvements relate to devices for regulating the distance between the points of electrodes of cylindrical or prismoidal form used in the production of electric light; and my invention consists, first, in mounting the electrodes in tilting holders, preferably geared together, whereby the electrodes occupy nearly parallel positions, and are made capable of oscillation in the same plane; secondly, in forcing the points of the electrodes together by means of a spring, and in separating them by means of an electro magnet whose attraction, when highly polarized, by reason of the diminished resistance when the electrodes are near together, is sufficient to overcome the force of the spring; thirdly, in combining with the spring a curved lever or cam, by means of which the action of the spring upon the tilting electrode-holder is varied to correspond as nearly as possible to the variable attractive force of the magnet upon the armature in the different positions which the armature occupies as the electrodes diminish in length; fourthly, in so mounting my electrodes that they project laterally from a vertical plane.

The accompanying drawings illustrate an electric lamp embodying my present invention, and also a lamp in which one electrode only is mounted in a tilting holder. The latter feature I am about to make the subject of a separate application for a patent, which I shall designate "Case No. 3."

Figure 1 is a side elevation of an electric lamp provided with one stationary and one tilting electrode, projecting laterally from a bed-plate which is supposed to be affixed to a vertical wall. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation of a lamp mounted upon a horizontal bed-plate, and having both electrodes supported in tilting holders.

In Figs. 1 and 2 the heavy black line A represents the surface of a vertically-placed board, or of a wall to which the various parts of the lamp are bolted. The stationary electrode-holder B, provided with a binding-post, B′, is bolted to the lower part of the board A, and terminates at its outer end in a sleeve, B^2, for receiving the end of the stationary electrode C, which is clamped in position by the pressure of the set-screw B^3 upon the gib B^4, introduced into the sleeve between the electrode and the end of the set-screw. The other electrode, D, is supported at its inner end in a similar sleeve, E, affixed to the end of the lever E′, pivoted upon a standard, E^2, projecting laterally from a metallic plate, F, which is bolted to the vertically-placed board A. Immediately above the standard E^2 is a longer standard, G, also bolted to the plate F, provided at its outer extremity with an adjusting-screw, G′, the inner end of which is linked to one end of a spiral spring, *g*. The opposite end of this spring is connected by means of the link *g′* to the end of the curved arm or lifter g^2, the upper end of which is affixed by means of the pivot g^3 to the outer extremity of the laterally-projecting standard g^4. The upper and longer end of the lever E′ rides upon the curved face of the lifter g^2, and when subject to the preponderating action of the spiral spring *g* the upper and longer end of the lever is rocked outward, thus bringing the point of the movable electrode down upon the point of the stationary electrode.

The separation of the points of the electrodes is effected by the rocking of the lever in a contrary direction when the force of the spring is overcome by the attraction exerted by the electro-magnet H upon the armature *h*, which is transversely affixed to the upper end of the lever E′.

The electro-magnet H is supported in an inclined position, and consists of two parallel cores suitably surrounded by helices, and affixed at their upper ends to the iron bridge H′, which is bolted to the plate F.

It will be seen that a plane bisecting the axes of the electro-helices and cores also bisects the axis of the pivot upon which the lever E′ turns, and the armature *h*, instead of moving directly toward the cores when the force of the magnet preponderates over that of the spring, moves in an arc of a circle across the magnetic field in front of the cores, from the outer edges of the cores toward the plane bisecting the center of the cores.

This mode of effecting the movement of an armature by the attractive force of an electro-magnet is not new, nor is it new to oppose to the attractive force of an electro-magnet so exercised upon a swinging armature the force of a spring acting directly upon the object to which the swinging armature is attached; but in my invention the spring acts indirectly upon the object to which the armature is attached through the curved lever or lifter g^2; and it will be seen that the end of the lifter g^2, as the armature approaches the center of the core, moves farther than that portion of the lever immediately opposite the end of the spring, so that the spring is not only excessively elongated, but is given an increased leverage upon the armature-carrier by the changing of the point of contact between the lifter and the carrier or lever E′. This part of my invention consists in making the rate of increment in the force exerted by the spring correspond to the rate of increment in the force exerted by the magnet as the armature approaches the center of the magnetic field. In other words, I increase the resistance which the magnet has to overcome exactly in proportion as the magnetic attraction is increased by the nearing of the armature to the center of the magnetic field. The necessity for this balance of forces, which results in securing uniformity of action upon the armature irrespective of its position, is created by the shortening of the carbons as they are consumed. For example, in starting the lamp electrodes thirty inches long may be inserted in the holders, and the armature will then occupy the position in which it is nearest to the center of the magnetic field, where the attractive force upon it of the magnet will be highest, and where, therefore, the greatest resistance of the spring must be exerted. As the electrodes are consumed and shortened in length the armature stands farther from the center of the magnetic field, where it is less energetically attracted by the magnet, and must therefore be subjected to a less degree of force in the contrary direction to enable it to yield to the weaker force of the magnet. This object is effectually accomplished by means of the curved lifter g^2, to which the spiral spring is attached, and which acts upon the armature with a progressively shorter leverage as the electrodes diminish in length.

One end, I, of the coil surrounding the cores upon the electro-magnets is electrically connected with the iron bridge H′ by means of the binding-screw I′, and hence has a continuous metallic connection with the lever E′. The other end, *i*, of the coil is connected with the binding-post J, which is secured to the vertical board A.

The line-wires from a battery or other source of electricity are respectively connected with the two binding-posts B′ and J, and the circuit then embraces the coils surrounding the cores of the electro-magnet, the metallic plate F, and the metallic parts which are secured thereto, and, finally, the lever E′, the electrodes D and C, and the stationary electrode-holder B, with its binding-post B′.

The modification of my invention shown in Fig. 3 consists in providing both electrodes with tilting holders, and exhibits a duplication of the electro-magnet, the spring and the compensating mechanism, and the rocking-lever E′, which have been already described.

In the apparatus shown in Fig. 3 the various parts are represented as affixed to a horizontal bed-plate and the electrodes as extending upward in a nearly vertical direction.

The duplication of the magnet and spring will not ordinarily be necessary, as a single magnet, as shown in Figs. 1 and 2, will have sufficient force to effect the tilting of both electrodes when they are so geared or connected as to move together. A very convenient mode of so gearing them is shown in Fig. 3, where a segment of a gear, K, is affixed to the end of the lever E^2, and meshes into a similar segment of a gear, K′, supported upon the outer end of the swinging arm L, but separated therefrom by the insulating material K^2.

When but one magnet is used for operating the two tilting electrodes the arm L is cut off, as shown by the dotted lines L′ L′ in Fig. 3, and is pivoted upon the end of the standard B, which is electrically connected with the binding-post B′, the duplicate magnet and duplicate compensating mechanism being in this case omitted.

It is obvious that there are various modes in which the two tilting or rocking electrode-holders may be so geared or connected as to move together; and I do not, therefore, confine myself to the specific mode shown, this part of my invention being present when two tilting or rocking holders are so connected and arranged that the electrodes are supported in the same plane, and are capable of being so tilted as to move their outer ends to and from each other by a force applied to one only of the rocking or tilting holders.

I have found that the apparatus shown in Figs. 1 and 2, where one of the electrodes is stationary and the other movable, works well in practice; but it may be desirable in some cases to carry forward the invention by mounting both of the electrodes in rocking or tilting holders, and the structure shown in Fig. 3 illustrates two effectual methods of accomplishing this purpose, to wit, either by gearing the two rocking electrodes together and using but one magnet and spring, or by duplicating the magnets and springs, in which latter case it will, of course, be understood that the electrode-holders may or may not be geared together.

My apparatus may be operated with alternating currents, in which case electrodes of the same size are employed, or with a current of constant polarity, in which case there will be the usual difference between the sizes of the negative electrode and the positive electrode.

In Fig. 1 the upper electrode, D, is represented as twice the size of the lower electrode, C, and is intended for connection with the positive pole of the battery.

The design in making the upper electrode the positive electrode is to improve the brilliancy of the light thrown downward by preventing the larger electrode from acting as a screen for any portion of the arc.

It will be obvious that by means of my laterally-projecting electrodes, and by my placing the larger electrode over the smaller electrode, I am enabled to avoid the presence of any object which would throw a shadow upon the space beneath the light; and my invention therefore affords an especially effectual means of illuminating large halls or rooms from their ceilings.

I claim as my invention in apparatus for regulating the distance between the points of prismoidal or cylindrically-formed electrodes employed in the production of electric light—

1. Electrodes of prismoidal or cylindrical form placed in nearly parallel positions in the same plane, and mounted in tilting holders, whereby the electrodes may be progressively tilted as they are consumed and their outer ends maintained in the required proximity.

2. Electrodes arranged in nearly parallel positions in the same plane, and mounted in tilting holders, in combination with an electro magnet or magnets and a spiral spring or springs, so arranged with reference to the electrode-holders that the outer ends of the electrodes are separated when the attractive force of the electro magnet or magnets preponderates over the force of the spring or springs, and the outer ends of the electrodes are brought together when the force of the spring or springs preponderates over the attractive force of the magnet or magnets, substantially as described.

3. Two tilting or rocking electrode-holders adapted to move in the same plane, and geared or connected together, in combination with an electro-magnet and a spiral spring, whereby the forces of such electro-magnet and spring act upon one only of the tilting or rocking holders, and are transmitted to the other rocking or tilting holder by means of the gearing or other connection of the tilting electrode-holders with each other, substantially as described.

4. An electro-magnet and an armature adapted to swing across the magnetic field in front of the core of the magnet, in combination with a spiral spring and a curved arm or lifter, for the purpose of transmitting the force of the spring to the armature-carrier with a variable leverage, substantially as shown and described.

5. Electrodes arranged in nearly parallel positions in the same plane, and mounted, one or both of them, in a tilting holder or holders, and projecting laterally from a vertically-placed board or wall, substantially as and for the purpose set forth.

6. In an electric lamp provided with laterally-projecting electrodes arranged in the same plane, one above the other, the larger electrode D, arranged above the smaller electrode C, substantially as and for the purpose set forth.

EDWARD WESTON.

Witnesses:
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EDWD. PAYSON.