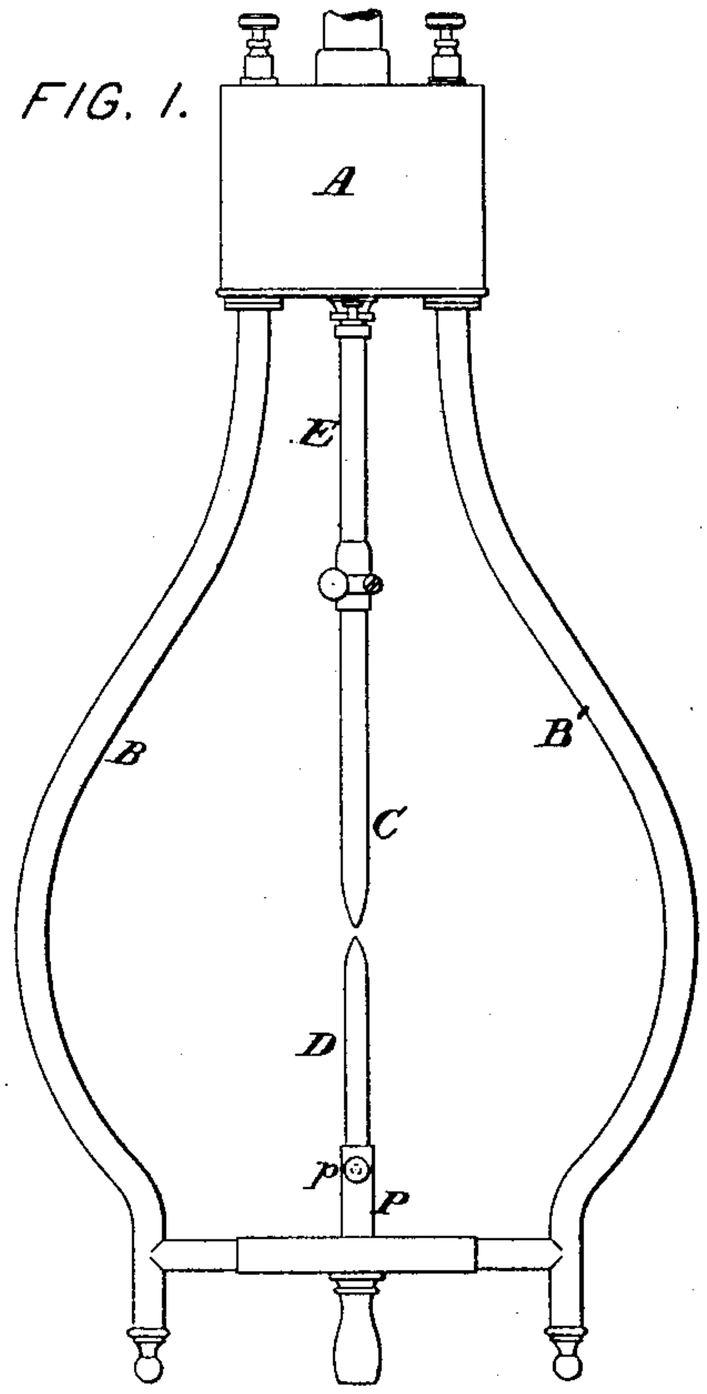
J. B. FULLER, Dec'd.

S. L. FULLER administratrix.

ELECTRIC LAMP.

No. 253,033. Patented Jan. 31, 1882.

FIG. 1.



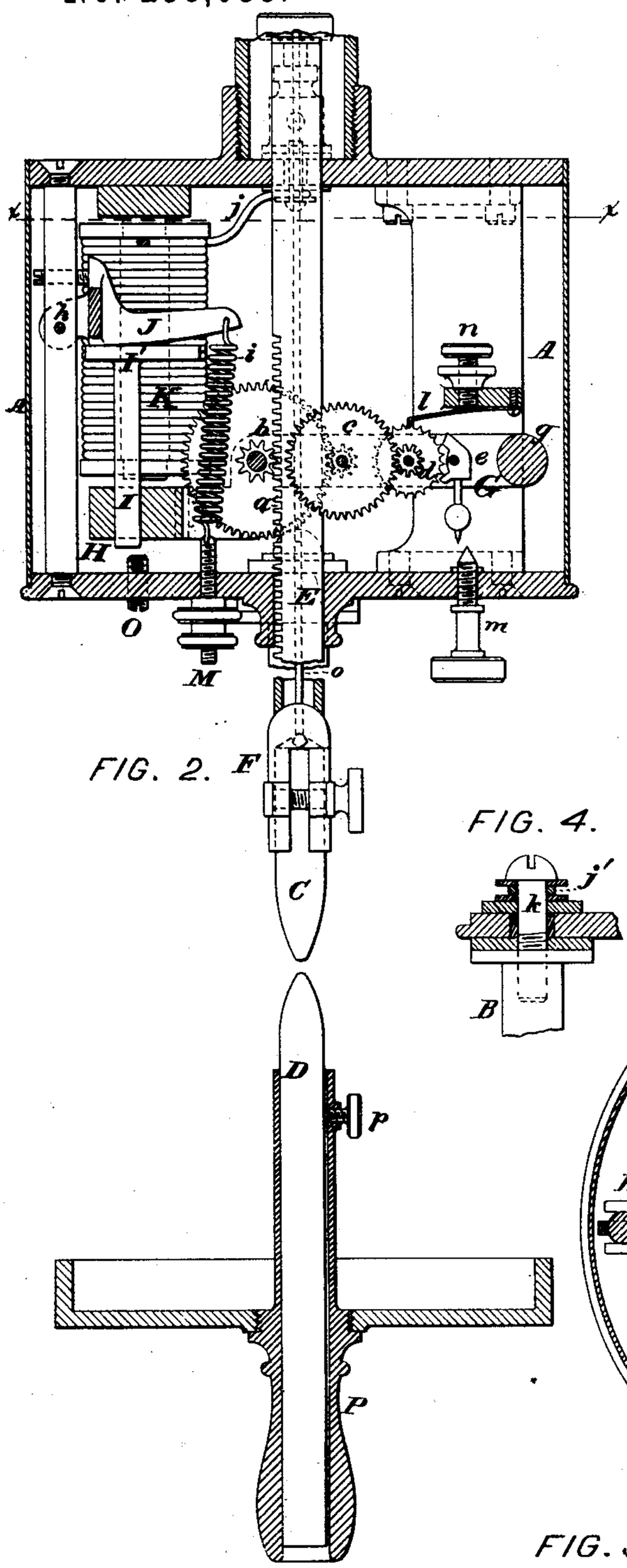


FIG. 2.

FIG. 4.

FIG. 3.

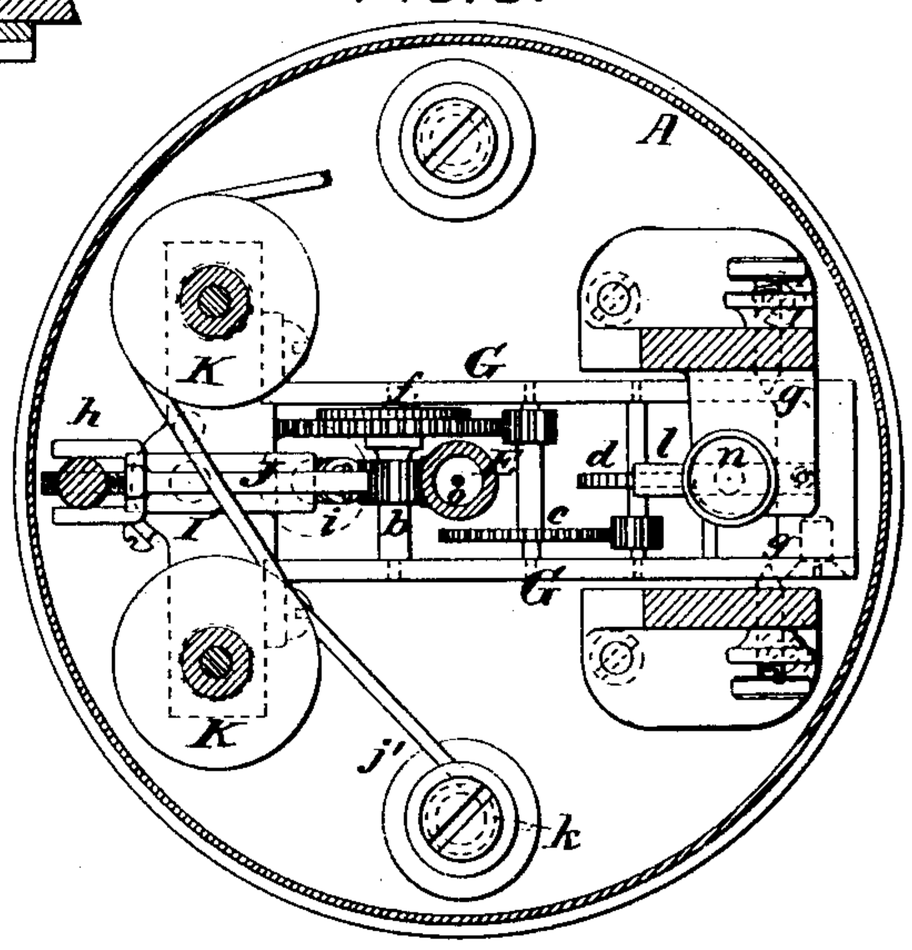
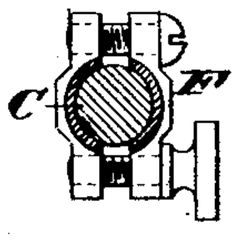


FIG. 5.



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By

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Jim Billings Fuller, Deceased,

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UNITED STATES PATENT OFFICE.

SARAH L. FULLER, OF NEW YORK, N. Y., ADMINISTRATRIX OF JIM BILLINGS FULLER, DECEASED, ASSIGNOR TO THE FULLER ELECTRICAL COMPANY, OF SAME PLACE.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 253,033, dated January 31, 1882.

Application filed December 18, 1879.

To all whom it may concern:

Be it known that JIM BILLINGS FULLER, deceased, late of the city, county, and State of New York, invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

This invention relates in the main to certain mechanism whereby the carbons may be maintained at the proper distance apart to produce the best illuminating effect as they waste away under the influence of the current of electricity.

The difficulty here sought to be obviated is one that exists in all lamps of this character where two carbons connected with the poles of an electric circuit are brought into proximity to produce an electric light; and many devices have been employed by electricians to feed the carbons toward each other as they are consumed, and thus maintain a steady light. Among such devices may be mentioned clockwork or gears arranged to feed one or both of the carbons forward as fast as they are burned away. These are, however, defective, in that the consumption of the carbon is not always regular, and the light is liable to fluctuate or go out entirely. Electro-magnets have also been employed to regulate the relative positions of the carbons, being controlled by the variations in the electric current; but these have not been entirely successful in preventing the fluctuation of the light, which is so objectionable. The mechanism herein shown employs an electro-magnet in connection with a train of gears controlled by an escapement, and with a compensating-lever device, all of which will be more fully hereinafter described.

In the drawings which serve to illustrate the invention, Figure 1 is an elevation on a small scale, showing the lamp as a whole. Fig. 2 is a vertical mid-section, arranged to show the operative mechanism. Fig. 3 is a horizontal section taken in the plane of the line *x x* in Fig. 2. Figs. 4 and 5 are detail views in section.

Let A represent a casing which contains the feeding and regulating mechanism, B B′ the pendent frame which supports the lower carbon, and C D the upper and lower carbons. All of these parts are or may be arranged in the usual way.

E is a tubular carbon-carrier, arranged to play in bearings in the head of the casing A. This tube is provided at its lower end with a clamp, F, to gripe and hold the carbon C, which clamp is attached to the tube E by means of a rod, *o*, passing down through its central cavity, and connected with the clamp so as to make a universal and flexible joint. Fig. 5 shows this clamp and the carbon C in transverse section. The carrier E is provided with a toothed rack, *a*, which meshes with a pinion, *b*, forming the terminal of a train of gears, designated generally by *c*. A toothed wheel, *d*, at the other terminal of the train *c* is arranged to engage an escapement-lever, *e*. By following out the train *c* it will be seen that a slow longitudinal downward movement of the tube E will produce a rapid rotation of the wheel *d*, which rotation is retarded by the escapement-lever *e*. To avoid the backward rotation of the entire train when the tube E is pushed upward, the large wheel on the shaft with the pinion *b* is arranged to turn loosely, and is provided with a pawl adapted to engage a ratchet, *f*, fixed on the shaft. This is an ordinary pawl-and-ratchet device, and will require no further description.

So far as described the operation would be as follows: The tube E being arranged to stand vertically, or nearly so, its weight carries it down slowly, thus producing rapid rotation of the wheel *d*, as before stated. To regulate or check this downward movement the following-described means are employed:

The gears *b c d* and the lever *e* are mounted in a metal frame or lever, G, hung on pivots at *g*. The free end of this frame bears an armature, H, from which projects an upright, I, supporting a table, I′, arranged to take under a curved compensating-lever, J, hung at *h*, and provided with a spring, *i*, as shown in Fig. 2. This spring, with the compensating-lever, serves to keep the armature H and its connecting train of wheels in equipoise as against the varying strength of attraction from the magnet while the lamp is in operation, as will be hereinafter more fully described.

K K are ordinary helices, arranged to act upon the armature H in the usual way to form an electro-magnet.

The wires from the generator (which may be a magneto-electric machine) are attached at the binding-posts L L′. The former of these is

insulated from the casing A, and its lower end is secured to one end, *j*, of the conducting-wire of the helices, the other end, *j'*, being electrically connected with the carbon D through an insulated screw, *k*, (shown in detail in Fig. 4,) and the bar B of the pendent frame. The binding-post L' contacts with the casing A, and through it and the carrier E electrical communication is established with the carbon C. Now, when the generator is set in motion and the carbons are brought together the circuit is closed, the cores of the helices K K become magnetic and attract the armature H, thus lifting the frame G and the gears *b c d*. This movement of the frame first brings the wheel *d* into engagement with a fixed catch or detent, *l*, whereby the rotation of the gears is checked, and in its continued upward movement the frame bears the carbon-carrier E with it, thus forming an electric arc at the carbon points, which offers sufficient obstruction or resistance to the current to produce the required light. The extent of this separation of the carbons is limited by a screw or other adjustable stop, O, which is so placed as to stop the downward motion of the armature H at the point desired. The movement of the train being stopped, the downward movement of the carbon C is also checked, and this will continue as long as the armature is attracted to the magnets; but as combustion goes on the carbon points become separated far enough to weaken the current, when the spring *i* overcomes the reduced attraction of the electro-magnet and draws down the compensating-lever, which forces down the armature with its train of gears until the detent *l* is disengaged and the train permitted to move and the carbon C to descend until its proximity to the other carbon again strengthens the current sufficiently to attract the armature H with sufficient force to overcome the spring *i*, when the detent *l* again stops the feed. Thus the carbon C is permitted to descend only as rapidly as is required to produce the best illuminating effect and a steady light.

The compensating-lever J is curved on its under side and rocks upon the table I'. This curve is so arranged that its point of contact with the table varies with the upward and downward movement of the table by the armature. Before the lamp is applied to use it is adjusted to work under a definite current of electricity of greater or less strength, according to the amount of illumination required, by passing such current through the helices of the electro-magnet, and by varying the curve of the lever, the relative height of the table above the armature, and the tension of the spring. In making this adjustment it is necessary to take into account the distance of the armature from the electro-magnet, the strength of the spring, the relative lengths of the two arms of the compensating-lever, depending on the point of contact between the lever and the table and the law of magetic attraction, and arrange the parts so that the magnetic force is fully compensated for. As this attraction varies in inverse proportion to the square of the distance of the object attracted, these means of compensation, with proper care in first adjustment, will so balance the armature H that, with the given current, it will remain at rest at any point where it may be placed between the screw O and the poles of the magnet. An increase of the electric current will at once increase the attraction of the magnet, and the armature will move upward. On the other hand, a decrease in the current will decrease the attracting power of the magnet and will cause the armature to correspondingly fall, each movement of the armature toward or from the helices changing the power of the compensating-lever correspondingly by changing its point of contact, and thus increasing or decreasing the effect of the spring.

In adjusting the lamp for use the tension of the spring *i* is regulated by the nuts and screw M. A screw, *m*, is also arranged to engage the pendant from the escapement-lever *e* and act as a stop to the train of gears when the lamp is not in use.

The lower-carbon holder consists of a tube, P, open at the lower end, into which the carbon D is introduced, and where it is adjusted and held by means of a binding-screw, *p*. This holder may be attached to the frame B by means of a screw-thread or other suitable device, as shown in Fig. 2. This construction admits of the use of a long carbon pencil, which may be moved upward from time to time and held in position by the screw *p* until the whole is consumed.

To enable the detent *l* to operate properly upon the wheel *d*, so as to stop its rotation and still permit the armature to rise higher after these elements have engaged, the teeth of the wheel *d* may be made quite long, and the detent may be properly adjusted to the position of the wheel *d* by means of a set-screw, *n*, or other suitable means.

What I claim as the invention of said JIM BILLINGS FULLER is—

1. In an electric lamp, the combination of the electro-magnet arranged in the main circuit, the armature H, the upright and table I I', the curved compensating-lever J, the adjustable tension-spring *i*, and the adjusting-screw O, all arranged substantially as shown, for the purpose of regulating the movement of the armature.

2. The combination of the electro-magnet, arranged in the main circuit and provided with the compensating-lever and spring, as shown, with the swinging lever or frame bearing the train, the toothed carrier E, and the fixed detent *l*, all arranged to operate substantially as and for the purposes set forth.

SARAH L. FULLER,
Administratrix of the estate, &c., of Jim Billings Fuller, deceased.

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