(No Model.)

V. W. BLANCHARD.

ELECTRIC LAMP.

No. 254,912. Patented Mar. 14, 1882.

Fig. 2.

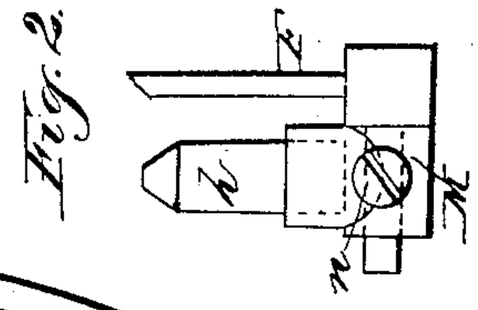
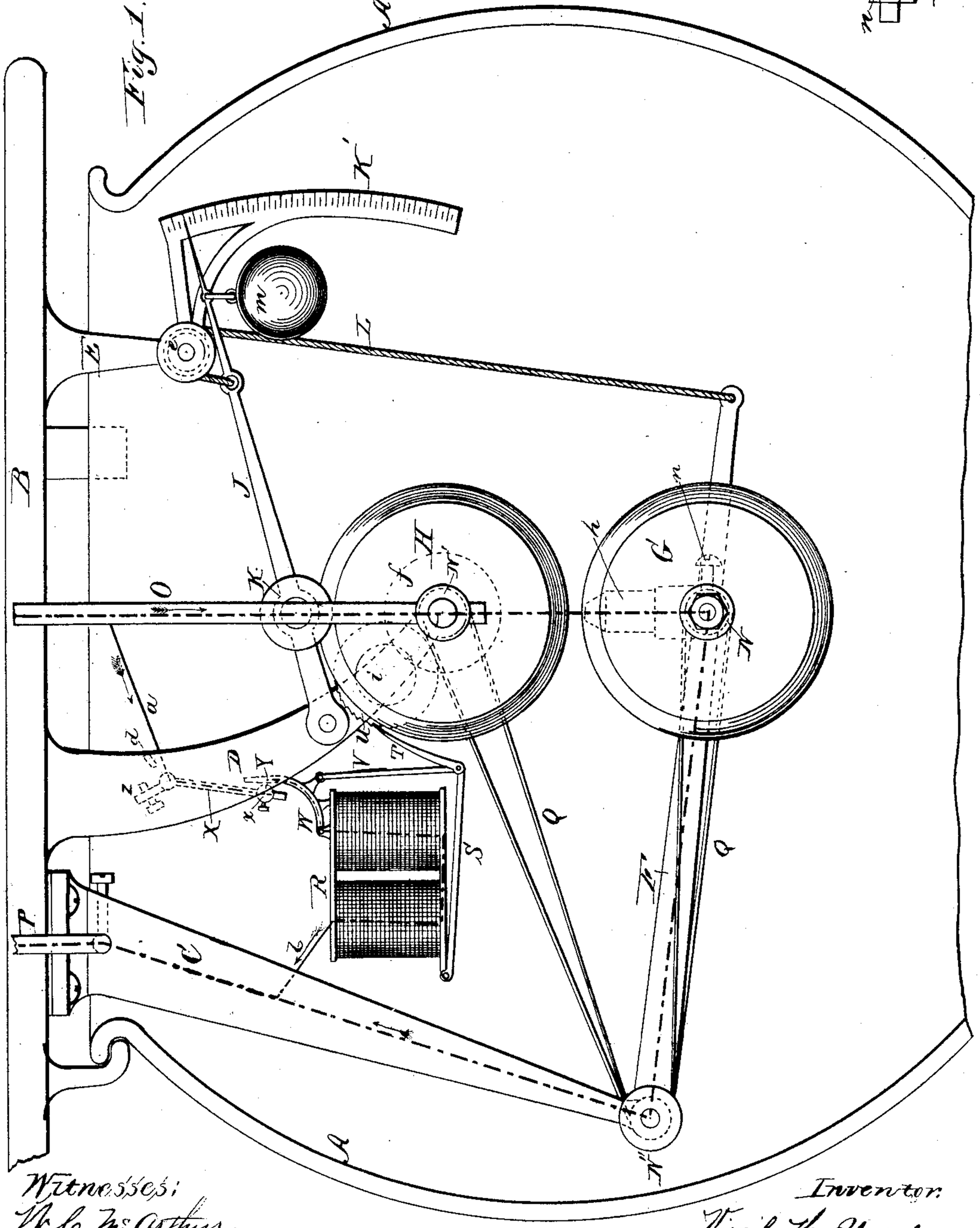


Fig. 1.



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UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 254,912, dated March 14, 1882.

Application filed February 10, 1881. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Lamps; and that I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

The object of this invention is to provide an electric lamp for various purposes in the useful arts, combined with a meter by means of which the volume of the current of electrical energy used in it for illuminating purposes may be accurately measured; and to this end it consists in such novel combination and arrangement of parts as will be hereinafter described, and specifically pointed out in the claims.

To enable others skilled in the art to which my invention relates to make and use the same, I will now proceed to describe its construction and operation, referring by letter to the accompanying drawings, in which—

Figure 1 is a side elevation of my lamp, and Fig. 2 a detail view of the lower pencil or point.

A represents a glass globe, suspended by a rim engaging with projections from the cap or cover B; and C, D, and E represent arms or studs extending downward from the cap B into the glass globe, to sustain the various parts of the mechanism required in the construction and operation of the working parts of the lamp.

F represents an arm or lever, hinged or pivoted at one end to the lower extremity of the stud C, and near the other end of this lever is pivoted a circular disk of carbon, G.

H represents another circular disk of carbon, pivoted at its center to the lower extremity of the stud D. It will be observed that by raising or lowering the free extremity of the arm F the periphery of the disk G may be made to approximate the periphery of the disk H, and that the center of one is placed in a perpendicular line directly over the center of the other.

J represents an arm hinged or pivoted to the stud D, and having the grooved pulley K pivoted to it in apposition with and engaging the periphery of the disk H.

Attached to the stud E is a scale, K′, arranged on the arc of a circle having the pivot of the arm J for its center, and the said arm is provided with a point upon its free end, which traverses this scale as the arm is raised or lowered.

L is a cord or chain attached to the arm J a short distance from its point, and passing over a grooved pulley, *e*, pivoted to the lower end of the stud E and attached to the free end of the hinged or pivoted arm F; and *m* represents a weight hung to or near the pointed end of the arm J, said weight being a little more than sufficient to overcome the combined weight of the arm F and its disk G. It now becomes evident that the action of the weight *m* will bring the periphery of the grooved pulley K into apposition with the circumference of the circular disk H, holding it securely in that relation, and at the same time, by means of the cord L, will securely hold the circumference of the disk G a certain distance from that of the disk H. It will also be evident that if a gradual and uniform reduction of the circumference of the disks G and H should take place, if the distance from the point of attachment of the cord L to the arm J to the point of pivoting the grooved pulley K be twice the distance from this latter pivot to the point of the arm J, then the weight *m*, acting through its connections, would preserve a perfectly uniform distance between the edges of the disks G and H in a vertical line. The disks decrease in size at a perfectly uniform rate, and while the disintegration of the disk H will allow the pulley K to fall a certain distance, it is evident that the other disk, G, must be raised twice that distance to preserve a uniform distance between them. It also becomes evident that by a continuous contact of the periphery of the grooved pulley with that of the disk during the continuous revolution of the latter any wear, loss, or disintegration in the circumference of the said disk could be readily and conveniently detected on the scale K′ by the pointed extremity of the arm J.

N N′ N″ represent three grooved pulleys, the first being attached to the center of the disk G, the second to the center of the disk H, and the third to the center of the joint, by means of which the arm F is hinged to the stud C. A film of asbestus paper, glass, hard rubber, or other suitable material that will not conduct the electrical current should be interposed between the grooved pulleys N N′ N″ and their point of attachment, as described. Also, the same non-conducting material should be interposed between the disk H and its central pivotal bearing and the stud D, and also between the base or point of attachment of the stud C with the cap or cover B, so that the electrical current or energy, passing down the conducting-wire O (in the direction of the arrow) to the center of the disk H, would be compelled to pass in a vertical line to the center of the disk G, and thence through the arm F into the stud C, and thence into the conductor P, by means of which the electrical circuit might be established through the generating apparatus. The proper methods of insulating the electric circuit are so well known as to require no special description in this case beyond the general outline of the route traversed by the current.

Q indicates a band of fibrous texture or metal passing around the grooved circumference of the pulleys N N′ N″, by means of which a rotary motion may be communicated from the pulley attached to the disk H to that attached to the disk G, so that a rotary motion may be readily communicated from one disk to the other.

R represents two coils of wire surrounding cores of soft iron, forming an ordinary electro-magnet, and S an armature in close approximation to one pole of said magnet, hinged by one extremity, and having attached to its other extremity by a hinged joint a pawl, T, that works by its own weight when actuated by the armature and engages with a ratchet-wheel, U, firmly connected with the small toothed pinion *i*, both revolving on a common axis supported by the stud D.

f is a toothed pinion electrically insulated from but firmly connected with the disk H, and revolving upon the same pivot. This pinion is of such size as to gear with and receive motion from the pinion *i*, so that motion communicated by the pawl T to the ratchet-wheel U will, through the medium of the two pinions *i* and *f*, be communicated to the disk H.

V represents an arm, attached at its lower end to the armature S and at its upper end to a bell-crank lever, W, pivoted to the upper surface of one of the coils R, forming the electro-magnet. The arm is suitably insulated from contact with the bell-crank lever by the interposition of proper non-conducting material at the proper points.

X indicates a pendulum-lever provided with a movable sliding ball or weight, *x*, secured at any desired point on the lever by means of a set-screw. The upper end of the pendulum is pivoted to the stud D and its pivotal point properly insulated in the usual manner, the ball of the pendulum, when the latter is in a state of rest, always being in contact with the surface of the arm Y, that projects upward from the bell-crank lever W, so that said ball will not only serve to establish an electrical circuit between the rod of the pendulum and the bell-crank lever when the former is in a state of rest, or at the lowest point in the arc of its motion, but will also serve as a point of contact, whereby motion communicated to the bell-crank lever by the armature S through the medium of the arm V may be communicated to the pendulum, giving it a swinging motion in the direction of the arrow, as seen in the drawings.

a and *b* represent two small copper wires, one connecting the large conductor O with the pendulum X and the other connecting the magnet R with the stud C, so that when the electrical circuit is established by the contact of the ball of the pendulum-lever with the projecting arm of the bell-crank lever a current of electrical energy or force will be established between these two points, flowing through the electro-magnet R, attracting at the same time with a greater or less degree of force the armature S, by means of which the pawl T is actuated to give motion to the ratchet-wheel U.

It will be observed that as the armature S is suddenly actuated by the magnet R the projecting arm Y of the bell-crank lever W, by communicating force to the ball *x* of the pendulum X, with which it is in contact, will cause the lower extremity of said pendulum to swing away from contact with the arm Y, thus breaking the circuit between the pendulum and the magnet, and by moving the ball upward on the rod it is evident that the arm Y will impart more motion to the pendulum in its swinging action; and as the electrical circuit is broken between the pendulum and the electro-magnet during the swinging action, as described, it becomes evident that by changing the position of the ball *x* the continuity of said current may be interrupted and established at greater or less intervals of time within a certain limit, as may be desired by the operator; and by the means just described it also becomes evident that the working action of the pawl T on the ratchet-wheel U may be increased or diminished, whereby the disks H and G may, by the connections heretofore described, be made to revolve with a greater or less rapidity of motion, as the judgment of the operator may dictate.

The upper end of the arm or pendulum X is provided above its pivotal bearing with a short arm, Z, having a set-screw, that will come in contact with a lug or projection, *d*, upon the face of the stud D and prevent the pendulum from passing a perpendicular above its pivotal point in its swinging motion.

M is a cylinder, with a socket placed at right angles with its barrel, said cylinder being pro-

vided with a set-screw, *n*. This cylinder is adapted to fit the pivot or journal on which the disk G revolves, and is made fast in any desired position on the pivot by the set-screw *n*.

h represents a pencil, of carbon or other suitable material, of proper length, fitting into the socket of the cylinder M.

By removing the disk G from its bearing at the extremity of the arm F and substituting the cylinder M, with its socket and pencil of carbon, in its stead, the cylinder being rigidly secured by the set-screw in such a position that the upper end of the pencil will closely approximate the lowest point on the disk H, it becomes evident that the current of electrical energy will pass from the disk H to the carbon pencil, and thence through the arm F, as hereinbefore described.

In the practical operation of my invention, if carbon or other similar substance should be used to produce what is termed the "arc-light," or a light resulting from the passage of the electrical current between two points at a suitable distance from and entirely separated from each other, the disks H and G or the disk H and pencil *h* would closely approximate but not actually touch each other. This may be done by lengthening or shortening the cord or chain L, connecting the free extremities of the arms F and J, and the disk G will always be held in the proper electrical relation to the disk H. At the same time the length of the cord or chain should be so adjusted that the pointed end of the arm J will register zero upon the scale K′, while at the same time the peripheries of the grooved pulley K and disk H are in contact, and the belt or band Q so adjusted that motion may be transmitted from one disk to the other with as little frictional resistance as possible. If the pencil *h* is substituted for the disk G, it is apparent that this belt or band may be dispensed with.

Although a copper wire is described as connecting the conductor O with the pendulum X and the electro-magnet R with the stud C, it would of course produce the same result by the use of platinum, or any other metallic or suitable substance that would contribute to the operation of the armature by an induced electric current derived from the conductor, in the usual manner so well known to electrical science. Then after adjusting the pendulum-weight *x* in the proper position, so that a stated speed may be given to the revolving disks through the described intermediate mechanism, a large volume of electrical force or energy may be transmitted from a suitable generating apparatus to the conductor O, and this current, passing to the center of the disk H, will be compelled by the proper insulation of said disk to pass downward in a vertical course to the center of the disk G, and thence through the arm F and stud C to the conductor P, by means of which the electrical circuit may be completed by connection with the generating apparatus. Simultaneously with the passage of the current over the route just described a derived current will pass over the copper or platinum wire *a*, and the armature S will be drawn in contact with the lower pole of the electro-magnet R, communicating a rotary movement to the disks. At the same time as the armature is forcibly drawn to the magnet the projecting arm Y on the bell-crank lever W will, by impact against the ball *x*, cause said ball to swing out to a greater or less distance, thus breaking the electric circuit with the magnet, and allow the armature to fall away from said magnet, carrying with it the pawl T, which takes a fresh position to actuate the ratchet U, as described, when the circuit shall be again established by the return of the pendulum to its original position in contact with the arm of the bell-crank lever.

It thus becomes apparent that by the swinging action of the pendulum a revolving motion of greater or less degree of speed within a certain limit will be given to the disks H and G. By this means destruction or disintegration of the disks may be in a great degree prevented in the production of the light, and by the same means the lower disk or pencil is automatically fed upward as disintegration takes place, in order to preserve the proper distance between the disks; and also by this means, as this destruction takes place, the pulley K, sustaining the arm J, falls and enables said arm to register upon the scale K′ the amount or volume of electrical energy that has traversed the line from center to center of the disks, as described.

By making the substance exposed to the intense heat that always accompanies the production of the electric light in the form of disks, and then compelling the electric current to traverse a line directly from the center of one to the center of the other, and at the same time slowly revolving said disks, the substance of which they are composed will be for a brief period only, yet at the same time repeatedly, exposed to the destroying effects of the intense heat, and hence will not be destroyed as quickly as they otherwise would be. A great advantage is also derived from the use of a larger volume of material at the luminous point, rendering the substitution of new material less frequent; and it is well known that the arc of a circle such as presented in the circumference of the disks renders the substance, whatever it may be, less liable to disintegration than when it is in the form of a slender cylinder or pencil, such as is now generally used in the production of an electric light.

By the application of a photometer to the light produced its volume may be measured or estimated in candle-power during a certain number of revolutions of the disks, and then by allowing the estimated volume to be represented by one degree or space on the scale K′ by means of the regular and gradual fall of the arm J, an accurate record is automatically kept of the volume of electrical energy

that has passed from center to center of the disks, for the fact is well established that the destruction of said disks or substance from which the light is produced is uniformly in proportion to the volume of light produced.

It will be seen that as the dropping of the armature and pawl is by their own weight there are no springs to break or get out of order; and while I have described the mode of varying the speed of the disks by the shifting of the ball *x* upon the pendulum as the one which I prefer, yet it is evident that the same result might be obtained by varying the size of the pinions *i* and *f*, so that a short stroke of the pendulum might be made to give a slow motion of the disks, and also by decreasing the movement of the armature the same effect would be produced.

In certain cases it might be desirable to have the glass globe A continuous and whole at the bottom, and to have the cap B adjusted to it by means of an air-tight joint, after which the air in the globe or the oxygen gas contained in said air may be removed by suitable means now in general use. In such cases the durability of the disks would be much increased.

It will be observed that the edges of each disk H and G are beveled, so that the grooved pulley K does not touch the sharp edge of the disk, but bears upon its beveled surface on each side below its edge. The disintegrating effect of the electric current will continue to preserve the beveled edges of the disks, and they afford a continuous smooth surface for the grooved pulley as a track to run on when the edge itself might be irregular from the crumbling effect of the intense heat and the pressure of the pulley.

I am aware that in electric lamps arranged to produce the electric arc rotary carbon-disk electrodes have been used; but such disks have been in contact only when no current was flowing, and separated to produce the light; and I lay no claim to such a lamp.

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

1. In an electric lamp, the combination of the light-producing devices and a meter for registering the total volume of electrical energy used, substantially as described.

2. The combination, in an electric lamp, of the suitably-supported revolving-disk electrode H with the arm J, carrying pulley K and the scale K′, substantially as and for the purpose set forth.

3. The combination, in an electric lamp, with the revolving-disk electrodes H and G, the latter hung upon a pivoted arm, of the cord L, pulley *e*, weight *m*, arm J, and pulley K, whereby the one is automatically fed toward the other, substantially as described.

4. The combination, in an electric lamp, of the revolving disks H and G, arm F, pulleys N N′ N″, band O, cord L, arm J, pulley *e*, weight *m*, and pulley K, substantially as described.

5. In an electric lamp, the combination, with the revolving disk H and the revolving disk G, mounted upon the swinging arm, of the feeding mechanism composed of the toothed pinions *i* and *f*, ratchet-wheel *u*, pawl T, armature S, and electro-magnet R, and the bands and pulleys for transmitting motion from one disk-shaft to the other, substantially as described.

6. The combination, in an electric lamp, of the conductor O, wire *a*, pendulum X, bell-crank lever W, electro-magnet R, armature S, arm V, and a suitable electrical connection between said magnet and the conductor P, substantially as described.

7. The combination, in an electric lamp, of the electrodes and their operating devices, and the pendent studs supporting the same, the cap B and the globe supported by said cap, substantially as described.

8. The combination, in an electric lamp, of the pendulum X with the bell-crank lever W, connecting-arm V, armature S, electro-magnet R, and suitable electrical connections between the opposite terminals of said magnet and the main light-circuit, substantially as described.

9. The combination, in an electric lamp, of the disk H, having beveled margins, with the grooved pulley, arranged to straddle the edge of said disk and bear upon said beveled margins without pressing heavily upon the edge formed by the junction thereof, substantially as and for the purpose set forth.

10. The combination, in an electric lamp, of the rotary-disk electrode H, having beveled margins, with the grooved pulley K, bearing upon said margins, but not upon the edge formed by the junction thereof, the arm J, weighted cord L, and the hinged arm F, carrying the electrode opposite to the disk H, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:
JOHN G. QUAIFE,
HENRY P. LISSON.