(No Model.)

W. M. THOMAS.

ELECTRIC LAMP.

No. 253,322. Patented Feb. 7, 1882.

Fig. 1.

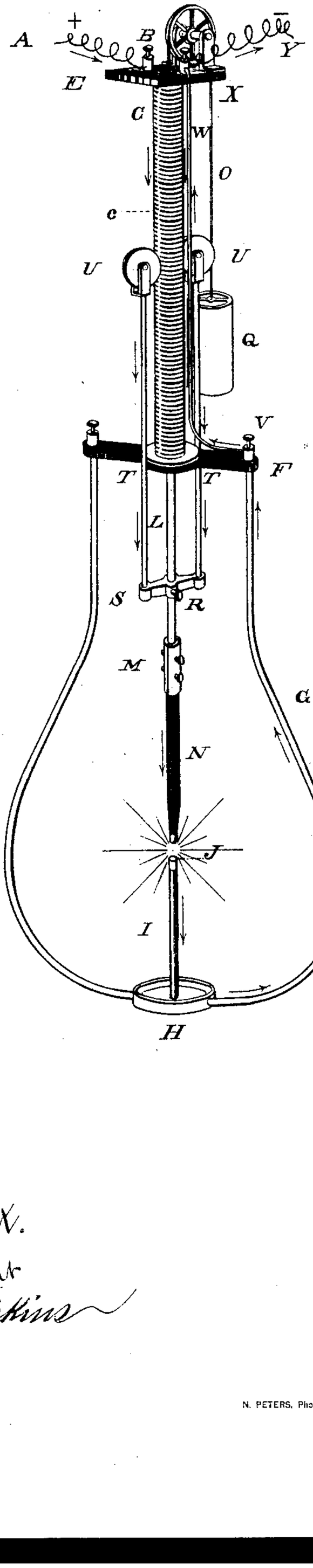
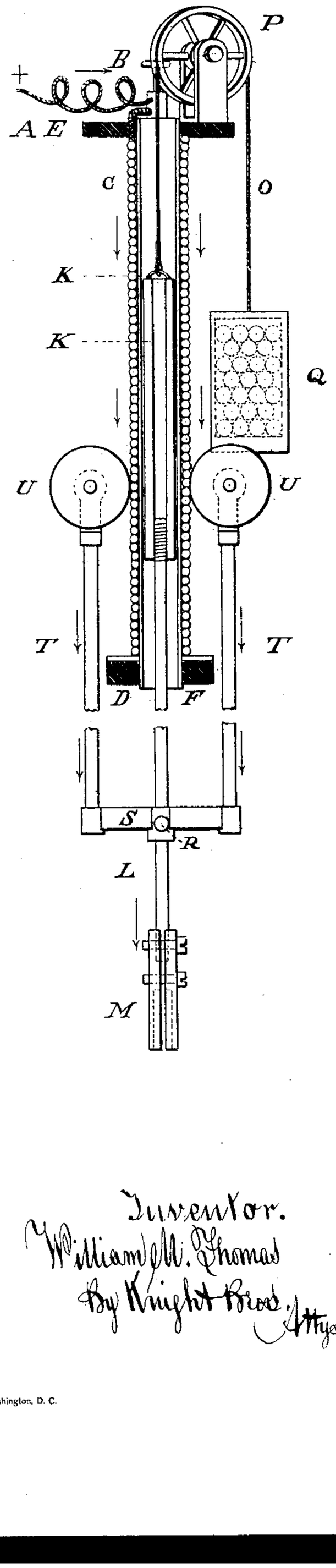


Fig. 2.



Witnesses.
A. P. Knight
L. M. Hopkins

Inventor.
William M. Thomas
By Knight Bros. Attys.

UNITED STATES PATENT OFFICE.

WILLIAM M. THOMAS, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO SAMUEL W. SKINNER, OF SAME PLACE.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 253,322, dated February 7, 1882.

Application filed October 27, 1881. (No model.)

To all whom it may concern :

Be it known that I, WILLIAM M. THOMAS, of Cincinnati, Hamilton county, Ohio, have invented new and useful Improvements in Electric Lamps, of which the following is a specification.

My invention is more particularly designed for those arc electric lamps whose electrodes are maintained at proper polar separation by direct attachment of one of them to a soft-iron armature or suction-core suspended within a coil or helix whose magnetism is dependent on the electric current. So far as known to me, electric lamps of this kind—of which those of Archereau and Gaiffe may be considered types—have seldom passed beyond the domain of the lecture-room, principally, it is believed, either because of the limited duration of their efficiency, or else of the too abrupt character of the automatic adjustment ("righting") of the electrode-interval. This defect is inherent in their construction, being an incident of the necessarily variable magnetic potential of the coil in its constantly-changing relations to the core as the carbon shortens by consumption.

I overcome the above difficulty by a contrivance, hereinafter described, that maintains a uniform distance between the suction-core and the place of current delivery of the coil. In association with a carbon thus operated I employ preferably a fixed negative electrode composed of or tipped with a highly refractory metal—such, for example, as iridium, or one of the native alloys of that metal. Such negative electrode being while in operation immovable, and being, moreover, practically indestructible, it follows that the positive electrode alone requires to be invested with capacity for self-adjustment, and consequently the point of light remaining in one place is available for focusing and like purposes, which purposes are further subserved by the exceptional promptness and delicacy of self-adjustment of my arc-interval and consequent comparative steadiness and uniformity of illumination.

The coil (helix) employed by me consists of a single layer of covered wire compactly wound.

The positive electrode is preferably composed of compressed lamp-black or other form of carbon, such as customarily employed in arc electric lamps, and is attached to a metallic stem, preferably tubular, to whose other extremity is secured a soft-iron core, whose occupancy of an electro-magnetic coil that constitutes the positive terminus of a dynamo or other suitable generator causes the suspension of the said electrode within the coil whenever the electric fluid is in motion.

The proper height of suspension is secured by the following means: The insulating wrapping or envelope is removed from one or more (preferably two diametrically-opposite) tracks upon the periphery of the coil, and two sliding shunts or conductors are held elastically in contact with these exposed portions. These conductors, being attached to the stem of the positive electrode and rising and sinking with it, carry off the electric charge or current from their point of contact and cut off or throw out of the magnetic field so much of the coil as extends, for the time being, beneath them. To secure the highest possible sensitiveness of action the contact of said sliding conductors is preferably obtained by anti-friction wheels. The points of contact of conductors with the coil-tracks, traveling slowly down the latter, keeping pace with the diminishing carbon length, bring additional convolutions within the magnetic field, and secure a uniform and steady arc by the constancy of the magnetic action. An increase of electrode interval—such, for example, as occurs from the sloughing off of burned portions from the positive electrode—is of course accompanied by a slackening of the electric current, with consequent reduction of magnetic force, which yielding momentarily to the gravity of the electrode, the arc-interval becomes lessened, the electrical resistance diminished, and the current increased until the positive electrode, being thereby restored to its normal distance from the negative electrode, a practically uniform light is obtained.

In addition to the above-described automatic accommodation of the parts, a means of discretional adjustment of the relative heights of the suction-core and the sliding conductor enables the apparatus to be set at will to any de-

sired arc-average for greater or less illumination. A further means of discretional adjustment may consist of a controllable counterpoise, by which the effectual or virtual weight of the suction-core and adjuncts may be reduced to just sufficient for effectiveness. This comparative levity of the electrode prevents the liability of injury to the tips on sudden cessation of the current.

With the above principal features of my invention I may associate one or more other useful features, hereinafter explained.

In the accompanying drawings, Figure 1 is a perspective view of an electric lamp embodying my invention. Fig. 2 is a partly sectional elevation of the coil and adjuncts.

The positive wire A from a dynamo or other suitable generator connects by binding-post B with a coil, C, of insulated wire, which is wrapped around a non-magnetic bobbin, D, preferably a longitudinally-split brass tube. The ends of tube D are secured in collars E F, of gutta-percha, vulcanite, or other non-conducting substance of proper strength.

The negative electrode employed by me is preferably metallic and stationary, and may be of any suitable construction. For example:

Depending from lower collar, F, is a pendant, G, from whose pan H there rises vertically and in alignment with the coil C a copper or other metallic post or column, I, which post is tipped with iridium, J, or with some refractory alloy of that metal.

The suction-core or armature K may be a cylinder of soft iron, preferably tubular.

Screwed or otherwise securely fastened in the lower end of core K is a brass or copper stem, L, also preferably tubular, which terminates below in a clamp, M, that holds the carbon N, constituting the positive electrode.

A bail, *k*, on core K enables engagement of a cord, O, which being carried over sheave P terminates at its other extremity in a counterpoise, Q, which, being loaded at discretion, has the effect of reducing the virtual gravity of the positive electrode to the amount sufficient to balance the coil-suction, and thus secure the desired arc-interval in the normal condition of the apparatus.

Held by set-screw R to stem L is a brass cross-bar, S, from whose extremities arise two rods, T, of spring-brass, in whose summits are journaled a pair of brass anti-friction wheels, U, which, by virtue of the elasticity of the rods T, press moderately against the periphery of the coil, on diametrically-remote sides thereof.

Along the narrow tracks traversed by the wheels U, of which one is seen at *c*, Fig. 1, the silk, cotton, or other insulating envelope of the wire is removed, so as to leave naked the metallic surface of the wire at that part and to bring the wheels in direct electrical communication with the wire at the (for the time being) point of contact. One side of pendant G communicates with binding-post V on collar F, which connects by wire W with binding-post X on collar E, from which post a wire, Y, conducts to the negative rheophore.

The operation of my device is simple and obvious. The shunt-wheels U having, with their supporting-frame S T, been by means of set-screw R fixed at their proper height relatively to the core K, and the counterpoise Q having been suitably loaded, so as to diminish the virtual weight of the core and its appendages to that which just serves to cause their descent at any relaxation of coil-magnetism, a connection of the wires A and Y with the generator causes the positive current to flow, as indicated by the arrows, and the positive electrode to detach itself from the negative, so as to create an arc-interval. Any wear or dislodgment of the carbon-tip has the well-known effect of increasing the tension and decreasing the electric flow with corresponding reduction of coil-magnetism. This permits the weight of the positive element to prevail over the coil-suction until the two opposing forces—gravity and magnetism—being restored to equilibrium the normal arc-distance is resumed. So prompt, and at the same time so delicate, are these movements and countermovements that the light is practically uniform. Experimental tests show that the lower effective end of the coil preserving a constant relation to the core, and the coil's magnetic activity being largely concentrated at what is for the time being its delivery end, a substantially uniform magnetic action is secured, notwithstanding the change in virtual length of magnetized coil.

The above-described preferred form of my invention may be varied in non-essential particulars. For example, while preferring, for the reasons stated, to employ a metallic negative electrode, I reserve the right to substitute one of carbon, which may either be stationary or be shifted simultaneously with the positive by any of the automatic expedients now in use, and instead of the gravitating counterbalance herein described I may employ any proper equivalent, such as a compensating-spring. Furthermore, the transverse section of the helix-wire, instead of being circular, as shown, may be oblong, with its greatest dimensions perpendicular to the helical axis.

As the functions of my invention may be discharged in connection with a single contact-wheel, but one such wheel and a single bared track may be employed, the duties of the other wheel then being simply that of a guide; but inasmuch as an additional wheel and bared track secures the contact of one wheel before the other has ceased contact, a practically unbroken contact is obtained, while the sensitiveness of the automatic adjustment is doubled. My preferred number of contact-wheels is two, as shown; but for still greater sensitiveness three or more equidistant contact-wheels may be employed.

I do not claim broadly the employment of suction-coils with shifting magnetic fields, nor

the use of a counterpoised suction-core having direct mechanical attachment to the carbon-holder; nor do I claim the association of a carbon positive electrode with a metal negative electrode, such expedients being old.

I am aware that it has been proposed to make electric lamps with insulated helices and conductors traveling along said helices, so as to shunt the current from the negative electrode into and out of the helix, in order to cause the magnetic field to shift in conformity to the movement of the electrode regulated thereby.

I claim as new and useful improvements in arc electric lamps—

1. In combination with an electro-magnetic helix, connected at one end with the positive wire from the generator, and constituting the terminus thereof, one or more conductors which travel on naked tracks on the external peripheries of the convolutions of the helix, and have electrical connection with the positive electrode and mechanical attachment to the suction-core, substantially as set forth.

2. In combination with an electro-magnetic helix that constitutes the terminus of the positive wire from the generator, one or more conductors which travel upon naked tracks on the peripheries of the convolutions and have electrical connection with the positive electrode, and direct mechanical attachment, by means of adjustable fastening R, to the suction-core, substantially as set forth.

3. In the described combination, the stationary negative electrode J, of refractory metal, the stationary electro-magnetic coil or helix C, constituting the terminus of the positive rheophore, the positive electrode N, and one or more conductors, U, that traverse naked tracks *c* on the peripheries of the coil-convolutions, and which have electrical connection with the positive electrode and direct mechanical attachment to the suction core, substantially as set forth.

4. In combination with the electro-magnetic helix C *c*, shifting conductor U, positive electrode N, and suction-core K, the adjustable counterpoise O P Q, substantially as set forth.

In testimony of which invention I hereunto set my hand.

WILLIAM M. THOMAS.

Attest:

GEO. H. KNIGHT,

SAML. S. CARPENTER.