

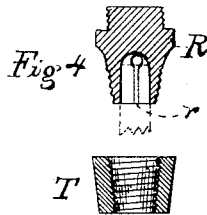
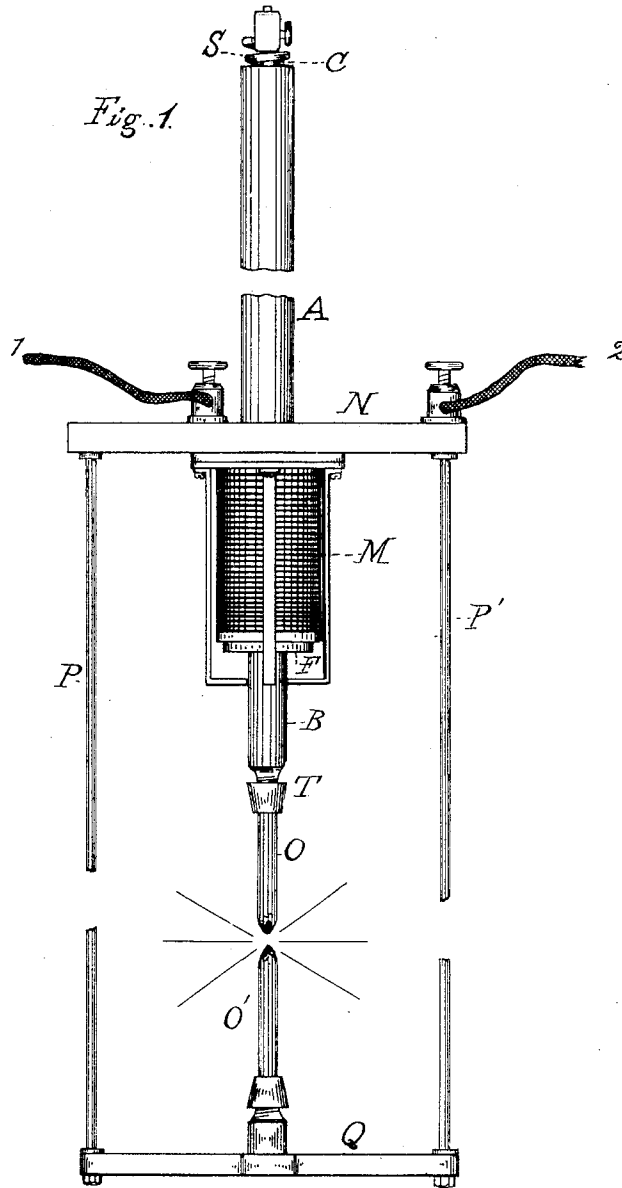
(No Model.)

2 Sheets—Sheet 1.

O. A. MOSES.
VOLTAIC ARC LIGHT.

No. 276,702.

Patented May 1, 1883.



WITNESSES:

Edw. C. Rowland,
W. W. Seely

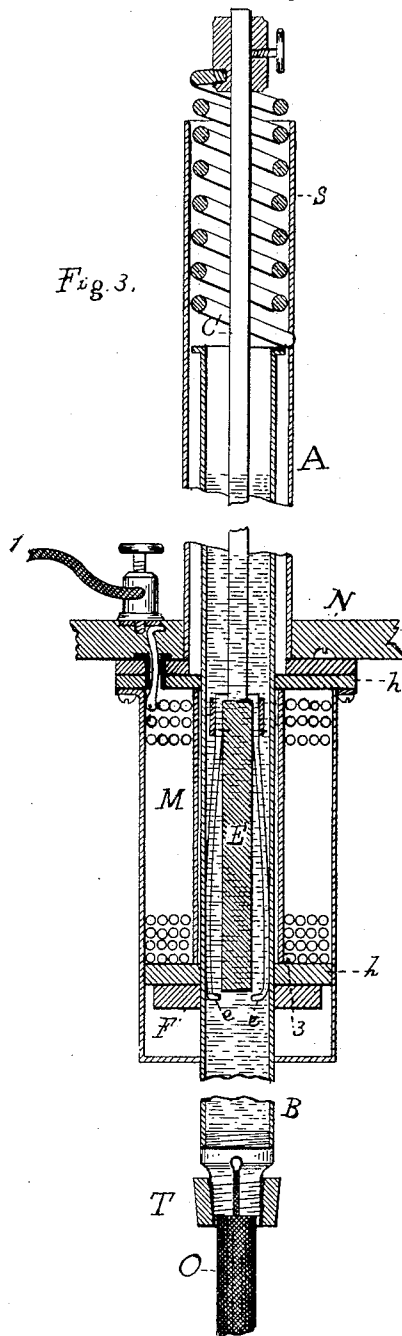
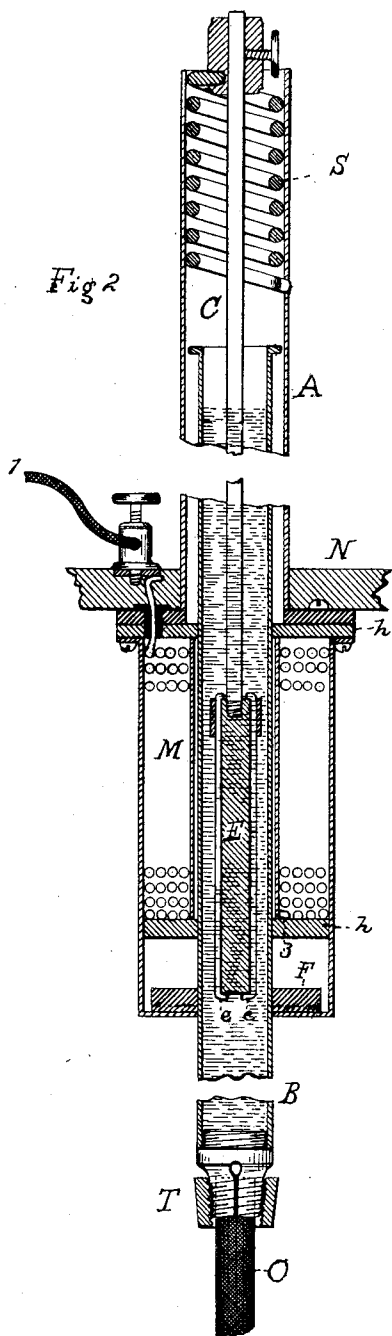
INVENTOR:

Otto A. Moses
By Rich. A. Dyer
Att'y.

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UNITED STATES PATENT OFFICE.

OTTO A. MOSES, OF NEW YORK, N. Y.

VOLTAIC-ARC LIGHT.

SPECIFICATION forming part of Letters Patent No. 276,702, dated May 1, 1883.

Application filed September 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, OTTO A. MOSES, of New York city, in the county and State of New York, have invented a certain new and useful Improvement in Voltaic-Arc Lamps, (Case "A,") of which the following is a specification.

My invention relates to that class of electric lights known as "voltaic-arc lamps;" and its object is to furnish a lamp of exceedingly simple and economical construction, with provision for automatically controlling the feed of the carbon by means of a solenoidal or magnetic governor of few parts, but efficient in operation, and especially adapted to be used in multiple-arc systems with other lamps of the same type, or with incandescent lights, but also capable of being used in series or multiple series.

To these ends the invention consists in the features more particularly hereinafter described and claimed.

In carrying the invention into practice a frame is used for supporting the various parts, which may consist of two metallic sides and a metallic bottom, for which mere rods, as offering the least obstruction to the light, will answer, united at the top or fourth side by an insulating material, which forms the barrier in the lamp between its two electrical terminals, or with a metallic top plate insulated from the rods connected therewith. Affixed to the top is a hollow electro-magnet or solenoid, to whose upper end plate is attached and projects upwardly a hollow tube, which may be called a "protecting-tube." Passing through the center of the solenoid, and fitting snugly therein, but capable of easy movement therethrough, is a tube, whose lower end is fitted with a holder for the upper or positive carbon, which may be termed the "carbon-holding tube." The carbon-holder may be integral with this tube, or a separate piece attached to it. It consists of a screw-threaded socket, preferably slightly tapering, and having two or more longitudinal slots. Upon it fits a tapering internally screw-threaded thimble, which tends to cause the lower edges of the slotted socket to press in toward each other, grasping and holding firmly the carbon. When this carbon-holding tube is well drawn up its upper extremity passes into and is protected by the

protecting-tube before referred to. Within the carbon-holding tube is arranged the core or armature of the solenoid, affixed to a rod or tube supported by a spring at its upper end from the protecting-tube in such manner and so adjusted that the resilience of the spring tends normally to cause the core or armature to project a little below and out of the base of the solenoid or magnet. This core or armature is of peculiar construction, consisting primarily of a rod or bar of soft iron, of smaller diameter than the interior of the carbon-holding tube, within which it is located. It is entirely covered by what may be called a "brush," consisting of iron wires arranged longitudinally upon the entire exterior of the core, and to which they are fastened at the top or middle, the lower or both ends being free and bent inwardly slightly toward the axis of the core. The iron wires may be copper-plated to reduce resistance, or a layer of copper wires may be used in addition to the iron wires. Below or partly or wholly within the solenoid or magnet, and within its magnetic field, is located, external to the carbon-holding tube, a piece of magnetic material—such as iron, steel, or nickel—which may be termed the "intensifier." This intensifier is preferably of annular shape and surrounds the carbon-holding tube, and is also preferably capable of motion to and from the solenoid or magnet, and fitted within a case, or playing between stops or other devices for limiting the extent of its motion, although the intensifier may have other than an annular shape, and, whether annular or not, may have a fixed position. The solenoid is placed directly in the circuit, which is preferably a multiple-arc circuit including one or more lamps. From the main circuit one connection is made to the free end of the solenoid or magnet-coil, its other end being attached to and forming electrical contact with the inner metallic shell of the solenoid, whence the circuit continues to the carbon-holding tube, passing principally through the brush, which makes good electrical contact for the purpose, thence to the + carbon, to the — carbon and the metallic frame of the lamp, to the other connection from the main circuit.

The operation of the lamp thus constructed and arranged in circuit is about as follows:

Upon closure of circuit the solenoid or magnet renders both the core or armature and the intensifier magnetic by induction, attracting them, the ring or intensifier toward its base, and the core or armature within itself and against the stress of the spring; but the free ends of the wires of the brush referred to, being all of one polarity, are repelled each by the others, flying outwardly and impinging against the inner side of the carbon-holding tube, binding it between the intensifier and the brush, so that it is lifted with them sufficiently to form the arc, and then held in that position. As the arc increases, of course, the resistance in the lamp - circuit increases, diminishing the magnetic force of the solenoid or magnet. The parts are so adjusted relatively to each other that when the point of greatest desired arc has been reached the magnetic effect of the solenoid or magnet is so weakened that the brush relaxes its hold upon the carbon-holding tube to some extent, which then drops by gravity and is forced downwardly by the movement of the core or armature, which is depressed by the spring until the magnetic force of the solenoid is again restored.

Instead of having the core or armature divided into two or more repelling parts; it may be of one single piece, having sufficient lateral movement to permit it to strike the sides of the tube inclosing it and force the tube against its guides. The brush form is preferred, however, since the movement is more uniform, and better electrical contact is made to conduct the current to the carbon.

It will be seen from the foregoing that the distinctive feature of the regulating mechanism is the location of a magnetic core or armature within the carbon-holding tube, such core or armature clamping the tube and forcing it to move with the core or armature, either by the clamping action alone or assisted by the fluid in the tube, as hereinafter stated.

The carbon-holding tube is preferably filled with some fluid—such as glycerine—which serves to lubricate its interior, preventing excess of friction, regulating or slowing down the movement of the contiguous surfaces, and preventing any spark at the points of contact of the tube and brush. The fluid also forms a means of communicating motion from the brush to the carbon-holding tube, in addition to that afforded by the contact of the brush with the tube, the interstices between the brush and tube not being sufficiently large to prevent the almost simultaneous movement of the brush and tube.

While this general description gives a fair idea of my invention, it may be better understood by reference to the drawings, in which—

Figure 1 is an elevation giving the general appearance of the lamp; Fig. 2, a longitudinal section of the lamp when not in operation; Fig. 3, a longitudinal section of the lamp when in operation, and Fig. 4 a detailed sectional view of the carbon-clamp.

N P P' Q represent the frame of the lamp, of which P P' Q may be metallic rods or tubes, while N is of insulation, and serves as a support or base for the remaining devices of the lamp.

M is the solenoid, attached to and supported by or from N. From its top rises the protecting-tube A, within which, and passing through the center of the solenoid, is the carbon-holding tube B, having a clamp, T, at its lower or free end.

B is arranged to make a comparatively snug fit within the heads *h h* of M, but at the same time to be capable of easy sliding therein.

Dependent from A, but secured thereto by the spring S, is a rod, C, passing within the tube B, and carrying at its lower end the armature or core of the solenoid, the stress of the spring tending normally to throw the free end of this core or armature a little beyond the end of the solenoid, as shown in Fig. 2. The armature or core consists of the central bar or rod of iron, E, whose exterior is covered by wires *ee*, arranged parallel to each other and to the axis of E. These wires *ee* are fastened securely together, and to E at the top E, in any suitable manner, the lower ends being left free and slightly turned in toward center of E, as clearly shown in Figs. 2 and 3. As these wires are fastened upon E in the similitude of a brush, the term "brush" has been applied herein to this peculiar construction of a core or armature.

Below the solenoid, and surrounding the tube B, is an iron ring, F, which, becoming magnetic by induction from M when M is charged, acts in turn by induction upon E, aiding or intensifying the action of M thereon, to which, therefore, the term "intensifier" is applied. F is capable of sliding freely upon B, and its motion is limited by either an open case, as shown, or by stops arranged in any suitable way.

In Fig. 4 is seen more in detail the carbon-clamp R, being a plug which is screwed into the free end of B, slightly tapering, screw-threaded, and slotted, as at *r*, in several places, while T is a thimble tapering and screw-threaded, so that as it is screwed upon R it forces together the lips or jaws formed by the slotting of R, causing them to grasp the carbon.

I find it desirable to fill the tube B nearly to its top with some viscous liquid, like glycerine, for the reasons hereinbefore given.

As before stated, a particular feature of the regulator herein described is the division of the armature or core into parts adapted to be mutually repelled, and located within the tube carrying the carbon, so that when repelled, these parts shall impinge on the inside of the tube and control its movement. For this purpose the brush, core, or armature shown is an excellent type, but only a type, as its mechanical construction, in order to avail of the principle of magnetic repulsion existing between similar polarities, may be greatly varied, and,

in fact, there are many ways in which an armature or core acting in same method may be made, all of which, for the purposes of this case, are equivalents of the form shown.

5 The circuit-connections in the lamp are as follows, 1 2 being the connections from the lamp to the main circuit: Connection 1 leads directly to the coil of the solenoid, the other end of which coil is electrically connected to the interior metal wall of the solenoid at 3. As the heads *h h* of the solenoid impinge on B, there is electrical connection between them, and from B to the upper carbon, when the parts are in the position shown in Fig. 2. The current also passes through the brush and liquid to the tube B. When, however, the parts are in the position shown in Fig. 3 the principal part of the current flows through the brush, which makes good electrical contact with the tube. From B the circuit is through upper carbon, O, to lower carbon, O', forming the arc, thence by Q P' to 2 and main circuit. When the lamp is not in operation the parts are in the position relatively to each other shown in Fig. 2, the ring F resting at its lower limit of movement, while E is protruded from the solenoid by action of S, the wires *ee* lying in their normal position against the core E. Circuit now being closed, M renders E, *ee*, and F magnetic by induction, the action of F, in turn, upon E intensifying the action of M thereon. *ee* immediately repel each other, impinging firmly against the interior of B. At the same time F is drawn up toward M, while E is attracted within it, seeking to place itself in a neutral position, the effect being that B is lifted with E, so that the carbons are separated and an arc formed. As M is directly in the circuit with the carbons, the magnetic effect of the current therein is directly affected by the resistance at the arc, which of course increases as the arc increases by consumption of the carbons. This finally reaches such a point that M cannot hold E against force of S, while *ee* loosen their hold upon B. Thereupon B is forced downwardly by its own weight and the action of the spring through the core and fluid until the magnetic effect of M is restored by the diminution of resistance effected by proper curtailment or relighting of the arc, due to this dropping of B. Thereupon *ee* again fly out and hold B firmly. The relative movements of E and B are made regular and smooth by the liquid within B, while the liquid prevents any sparks and oxidation due to sparks at the contacts between *e* and B, and also serves to communicate motion from E to B.

This construction forms a lamp exceedingly simple, involving very few parts, regular and efficient in action, and especially adapted to be used in multiple-arc circuits and in systems where incandescing lamps are used.

What I claim is—

1. In a voltaic-arc lamp, the combination, 65 with a solenoid or electro-magnet and its core or armature, of a carbon-carrying tube interposed between them, and within which the core or armature moves, substantially as set forth.

2. In a voltaic-arc lamp, the combination, 70 with a solenoid or electro-magnet, of a carbon-carrying tube and an armature or core located within such tube and clamping against the sides of the same, substantially as set forth.

3. The combination, with a solenoid or electro-magnet and a carbon-carrying tube, of a divided core or armature, the parts of which repel each other, said divided core or armature being located within the carbon-carrying tube and clamping against the sides of the same by the action of the repelling parts, substantially as set forth.

4. The combination, with a solenoid or electro-magnet and a tube within the same, of a core or armature located within said tube, said core or armature being composed of a central body and surrounding wires which repel each other and the body, substantially as set forth.

5. In a voltaic-arc lamp, the combination, 90 with a solenoid or electro-magnet and its core or armature, of a carbon-carrying tube containing fluid, within which the core or armature is placed, substantially as set forth.

6. In a voltaic-arc lamp, the combination, 95 with a solenoid or electro-magnet and a moving carbon carrying tube containing fluid, of the core or armature of such solenoid or magnet, located within such tube and fluid, the tube being moved by the core through the fluid when not in contact with such core, substantially as set forth.

7. The combination, with an electro-magnet or solenoid, a carbon-carrying tube, and an armature or core within such tube, of an intensifier external to the tube, substantially as set forth.

8. The combination, with a solenoid or magnet and its armature or core placed within the carbon-carrying tube, of a ring placed outside 110 of the tube, acted on by induction from the solenoid or magnet, and assisting in action upon the armature or core, substantially as set forth.

9. In a voltaic-arc lamp, the combination of 115 a solenoid or electro-magnet, a protecting-tube rising therefrom, a carbon-carrying tube passing through the solenoid and within the protecting-tube, and a rod suspended by a spring from the protecting-tube and supporting the core or armature within the carbon-carrying tube, substantially as set forth.

This specification signed and witnessed this 8th day of August, 1882.

OTTO A. MOSES.

Witnesses:

H. W. SEELY,
EDWARD H. PYATT.