(No Model.)

L. W. SPENCER & F. P. JAQUITH.

ELECTRIC ARC LAMP.

No. 388,594. Patented Aug. 28, 1888.

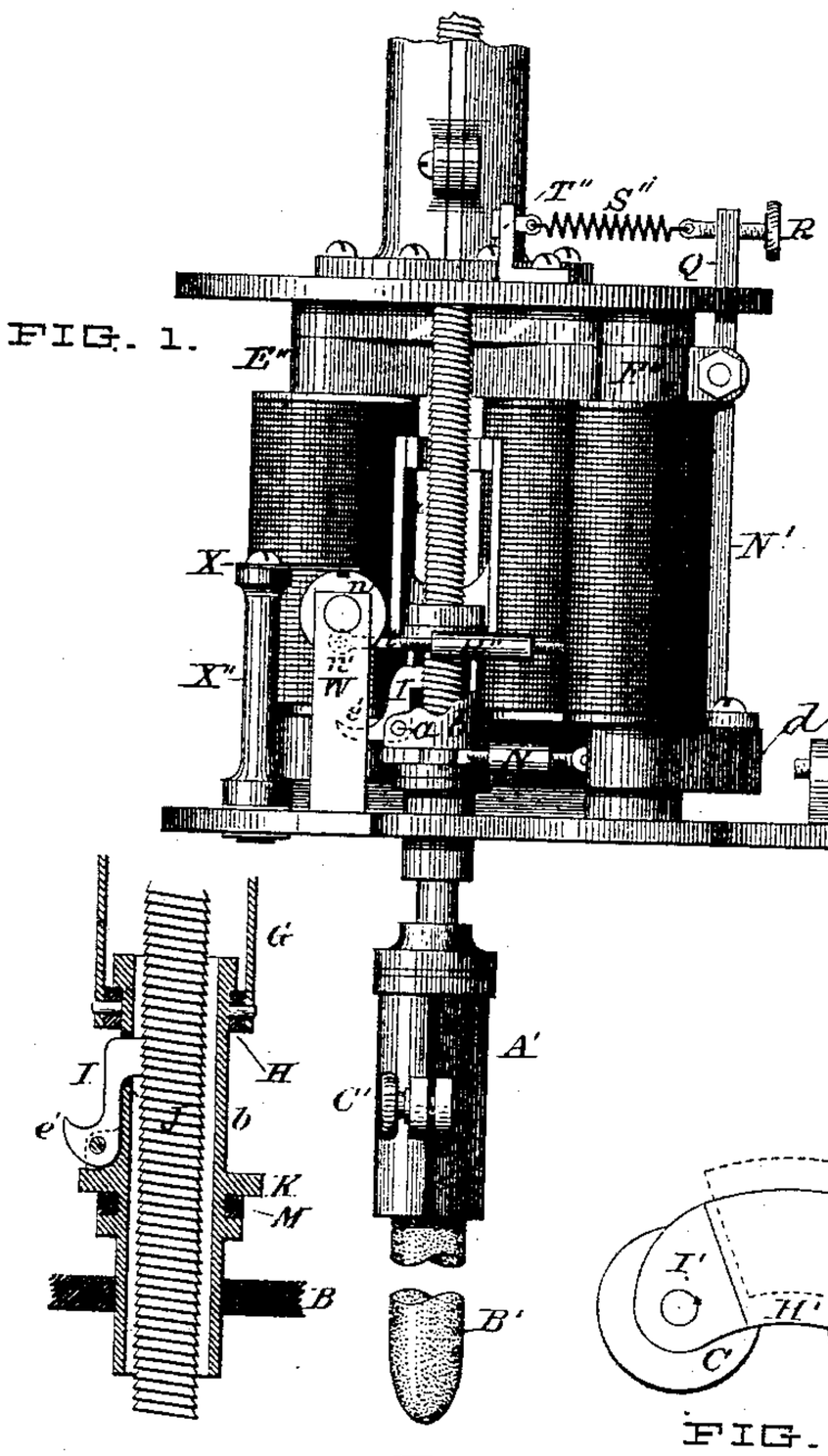


FIG. 1.

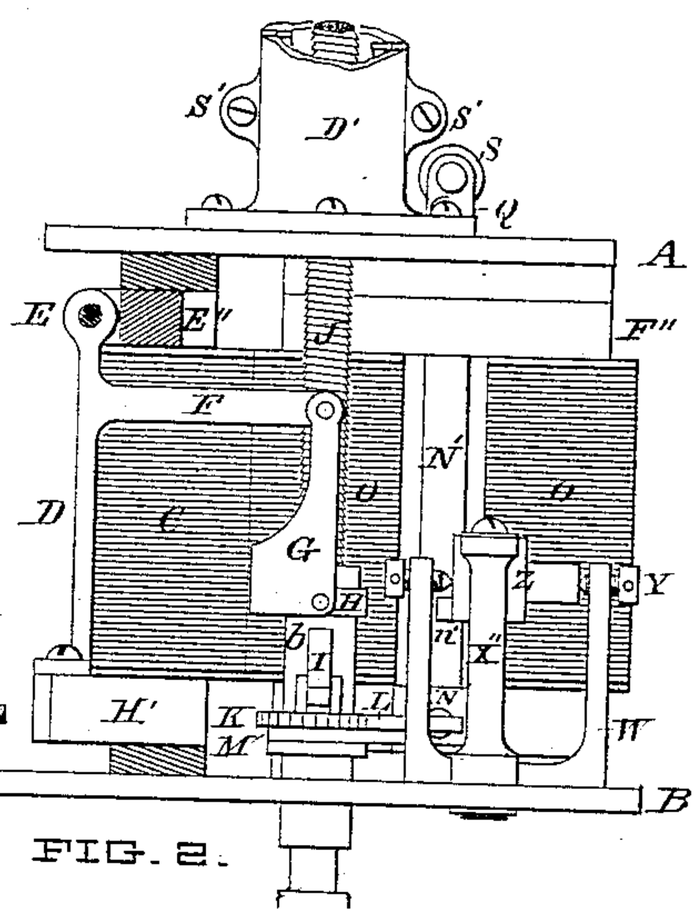


FIG. 2.

FIG. 7.

FIG. 6.

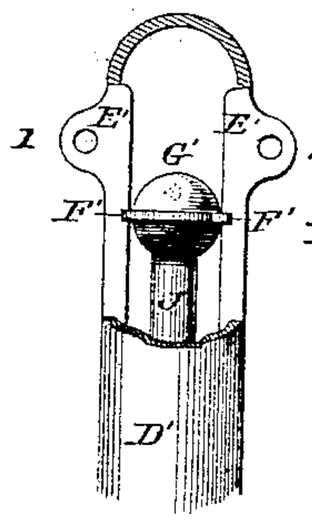


FIG. 4.

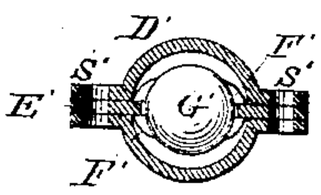
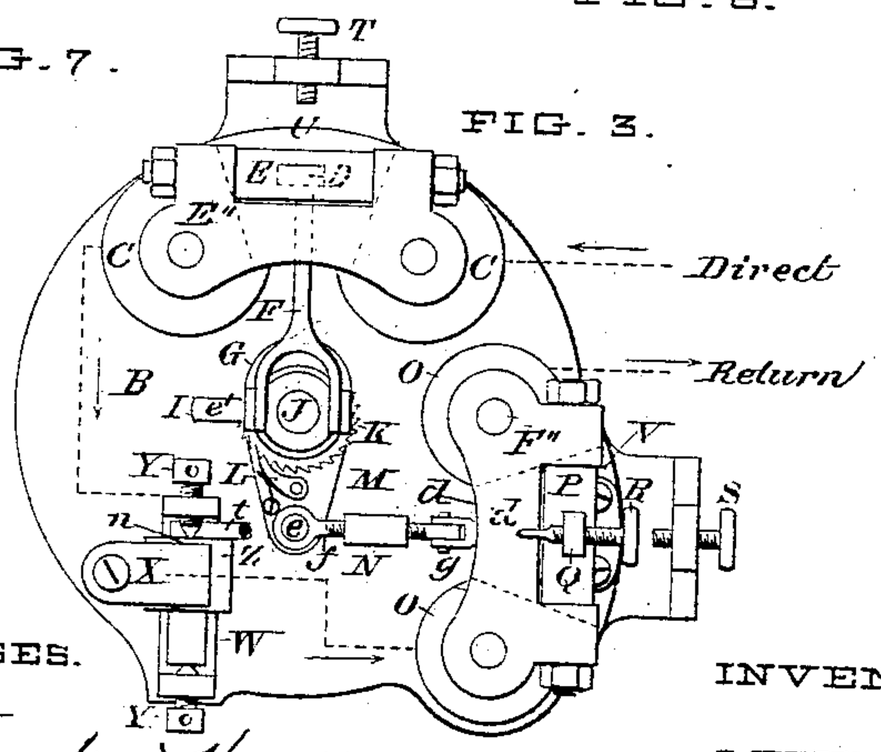


FIG. 5.

FIG. 3.



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UNITED STATES PATENT OFFICE.

LEWIS WALCOTT SPENCER, OF HOOSICK FALLS, AND FREDERICK POWERS JAQUITH, OF HOOSICK, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 388,594, dated August 28, 1888.

Application filed October 12, 1885. Serial No. 179,668. (No model.)

To all whom it may concern:

Be it known that we, LEWIS WALCOTT SPENCER and FREDERICK POWERS JAQUITH, respectively of Hoosick Falls and Hoosick, in the county of Rensselaer and State of New York, have invented certain Improvements in Electric-Arc Lamps, of which the following description, in connection with the accompanying sheet of drawings, constitutes a specification.

This invention relates to special mechanism for automatically regulating the feed of the movable toward the stationary carbon of an arc lamp, and to provisions connected therewith for effecting the primary adjustment of the movable carbon with reference to the fixed carbon.

I have shown in the drawings only the movable or upper carbon in connection with the devices for controlling its adjustment and feed, including the main magnets and the shunt-magnets with an interposed commutator.

The drawings fully illustrate the invention, wherein—

Figures 1 and 2 show, respectively, a side and a front elevation of my apparatus. Fig. 3 exhibits a plan of the same after removal of the upper supporting-plate of the frame structure. Fig. 4 is a partial longitudinal section of the upper portion of the guide-tube in which the carbon-holder stem works. Fig. 5 is a transverse section through top of guide-tube taken on line 1 2 of Fig. 4. Fig. 6 is a view of the under side of main magnets, showing shape of the armature. Fig. 7 shows details of construction of the nut and its connections.

In carrying out my invention, for convenience I mount my apparatus between two plates, A and B. A pair of electric coils, C C, is placed in the main circuit, as shown. From the bar spanning the tops of the magnets a pendulum-rod, D, is hung, so as to swing on the hinge-joint E. To the bottom of rod D the armature H′ is attached. This armature is of the contour shape shown in plan in Fig. 6, and its oscillation is limited by the adjusting-screw T. Bracket-arm F projects from rod D forward between magnets C C, and has suspended from its outer end the stirrup G, the bottom end of which is pivoted to a collar, H, within which rotates the hollow cylinder which carries the nut I. This nut is seen in side elevation in Fig. 1 as pivoted between cheeks *a a*, and is of elbow form, its upper part being fitted to engage with the thread on the rod J. The cylinder is provided with an annular ratchet, K, with which pawl L works. This pawl is pivoted on an oscillating plate, M, which is journaled on cylinder *b*, and has its reciprocating motion imparted to it from the pendulous movement of swinging armature *d*, connected with the shunt-coils O O. The carbon-holder A′ is attached to the lower end of stem J, and has a screw-clamp, C′, for securing the carbon in place.

The stem J is provided with a ratchet screw-thread, as shown, and nut I is correspondingly threaded to engage therewith. Nut I is held in engagement with the screw by a spring in its hinge-joint, or by other appropriate mechanical means. This construction of thread possesses special advantages. When it becomes desirable to insert a new carbon, the carbon-holder may be grasped by the hand and forced up to its proper altitude, the ratchet form of the thread permitting the screw to be slipped along or over the yielding nut I. The ratchet form of thread also facilitates the removal from the various bearings through which it passes of any deposited soot or products of combustion of the carbon, which often interfere with the proper action of delicate regulating mechanism. The nut also acting on only one side of the screw serves as a scraper to clean from the thread any accumulations which may have adhered thereto.

The stem J is adjusted to work vertically in a tubular chamber, D′, erected over the axis of the carbon-holder upon the plate A. It is made of a length to suit the length of carbon to be used in the lamp. Fig. 4 illustrates its details of internal construction and shows the upper part of the stem of the carbon-holder in working position. This tube consists of two longitudinal semi-tubes provided with wings or ears S′ S′, whereby they can be united. Between the semi-sections two longitudinal slides, E′ E′, are inserted, and the combination so formed is held together by screws or bolts through the ears S′ S′.

To the top of stem J is attached a ball or cross-head carrying lateral guides F′ F′, which

co-operate with slides E′ E′. These provisions permit the stem J freely but accurately to slide up and down within tube D′, and at the same time prevent the screw from turning. They also serve to maintain the burning-point of the carbon in apposition with the point of the under carbon.

The commutator consists of a small cylinder, Z, mounted in frame W. In the upper surface of the cylinder is inserted a strip of non-conducting material, *n*, and directly over this the brush X works. Brush X is insulated, but the current is transmitted by the usual means from the same to the shunt-coils O O. Cylinder Z has a crank-pin, *n′*, at one end, whereby connection by the pitman is made with the pendulum N′ of the shunt-coils. By these means the oscillation of the pendulum N′, by reason of the attraction and repulsion of armature *d*, causes cylinder Z to rotate on its bearings, so that the insulating-piece *n* is rotated out of contact with brush X, and the same is permitted to come into contact with the material of the cylinder Z, thus establishing the circuit directly from the main to the shunt coils.

The shunt-coils O O are similar in construction to the main coils, and are provided with an armature of wedge shape, *d*, attached to the end of a pendulum, N′, hung from the cross-bar F″. A longitudinally-adjustable connecting-rod is pivoted at one end to the crank-pin *e* and at the other end to the armature *d* by a joint-connection, *g*, as seen in Fig. 3. By means of a right-and-left hand screw and nut, N, the length of this connecting rod or pitman may be adjusted. By these appliances the attraction and repulsion of armature *d* impart reciprocating motion to pawl L on arm M, with which the pitman just described is connected. By the reciprocation of pawl D, working in engagement with ratchet K, an intermittent progressive rotary movement is imparted to nut I, with which the ratchet K is connected, and thereby the carbon-holder is intermittently lowered.

From the axis of pendulum N a short arm, Q, is erected, which is connected by means of a retractile spring with a fixed bracket, T″, connected with the frame of the lamp. The tension of spring S″ is adjusted by screw R. The repellent movement of armature *d* is limited by set-screw S. The normal course of the current is from the dynamo or other source of supply to the main magnets C C, thence through the structure of the upper-carbon holder to the upper carbon, and from that through the lower carbon to the source.

The lamp is equipped and operated as follows: Any suitable or convenient device may be used to hold the lower carbon or electrode, which should be isolated by insulation from the upper-carbon holder. The carbon-holder should be shoved up high enough to insert the carbon in the clamp-socket A′, where it is secured by screw C′. It may then be lowered to its approximate adjustment, or until the points of the two carbons are in contact, by throwing nut I out of engagement with the ratchet-thread of the stem J, which is easily done by depressing thumb-piece *e′*. Contact between the carbons being established, the current is turned on, whereby the magnet-cores are magnetized and armature H′ is drawn into contact therewith, whereby the position seen in Fig. 2 is established. This movement, acting through bracket F and stirrup G, which is pivoted to an appurtenance of the carbon-holder, produces an elevation of the carbon-holder, and consequently a separation of the carbon points whereby the arc is established. This status is maintained until the interval between the carbon points, by reason of the consumption of the ends of the carbons, has become so great and the resistance to the passage of the current by this path so high that it seeks a passage through the commutator, the principle of construction being such that when the resistance offered by the non-conductor *n* of the commutator is less than that offered by the interval between the points of the carbons the current will follow the path of least resistance and pass by the commutator to and through the shunt-coils. As a result of this diversion of the current, the shunt-coils become magnets, and, by attracting armature *d* through the before-described connecting-pitmen, cause a movement of ratchet K in the direction to rotate the nut I, so as to let the ratchet screw-stem and attached carbon down, and at the same time rotating the commutating-cylinder, so as to throw the resisting-piece *n* into the circuit, whereby the same, in obedience to the law of following the line of least resistance, seeks its normal path through the carbons, as in the first instance. This operation is repeated as often as the preponderance of resistance is transferred from the route through commutator to the interval of the arc.

If found necessary or desirable, sectional nuts similar to nut I may be applied at other points about the threaded stem.

Hence we claim—

1. In an electric-arc lamp employing a movable and a stationary carbon, a holder for the movable carbon provided with a screw-threaded stem, a rotating sectional nut with which such stem engages, said nut being in combination with a concentric ratchet, and a pawl actuated by the movement of the armature of a shunt-magnet, when constructed and arranged to operate substantially in the manner set forth.

2. In an electric-arc lamp, a vertically-movable non-rotating carbon-holder having a screw-threaded stem, a hollow cylindrical nut-carrier provided with a concentric ratchet, and a sectional nut adapted to engage with the thread of the screw-stem of the carbon-holder which passes through the center of said carrier, and about which said carrier revolves, a concentric collar for supporting said carrier, which collar is connected with or attached to the armature of the main magnets, substan-

tially as shown, whereby a rising-and-falling movement may be imparted thereto, in combination with a reciprocating or oscillating arm carrying a pawl which actuates said ratchet by means of the vibration of the armature of a shunt-magnet with which said arm is connected, substantially as shown, and for the purposes set forth.

3. The combination of the carbon-holder having stem J and guide-lugs F′ F′, with the tubular guideway D′, having the parallel ribs E′ E′, which co-operate with lugs F′ F′, substantially in the manner described, and for the purposes set forth.

4. In a regulator for arc lamps, the combination of the magnets C C, shunt-coils O O, swinging pendulum-rods N′ and D, armatures H′ and *d*, stirrup G, collar H, cylinder *b*, and nut I, cylinder Z, insulating-piece *n*, and brush X, substantially as set forth.

5. In a regulator for arc lamps, the combination of the magnets C C, swinging rod D, armature H′, arm F, stirrup G, collar H, cylinder *b*, and nut I, provided with thumb-piece *e′* and screw-threaded carbon-holder, substantially as described.

6. In a regulator for arc lamps, the combination of the magnets C C, shunt-coils O O, swinging pendulum-rods N′ and D, armatures H′ and *d*, stirrup G, collar H, cylinder *b*, and nut I, cylinder Z, insulating-piece *n*, brush X, crank-pin *i*, pitman *t*, and turn-buckle H″, substantially as and for the purposes set forth.

In testimony whereof we have hereto subscribed our names, at Hoosick, this 29th day of September, A. D. 1885.

LEWIS WALCOTT SPENCER.
FREDERICK POWERS JAQUITH.

In presence of—
FRANKLIN SCOTT,
C. H. HOUGHTON.