(No Model.) 2 Sheets—Sheet 1.

S. W. RUSHMORE.

ELECTRIC ARC LAMP.

No. 454,294. Patented June 16, 1891.

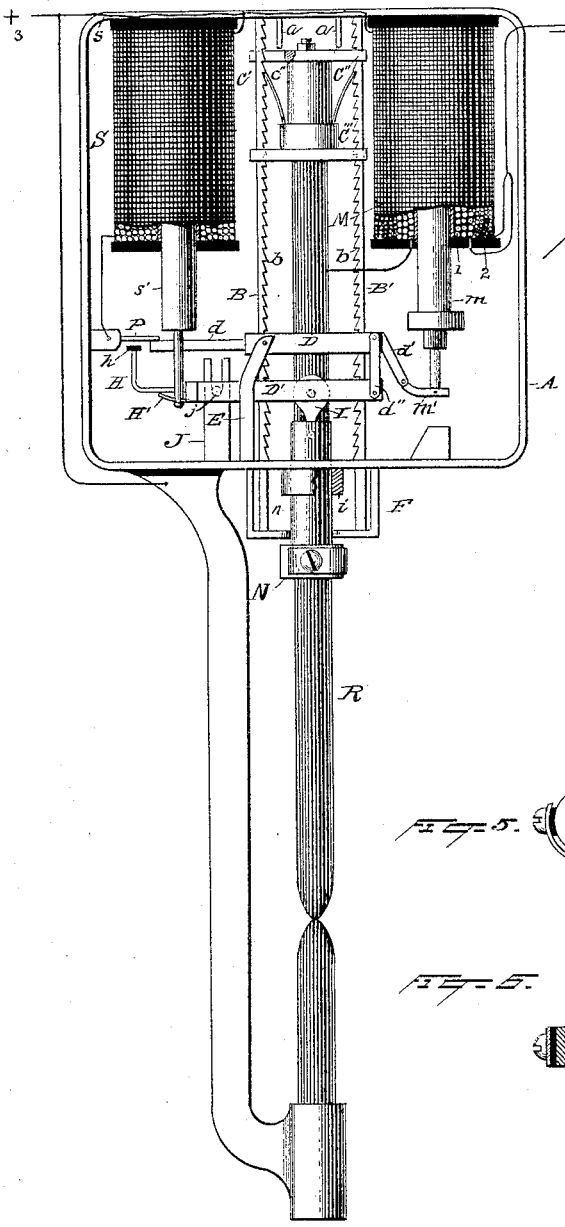


Fig. 5.

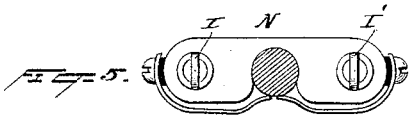
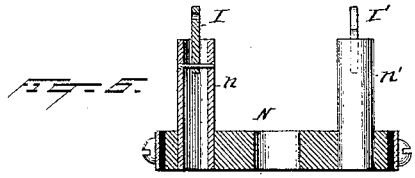


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

S. W. RUSHMORE.

ELECTRIC ARC LAMP.

No. 454,294. Patented June 16, 1891.

Fig. 2.

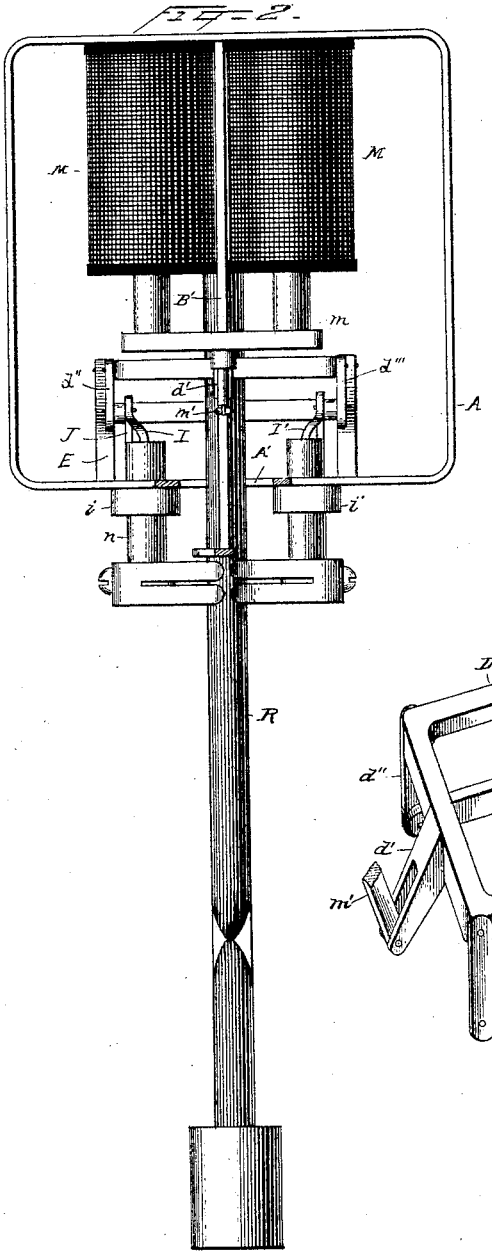


Fig. 4.

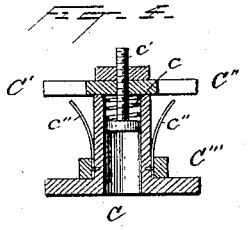
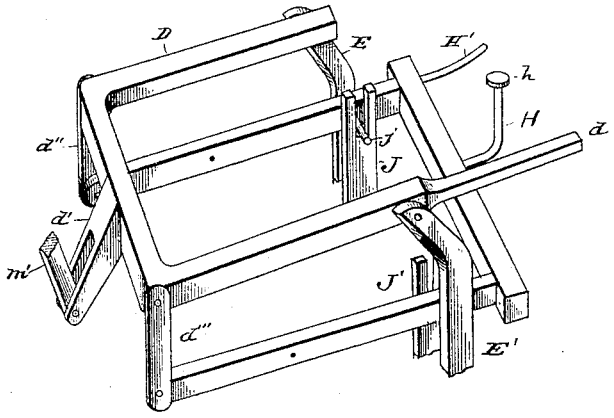


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

SAMUEL W. RUSHMORE, OF BROOKLYN, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 454,294, dated June 16, 1891.

Application filed December 10, 1890. Serial No. 374,255. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL W. RUSHMORE, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following, with the accompanying drawings, is a specification.

My invention relates to improvements in arc lamps, and is designed to provide a simple and effective means for controlling the movable carbon-rod to establish the arc; and the invention consists in the novel features of construction and in the several combinations hereinafter set forth and claimed.

In the drawings, Figure 1 is a front elevation of the lamp, the frame being in section. Fig. 2 is a side view of the lamp. Fig. 3 is an enlarged perspective of the pivoted frame forming a part of the feeding mechanism. Fig. 4 is a vertical central section of the follower which rests upon the movable carbon-rod. Fig. 5 is a top view of the carbon-rod clamp. Fig. 6 is a central vertical section through the clamp and one of its supporting-slides.

A is a box or casing in which the working mechanism of the lamp is mounted and into which the movable carbon R extends through an opening A′ in the bottom of the casing. On either side of said carbon or the carbon-carrying rod is a guide B B′, secured at the top of the case, and extending at the bottom through the opening A′ in the case and being steadied or supported by a bracket F. These guides are provided with ratchet-teeth *b*, which are adapted to co-operate with the spring-pawls *c*″, which project from the body of the follower C. The construction of said follower is shown most clearly in Figs. 1 and 4. The body of the follower consists of a cylinder adapted to fit over the upper end of the carbon-carrying rod. Within the tube is a sliding pin *c*′, pressed downward by a spiral spring *c*.

C′ C″ are projecting arms, adapted to slide over the guides, as shown in Fig. 1.

C‴ is a ring surrounding the body of the follower and the spring-pawls. This ring serves, when raised on the body of the follower, to hold said pawls away from the guide-bars. The ring can be raised upon the sleeve by allowing the follower to drop below the floor of the lamp through opening A′, where it can be reached by the hand. Projecting downward from the top of the casing are two pins *a a*′ in position to strike the top of the ring C‴ and push it down when the carbon-carrying rod is pushed entirely up.

M is a compound magnet—that is, a magnet having two coils, one of which is in series with the arc and the other of which is in a shunt thereto. This is shown most clearly in the diagram Fig. 1, in which 1 is the main coil and 2 the shunt-coil. This magnet is provided with an armature *m*, which is connected to the arm *m*′, which in turn is pivoted to the arm *d*′ of the section D of a double-pivoted frame. Said part D is pivoted to the posts E E′ and has a projecting arm *d*, which rests under the pivoted or spring-circuit terminal P. The lower part of the frame D′ is pivotally connected with the links I I′, which are connected with the tubes *n n*′, said tubes being adapted to slide freely in the collars *i i*′, secured to the floor of the lamp-case and carrying at their lower ends the friction-clamp N, the construction of which is most clearly shown in Fig. 5. The tension of the springs of the clamp on the carbon-rod is so adjusted that said rod will not move through the clamp under the influence of gravity and accidental jars, but will be held by the clamp and moved forward therewith, but when the carbon-rod is held from moving away from the arc and said clamp is raised by a suitable force (such as magnet S) the clamp will slide over the rod. Said part D′ is also provided with projecting pins *j*, adapted to rest in the slots in the upper end of the brackets J J′. This part of the frame is provided with an arm H, having an insulated knob *h* at the end under the terminal P. The parts D D′ are connected by links *d*″ *d*‴.

S is a second magnet, having an armature *s*, which engages the arm H′ of the lower section of the double-pivoted frame, so that when the armature is raised the pins *j* will ride up in the slots in which they rest, and the clamp N will also be raised.

Referring now to Fig. 1, the circuits will be described. 3 is the positive terminal of the lamp, and 4 the negative terminal. The first-mentioned terminal is connected to the

lower carbon, thence through the upper carbon to the coarse or series coil 1, and then to the negative terminal of the lamp. The shunt-coil extends from the positive terminal by wire 5 through the shunt-coil 2 to terminal 4. Magnet S is in a circuit leading from terminal 3 to terminal P, and when said terminal is in contact with arm *d* the circuit is completed to the upper-carbon rod and to the opposite terminal of the lamp.

The operation of the lamp will now be set forth. When the lamp is out of use, the upper carbon is down in contact with the lower carbon. In this position the double-pivoted or rocking frame is so tilted that knob *h* presses up against terminal P, raising the latter from arm *d*, thus holding the circuit of magnet S open. When the circuit is first closed to the lamp, the series coil 1 is energized, armature *m* raised, and through said armature and the pivoted frame the clamp N is raised, thereby raising the carbon R by compressing spring *c* in the follower and establishing the arc. This at once causes current to pass through the shunt-coil 2, which coil tends to counteract the series coil and to lower the armature *m*. As the carbons burn away, therefore, the upper carbon is gradually carried down by the clamp under the influence of the shunt-coil. When this feeding movement has progressed a certain distance, the arm *d* will strike the terminal P, closing the circuit through magnet S. This immediately raises armature *s'* and the lower section of the pivoted frame, and at the same time raising the clamp N, whereby it is enabled to grasp the carbon at a point farther from the arc. The carbon does not move up with the clamp, for the reason that it is locked from movement away from the arc by the pawls of the follower C. As D' is raised the knob *h* is carried. When the frame has been raised a certain distance, it strikes the terminal P and raises said terminal away from the arm *d*. This breaks the circuit of magnet S and gives increased power to the main magnet, which then operates to maintain the normal arc.

Without limiting myself to all the details as described, what I claim is—

1. The combination, in an arc lamp, of carbons and means for controlling the same to establish an arc, said means consisting of a yielding follower upon one of said carbons, but normally held from movement away from the arc, a fixed coil or magnet, an armature for said coil, and a connection between the armature and movable carbon, whereby when the coil is energized the yielding follower is compressed and the carbon is raised, substantially as described.

2. The combination, in an arc lamp, of carbons and means for controlling the same to establish an arc, said means consisting of a yielding follower upon one of said carbons, but normally held from movement away from the arc, a fixed coil or magnet, an armature for said coil, a connection between the armature and movable carbon, whereby when the coil is energized the yielding follower is compressed and the carbon is raised, and means for unlocking the follower, so that it may be moved away from the arc, substantially as described.

3. The combination, in an arc lamp, of a frame, a magnet comprising a main and a shunt coil, an armature for the magnet, one of said parts being supported in a fixed position by the frame, a movable carbon, a clamp which grasps said carbon, a yielding follower, an armature for the magnet, having a connection with the clamp, whereby when the magnet is energized the carbon is raised and the arc formed and then the carbon is fed forward, substantially as described.

4. The combination, in an arc lamp, of a frame, a magnet comprising a main and a shunt coil, an armature for the magnet, one of said parts being supported in a fixed position by the frame, a movable carbon, a clamp which grasps said carbon, a yielding follower, an armature for the magnet, having a connection with the clamp, whereby when the magnet is energized the carbon is raised and the arc formed and then the carbon is fed forward, a second magnet normally inoperative, but brought into an operative circuit by movement of the clamp toward the arc, an armature for said magnet, and a connection between the armature and clamp for moving the latter away from the arc, substantially as described.

5. The combination, in an arc lamp, of a frame, a magnet comprising a main and a shunt coil, an armature for the magnet, one of said parts being supported in a fixed position by the frame, a movable carbon, a clamp which grasps said carbon, a yielding follower, an armature for the magnet, having a connection with the clamp, whereby when the magnet is energized the carbon is raised and the arc formed and then the carbon is fed forward, a second magnet normally inoperative, but brought into an operative circuit by movement of the clamp toward the arc, an armature for said magnet, a connection between the armature and clamp for moving the latter away from the arc, and a circuit-breaker in circuit with the latter magnet, substantially as described.

6. The combination, in an arc lamp, of carbons, one of which is movable, a clamp which grasps the movable carbon with sufficient force to hold it from moving through the clamp by gravity or from the effect of accidental jars, but which will yield to allow the clamp to slide over the carbon when the clamp is raised, a follower on the carbon, which moves toward the arc as the carbon consumes, but which is locked against reverse movement, a magnet, and an armature therefor connected to the clamp for raising it, substantially as described.

7. The combination, in an arc lamp, of suit-

able carbons, one of which is movable, a clamp for said carbon, a series coil and an armature therefor connected with the clamp for establishing the arc, a shunt-coil acting against the series coil, a third coil having an armature connected to the clamp for raising it, and means for holding the carbon from movement away from the arc, substantially as described.

8. The combination, with a movable carbon of an arc lamp, of a clamp which grasps the carbon sufficiently to raise it if it is free to move, but which will yield to slide over the carbon if the latter is not free to move, a magnet or coil, an armature to move the clamp and carbon, a second magnet and armature connected to the clamp to move it, and a follower to hold the carbon while the second magnet acts, substantially as described.

9. The combination of an arc-lamp carbon, feeding devices therefor, a follower consisting of a sleeve adapted to fit the carbon or carbon-holder, a yielding head in the sleeve, one or more pawls on the outside of the sleeve, and a guide or guides, substantially as described.

10. A follower for arc lamps, consisting of a sleeve adapted to fit the carbon or carbon-holder, a yielding head in the sleeve, and one or more pawls on the outside of the sleeve, in combination with a guide-bar or guide-bars provided with means for engaging the same, substantially as described.

11. A follower for arc lamps, consisting of a sleeve adapted to fit the carbon or carbon-holder, a yielding head in the sleeve, and one or more pawls on the outside of the sleeve, in combination with a guide-bar or guide-bars provided with means for engaging the same, and means for holding the pawls out of engagement when the follower is moved away from the arc, substantially as described.

12. A follower for arc lamps, consisting of a sleeve adapted to fit the carbon or carbon-holder, a yielding head in the sleeve, and one or more pawls on the outside of the sleeve, in combination with a guide-bar or guide-bars provided with means for engaging the same, means for holding the pawls out of engagement when the follower is moved away from the arc, and means for releasing the holding device at the end of the movement of the follower, substantially as described.

13. The combination, in an arc lamp, of a reciprocating clamp for the movable carbon, two magnets, and armatures, the armatures being operatively connected to the clamp and each magnet attracting its armature in the direction to raise the clamp, said magnets being in circuit alternately, substantially as described.

14. The combination, in an arc lamp, of a reciprocating clamp for the movable carbon, a holder for the clamp, consisting of a double-pivoted frame, and two magnets and armatures therefor, said armatures being connected, respectively, to the two parts of the frame, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 18th day of September, 1890.

SAMUEL W. RUSHMORE.

Witnesses:
H. S. SPRAGUE,
F. B. S. MORGAN.