(No Model.) 2 Sheets—Sheet 1.

F. BUCHANAN.

ELECTRIC ARC LAMP.

No. 452,633. Patented May 19, 1891.

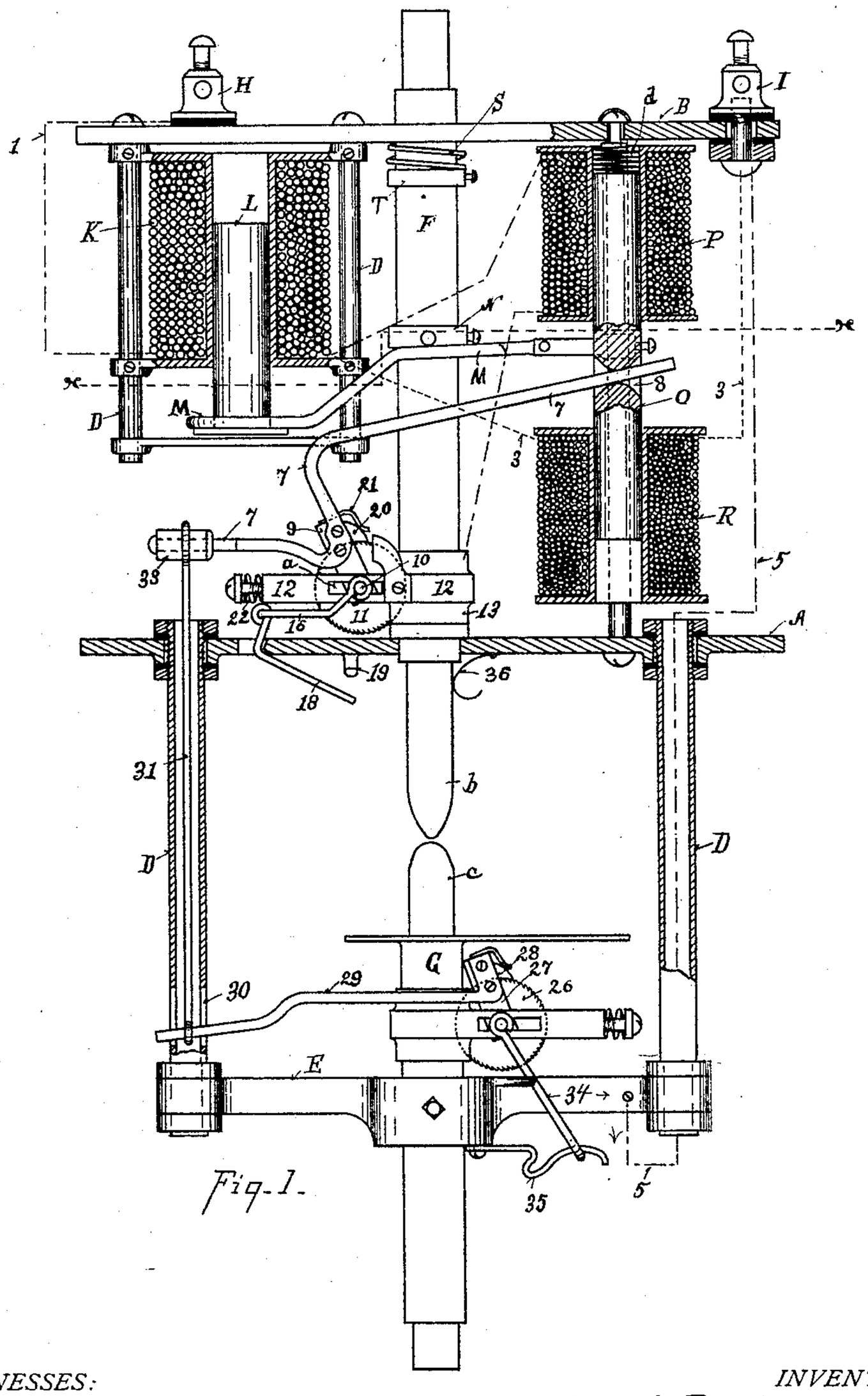

Fig. 1.

WITNESSES:

C. W. Miles.

T. Simmons

INVENTOR

Frank Buchanan

BY Wood & Boyd

HIS ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

F. BUCHANAN.

ELECTRIC ARC LAMP.

No. 452,633. Patented May 19, 1891.

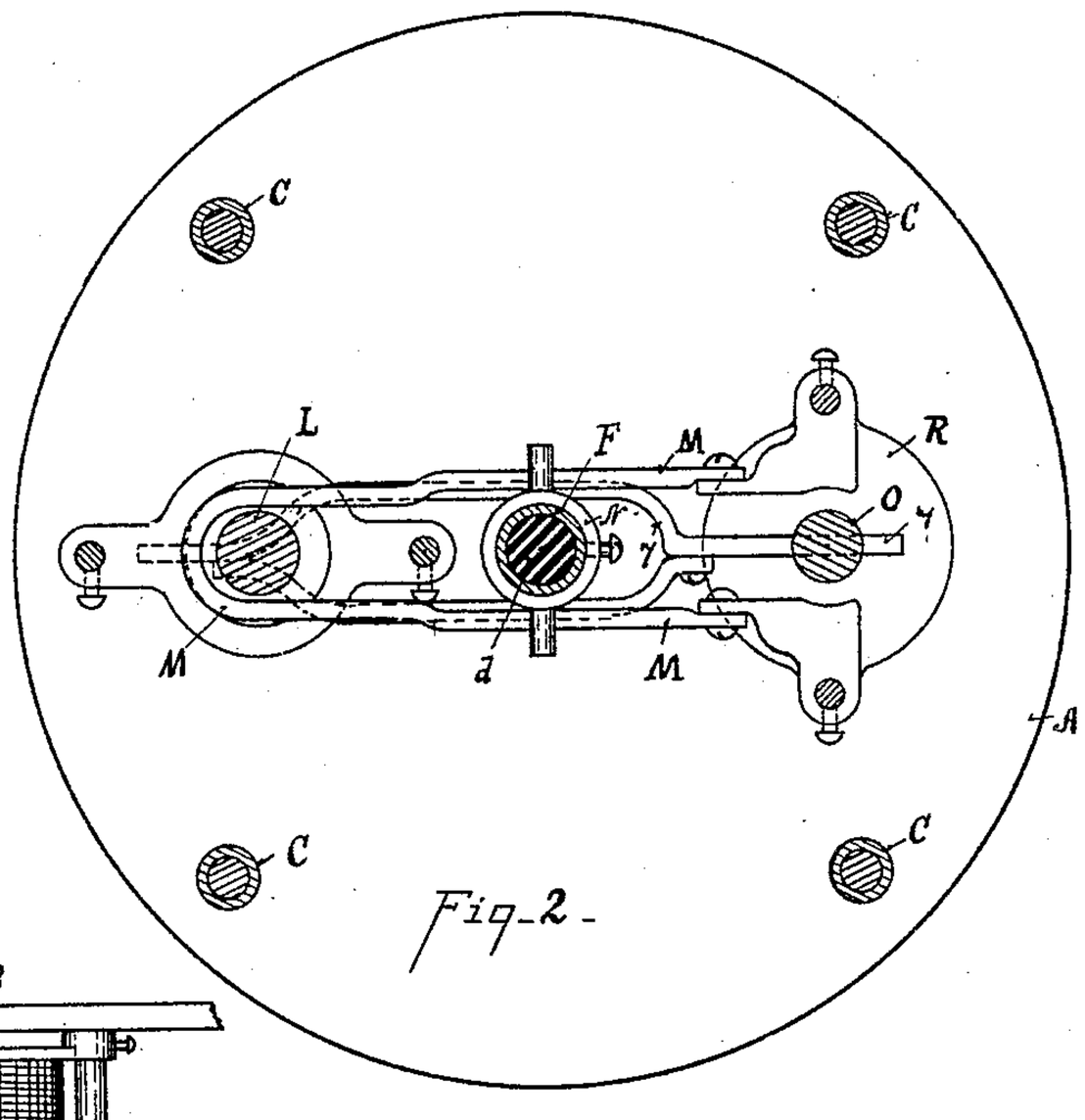

Fig. 2.

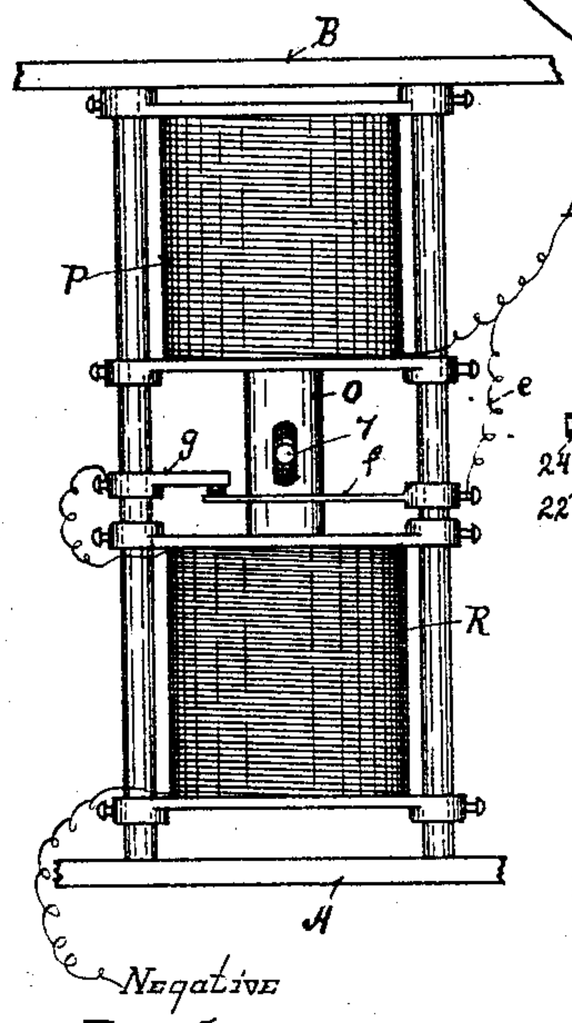

Fig. 5.

Fig. 3.

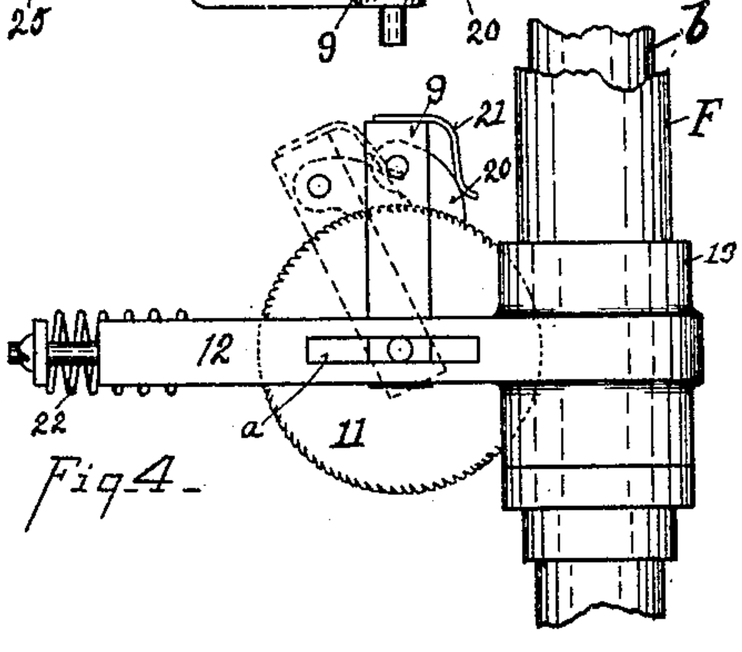

Fig. 4.

Witnesses
C. W. Miles.
P. Simmons

Inventor
Frank Buchanan.
By his Attorneys Wood & Boyd.

UNITED STATES PATENT OFFICE.

FRANK BUCHANAN, OF LIMA, OHIO.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 452,633, dated May 19, 1891.

Application filed January 9, 1891. Serial No. 377,227. (No model.)

To all whom it may concern:

Be it known that I, FRANK BUCHANAN, a citizen of the United States, and a resident of Lima, in the county of Allen and State of Ohio, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

This invention has for its object to provide novel means for feeding the carbons of an electric-arc lamp; and it consists in the features of construction and the combination or arrangement of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a sectional elevation of my improvement in position for use. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is a top plan view of Fig. 4. Fig. 4 is a detail elevation of the carbon-feeding mechanism. Fig. 5 is a modification showing an automatic cut-out for the shunt-magnet.

A represents the bottom disk of the lamp-frame; B, the top disk.

C represents posts connecting the disks A B together.

D represents pendent posts projecting down from the disk A and supporting the bridge-tree E, which supports the lower-carbon holder.

F represents the upper-carbon holder, and G the lower-carbon holder. These carbon-holders or sleeves F and G are open at either end, so as to allow the carbon to project up and down at any desired length.

H represents a binding-post which receives the positive line-wire; I, the opposite binding-post for holding the negative line-wire.

K represents a magnet forming the cross-wire and connected in the main circuit by wire 1.

L represents the armature of the magnet, to the lower end of which is attached a lifting-lever M. This lever engages with the collar N, fastened to the sleeve F, so as to raise the carbon-holder and lift the carbon for the initial formation of the arc. The lever N is pivoted at each end to brackets secured to the supporting-rods of magnets P and R.

P represents a secondary magnet connected in circuit with the magnet K. This magnet is not essential, as its office is chiefly to suspend the armature O, which serves as an axial core of magnet R. This magnet is connected in shunt-circuit by means of wire 3, connected to magnet R, and wire 4, connected to wire 5, which connects with the negative post I. When the magnet P is omitted and the spring *d* is employed to suspend the axial core O, magnet R is connected in circuit directly to magnet K by wire 3, as shown in dotted lines. Said magnet R is of fine wire, having greater resistance than the magnet P, and performs the function of feeding the carbon by the following mechanism:

7 represents a lever, the free end of which engages in the slot 8 of the core O. It is mounted upon a rocking standard 9.

10 represents the axle or shaft of said standard, which also serves as the axle or shaft of the feeding-clutch 11. This axle or shaft is journaled in the yoke 12, which is fastened to collar 13, which is in turn secured to the sleeve F.

a represents a slot in the yoke 12, so as to allow the axis of the feeding-clutch 11 to be moved away from contact with the carbon. The sleeve F and collar 13 are slotted, so as to allow the feeding-clutch 11 to come in contact with the upper carbon *b* and have firm frictional contact therewith. The face of said revolving clutch 11 is preferably made concave and serrated, so as to maintain a frictional contact of the clutch with the carbon and hold it in any desired fixed position.

16 represents a yoke connected to the axis 10 of the clutch 11.

18 represents a lever or catch which when lifted up engages with the hook 19 for holding the axis 10 and the friction-clutch 11 away from contact with the carbon, so that the said carbon may be taken out and renewed by hand.

20 represents a pawl pivoted upon the standard 9, the teeth of which engage with the serrated face of the clutch 11. 21 represents a spring for holding said pawl normally in engagement with said teeth.

22 represents a spring for holding the clutch 11 in contact with the carbon. The preferred form of obtaining this contact is by means of the yoke 23, which passes around the inside of the yoke 12, engages upon the axis 10, and

is provided with the stud 24, passing through the cross-bar 25, so as to allow said clutch-wheel 11 to move laterally upon its axial supports.

If it is desired to feed up the lower carbon as well as the upper carbon, this is accomplished by a similar mechanism; but, instead of duplicating the mechanism for feeding the upper carbon and providing a magnet to control it, I have reversed the position of the standard-and-pawl mechanism, 26 representing the friction-clutch wheel, 27 the rocking standard, 28 the pawl, 29 a lever projecting back and passing through slot 30 in one of the sleeve-posts D, and 31 representing a connecting-rod engaging-lever 30 with the extreme end of the lever 7, upon which is mounted a glass cylinder 33, so as to insulate the lever 29. When connected in this manner, the magnet R operates simultaneously the clutch-wheels 11 and 26 by moving the pawls 20 and 28, thereby moving the upper carbon downward and the lower carbon upward simultaneously by the movement of the axial core 0.

34 represents a lever; 35, a catch for moving rocking standard 27 and the clutch-wheel downward, so as to release the lower carbon *c* and allow it to be removed. The clutch-wheels 11 and 26 will normally hold the carbons *b c* in a fixed position.

S represents a spring interposed between the collar T and the top plate B, so as to normally hold the carbon-holder down and keep the carbons *b c* in contact.

Mode of operation: The carbons *b c* are placed in position with their points touching. When a lamp is connected up in circuit, the magnet K raises the armature L, and lifts the upper-carbon holder F upward so as to form the arc between the points of the carbons *b c*. The armature O being raised either by the spring *d* or by the magnet P, the standards 9 and 27 are rocked backward and the pawls 20 and 28 are in engagement with the clutches 11 and 26 ready for feeding. The magnet R, being in shunt-circuit is energized as the resistance increases by increasing the distance between the carbons *b* and *c*. As said magnet is energized the lever 7 is drawn forward by the downward movement of the axial core O, thereby turning the friction-clutches 11 and 26 and bringing the points of the carbons *b* and *c* in contact as the lever 7 is actuated by the armature O. As the energy of the magnet R decreases the magnet P raises the core O, carrying the standards 27 and 9 backward, the pawls 20 and 28 slipping over the friction-clutch wheels 11 and 26. As the carbons *b c* are burned away the magnet R is again energized and feeds the carbons *b c* forward in like manner.

36 represents one or more springs attached to a plate A and in contact with the carbon *b*, so as to insure an electrical contact of the said carbon at or near the point. By means of the construction herein shown the carbons *b c*, either one or both, may be made of great length, so as to last for a long time. In order to secure the proper adjustment of the carbon when the lamp is in any position and to prevent the shunt-magnet from feeding the carbon too far, I have provided an automatic cut-off having a shunt-magnet circuit, as shown in Fig. 5. The circuit in this case is made by wire *e*, through spring-lever *f*, contact *g*, which are placed in such relation to the axial core O that when the lever 7 is descended to the right point it strikes the spring *f* and separates it from metallic contact with the bar *g*, thus cutting the magnet R out of circuit and arresting the forward movement of the feeding-lever. When the axial core O is raised by the magnet P, the shunt-circuit is again established and ready for the operation described.

It is obvious that either the upper or lower feeding mechanism may be employed alone and one of the carbons may be fed, thus employing the feeding mechanism herein shown and described. I do not wish to limit myself to the details of constructing this feeding mechanism, as they may be variously modified and still accomplish the same general results. I believe I am the first to employ a revolving friction-clutch operated by a shunt-magnet in an electric lamp so as to insure a continuous and positive feeding of either one of the carbons forward to maintain the arc as the carbons are burned away. I believe I am also the first to obtain a positive feed without the use of a rod, chain, screw, or cord. Another advantage obtained by the construction herein shown is that when a series of lamps are in the same circuit and the carbons of one of the lamps are so nearly consumed that the end passes the center of the clutch-wheels they spring the carbons together, close the circuit, and thus cut out the resistance of the lamp without interfering with the other lamps in the circuit.

This lamp is especially adapted as a headlight because of the positive movement of the feeding mechanism, which avoids flickering and secures a uniform and steady feed.

Having described my invention, what I claim is—

1. In an electric lamp, the combination, with the carbon-holder, of a yoke-frame attached to the carbon-holder, a rotating friction-clutch wheel having its axle or shaft journaled upon the yoke and movable to and from the carbon, the shunt-magnet R, having a longitudinally-movable axial core O, and pawl-and-lever mechanism engaged with and positively moved by the longitudinally-movable core of the shunt-magnet to rotate the friction-clutch wheel in a direction to feed one carbon toward the opposite carbon, substantially as described.

2. In an electric lamp, the combination, with upper and lower carbon holders, of a yoke-frame attached to each carbon-holder, a rotating friction-clutch wheel journaled upon

each yoke, a pawl for turning each wheel, a lever for actuating each pawl, connections between the two levers, and means, substantially as described, for simultaneously operating both levers to rotate the friction-clutch wheels in unison, substantially as described.

3. In an electric lamp, the combination, with an upper-carbon holder, of a yoke-frame attached to the carbon-holder, a rotating friction-clutch wheel having its axle or shaft journaled upon the yoke-frame and movable to and from the carbon, a rocking standard journaled upon the axle or shaft of the friction-clutch wheel and carrying a pawl acting to rotate the said wheel, the shunt-magnet R, and the lever 7, operated by the magnet and secured to the rocking standard for rotating the friction-clutch wheel in a direction to move one carbon toward the other, substantially as described.

4. In an electric lamp, the combination, with the slotted carbon-holder, of a longitudinally-slotted yoke-frame attached to the carbon-holder, a rotating friction-clutch wheel having its axle or shaft movable along the slotted part of the yoke-frame, a pawl for rotating the friction-clutch wheel in a direction to feed the carbon, a swinging lever connected with and operating the pawl, and a shunt-magnet R, having a longitudinally-movable core O engaged with and positively moving the lever in both directions, substantially as described.

5. In an electric lamp, the combination, with a carbon-holder having an attached frame carrying a rotating friction-clutch wheel, of the magnet K, arranged in the main circuit and having the lengthwise-movable core L, the magnet R, arranged in a shunt-circuit and having the lengthwise-movable core O, the lifting-lever M, engaging the carbon-holder and having its opposite ends respectively connected with the cores of the two magnets, and lever mechanism actuated by the core of the shunt-magnet to rotate the friction-clutch wheel in the direction required to move one carbon toward the other, substantially as described.

6. In an electric lamp, the combination of the upper and lower carbon feeding mechanism, consisting, substantially, of the revolving clutches 11 and 26, with the standard and pawl carrying mechanism mounted upon the axial center of said clutches and operated through lever and connecting-rod mechanism by the axial core O, substantially as specified.

7. In an electric lamp, the combination, with the upper-carbon holder F, of the slotted yoke-frame 12, attached to the carbon-holder, the rotating friction-clutch wheel having its axle or shaft journaled in the slotted part of the yoke-frame and movable to and from the carbon, a yoke or frame 23, engaging the axle or shaft of the friction-clutch wheel and provided with a stud 24, a spring 22, arranged upon the stud and acting to press the yoke or frame and friction-clutch wheel toward the carbon, and a lever and catch 18 19 for holding the wheel and its yoke or frame retracted, substantially as described.

8. In combination with the axis 10 of the laterally-moving clutch 11, the spring 22, lever 16, and catch 19 for compressing the spring 22 and holding the clutch from contact with the carbon, substantially as specified.

9. In an electric lamp, the combination, with the upper-carbon holder and clutch, of lever mechanism for operating the clutch, a shunt-magnet R, having a lengthwise-movable core O, which actuates the lever mechanism to feed one carbon toward the other, and a circuit-breaker actuated by the lever which transmits motion to the friction-clutch for arresting the action of the shunt-magnet, substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK BUCHANAN.

Witnesses:
A. C. BUCHANAN,
ELSIE SHOEMAKER.