(No Model.)

L. H. BUCHANAN.

ELECTRIC ARC LAMP.

No. 502,948. Patented Aug. 8, 1893.

Fig. 1,

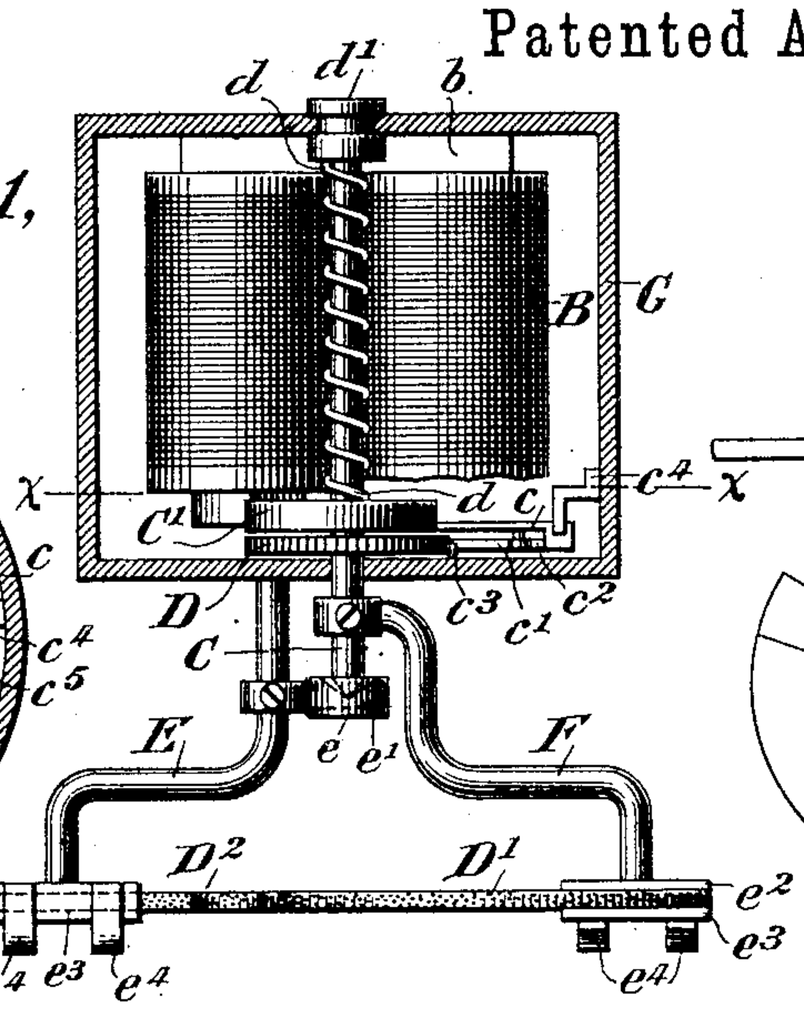


Fig. 2,

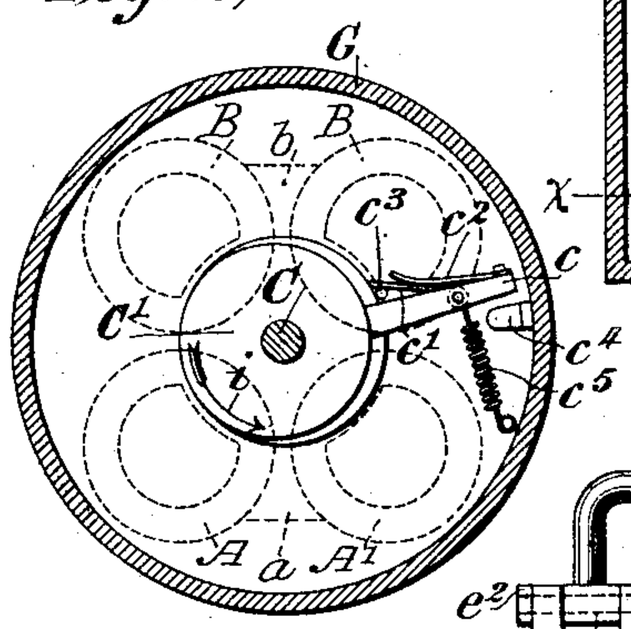


Fig. 5,

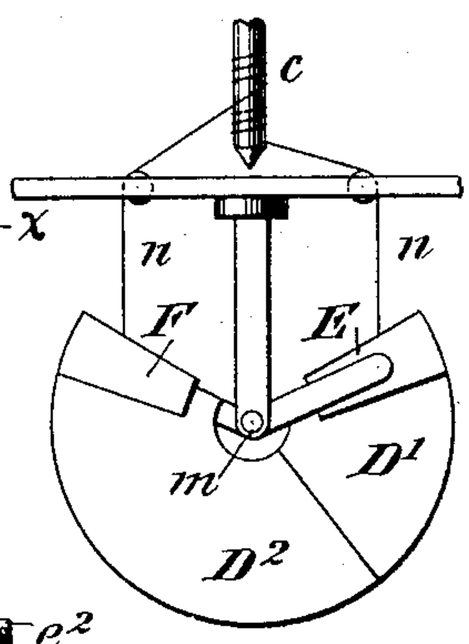


Fig. 4,

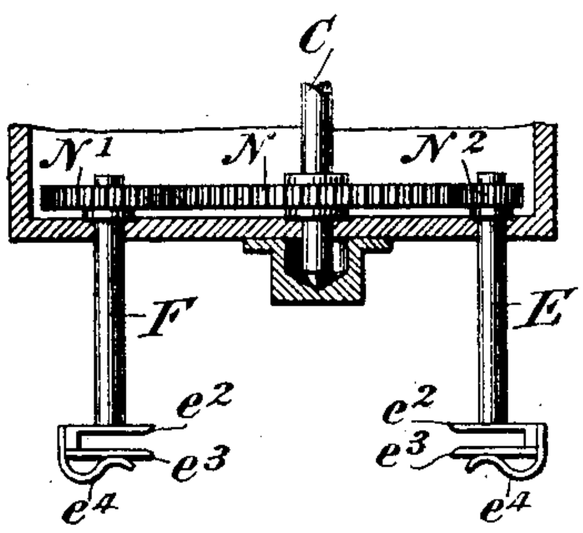


Fig. 3,

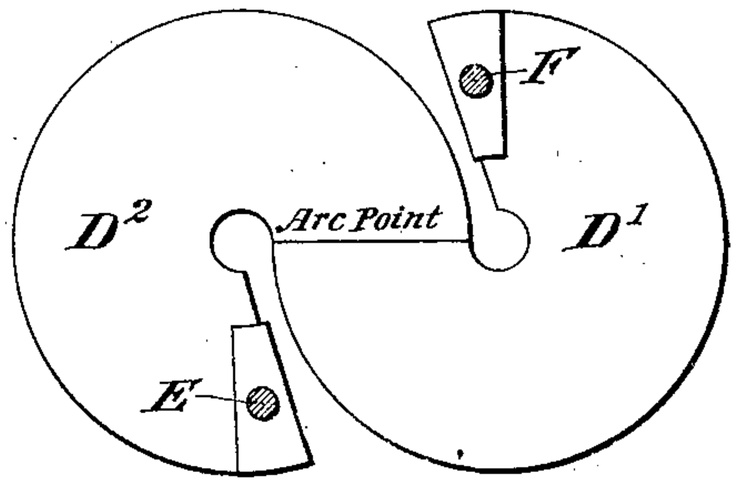


Fig. 6,

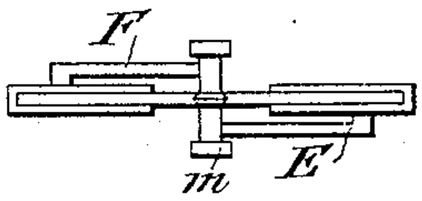
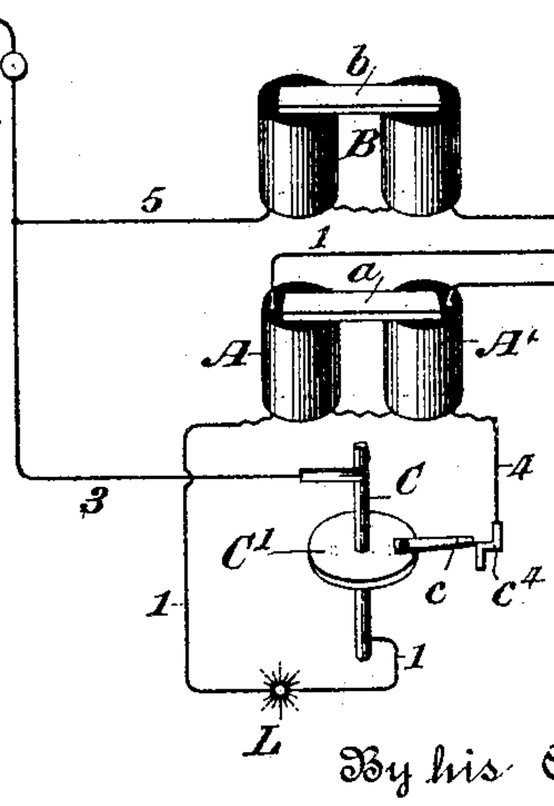


Fig. 7.



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UNITED STATES PATENT OFFICE.

LUTHER H. BUCHANAN, OF PASADENA, CALIFORNIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 502,948, dated August 8, 1893.

Application filed September 25, 1891. Renewed January 5, 1893. Serial No. 457,399. (No model.)

To all whom it may concern:

Be it known that I, LUTHER H. BUCHANAN, a citizen of the United States, residing in Pasadena, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention is directed particularly to improvements in electric arc lamps of the type disclosed in a prior patent granted to me by the United States on the 3d day of March, 1891, and numbered 447,746, and has for its objects, first, the arrangement and adaptation of parts in the type of lamp disclosed in the aforesaid patent in such manner as to make it more delicate and certain in its operation; second, the adaptation of an automatic cut out apparatus for use in connection with that type of lamp; and, third, the location and arrangement of the carbon feeding attachments in such manner that carbon sectors of larger area may be used, thereby affording a greater length of use for a single set of carbon disks than is possible with the apparatus and style of carbon feeding devices disclosed in the aforesaid patent. I accomplish these several results with the aid of the apparatus hereinafter described the essentially novel features of which are particularly pointed out in the claims at the end of this specification.

In my prior patent the carbon disk supporting arms are both adapted to rotate in opposite directions around a common center so that the carbon sectors which lie in the same plane cannot in any instance be of greater dimensions than that approximating the half of a circle.

In my present invention by reason of the location of the carbon feeding arms in such manner that they either one or both turn about different centers of support, I am enabled to very materially increase the area or size of both of the carbon disks, thereby proportionately increasing the effective or commercial life of the lamp. By reason of the automatic cut out attachments which I provide I am also enabled to protect the lamp against the evil effects of abnormal currents, such as occur on the breaking of one of the carbons.

My invention will be fully understood by referring to the accompanying drawings in which like letters of reference represent like parts wherever used.

Figure 1 is a vertical sectional view of the entire lamp showing the operative parts in part in side elevation in the body or case of the lamp. Fig. 2 is a horizontal sectional view taken through Fig. 1 on the line *x x* and as seen looking from the top toward the bottom of the drawings, the controlling electro-magnets being illustrated in plan view in dotted lines. Fig. 3 is a plan view of my improved enlarged form of disk carbons. Fig. 4 is a part sectional part elevational view illustrating a modified means of regulating the feed of the two disks in accordance with the speed of the consumption thereof so as to maintain the arc always in the same position. Figs. 5 and 6 are side elevational and plan views of a modified form of the lamp, and Fig. 7 is a diagrammatic view illustrating all of the circuit connections.

Referring now to the drawings in detail: G is the case of the lamp inclosing the operative parts thereof consisting essentially of two pairs of electro-magnets A A′, B B, each pair having a common magnetic yoke as *a* and *b* (see Fig. 7). These electro-magnets are secured by their yokes to the upper part of the case G, the inner faces of their lower pole pieces being curved as shown in dotted lines in Fig. 2.

C is a vertical shaft journaled in cone shaped bearings at its opposite ends, the lower bearing *e′* being of non-conducting material supported in a bracket *e* which in turn is sustained by an angular arm E rigidly secured to the under side of the case G, the upper bearing *d′* of said shaft being in the nature of an adjusting nut secured in the top of the case G and having attached to its under surface a spiral spring *d* which surrounds the upright shaft C and is secured thereto at its lower end.

C′ is a disk of magnetic material eccentrically mounted loosely on the upright shaft C so that that edge which is farthest from the shaft C will lie in close proximity to the inner curved faces of the pole pieces of the electro-magnets A and B as it rotates (see Fig. 2).

c is an arm of conducting material carried by the armature C′, its outer end lying in the

path of a fixed conducting stop c^4 secured to the casing G, and c^5 is a retractile spring one end of which is secured to the case G and the other to the outer end of the arm *c*.

c^3 is a stop pin secured to the lower end of one of the pole pieces of the electro-magnet B and lying in the path of a pivoted pawl c' carried also by the arm *c*, the free end of said pawl being adapted to take in the teeth of the ratchet wheel D rigidly secured to the shaft C beneath the armature C', c^2 being a leaf spring carried at the outer end of the arm *c* with its free end bearing upon the pawl c'.

F is a crank-shaped arm secured to the shaft C at a point below the casing G and corresponding in its general contour to the rigid arm E, both of said arms acting as the carbon or electrode supports.

e^2 e^3 are carbon disk clamps provided with springs e^4 adapted to cause the lower portions of the clamps e^3 to firmly grasp the carbon disks D' D^2, said clamps and springs being attached to the lower ends of the arms E and F.

By reason of the angular or bell crank shaped carbon supporting arms E and F, I am enabled to remove the centers of support of the carbon disks to such a distance from each other as to admit of the use of carbon disks, closely approximating in each instance the full arc of a circle, (see Fig. 3) thereby largely increasing the commercial or burning life of the lamp. These disks are eccentrically mounted upon the carbon supporting arms E and F as will be apparent on examination of Figs. 1 and 3.

In the modified form of the apparatus shown in Figs. 5 and 6 the disks D' and D^2 are secured to the arms E and F by a horizontally disposed cross shaft *m*, the outer ends of said arms being connected by cords *n* running over pulleys, said cords being operatively attached to a vertical shaft C which corresponds to the like shaft in Fig. 1 and is controlled in a similar manner.

In the modified form shown in Fig. 4, N is a gear wheel which is secured to shaft C, and N' N^2 are gears meshing therewith and carried respectively by the arms or shafts F and E, the gear wheel N' being of larger diameter than the gear wheel N^2 for the purpose of feeding the carbon carried by the shaft F slower than would be the movement of the carbon carried by the shaft E.

The regulating apparatus for establishing the arc and regulating the feed of the carbon disks in the modified forms shown in Figs. 4, 5 and 6, it will be understood is of course the same as that shown in Figs. 1, 2 and 7, and the operation of said apparatus as applied to Figs. 4, 5 and 6 will be understood after having a clear understanding of the operation of the modified form shown in Fig. 1 which is as follows:

Referring to Fig. 7: Suppose the disks D' and D^2 to be in the position shown in Figs. 1 and 3 with their edges in contact with each other. The current enters the lamp at the plus binding post on the right and passes by wire 1, through the magnet A, the disks D' and D^2 forming the arc at A, thence by wire 2, through shaft C, wire 3 to the minus binding post. At the same time a derived current flows through wire 4, magnet A' which is of slightly higher resistance than the coils of the magnet A, thence by wire 4, contact stop c^4, conducting arm *c*, armature C', shaft C where it joins the other branch and passes by wire 3 to the minus binding post as before. The winding of the two coils A and A' is such that the united effect of their pole pieces causes the armature C' to rotate in the direction of the arrow *i* (Fig. 2) carrying with it the arm *c* and pawl c', the free end of which comes into frictional contact with the ratchet-wheel D carried by the shaft C, thus tending to separate the carbon disks and establish the arc, and at the same time placing the spiral springs *d* and c^5 under additional stress. At the instant that the arm *c* is withdrawn from the contact c^4 the circuit is ruptured through the magnet A' but the magnetic effect of the magnet A is sufficient to maintain the arc after it is once established. As the arc lengthens therefore current is forced into the high resistance shunt 5 through the shunt magnets B, ultimately causing the armature C' under the influence of the pole pieces of said magnets to rotate in a reverse direction until the pawl c' carried by the arm *c* is brought into frictional contact with the pin c^3 thereby releasing the ratchet wheel D and allowing the spiral spring *d* to rotate the shaft C and arm F, and hence bring the carbon disk D' into closer relation with the disk D^2 thereby increasing the effect of the current through the magnet A and causing the armature C' to again be rotated in the direction of the arrow *i*, and the pawl c' to exert its influence on the ratchet wheel D as before. Should the carbon disks D' D^2 break or any abnormal current be thrown through the high resistance shunt B, the armature C' will immediately be rotated in the reverse direction of the arrow until the arm *c* comes into contact with the stop c^4 thereby affording a path of lower resistance to the current through the conductor 4, stop c^4, arm *c*, armature C', shaft C and conductor 3.

I do not limit myself to the details of construction herein enumerated as it is obvious that many of the parts might be materially changed without avoiding the scope of my claims.

I believe it is broadly new with me to eccentrically support a pair of disk shaped carbons which approximate complete circles and my claims in this particular are of a generic nature.

I believe it is also broadly new with me to subject a single disk shaped regulating armature to the influence of a series of concentrically disposed magnetic poles so that it shall rotate in obedience to the magnetic in-

fluence of the surrounding magnets and regulate accordingly the feed of the carbons or equivalent electrodes.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A pair of disk shaped electrodes eccentrically mounted on sustaining arms and each having an area greater than a half circle, substantially as shown and described.

2. A pair of disk shaped electrodes having each an area greater than three-fourths of a circle and sustained by supporting arms attached near their outer edges, substantially as shown and described.

3. In an arc lamp a pair of disk shaped electrodes each approximating a complete circle in area and sustained by an arm located near the outer edge of the disk, in combination with regulating mechanism for establishing the arc and regulating the length thereof, substantially as described.

4. An arc lamp regulator consisting of a disk shaped armature eccentrically and loosely mounted on a shaft in the magnetic field of a series of electro-magnetic poles, in combination with a pair of electrode sustaining arms and connections between the armature and the movable electrode sustaining arm whereby the arc is established and regulated, substantially as described.

5. In an arc lamp a series of regulating electro-magnets having curvilinear poles and a disk armature eccentrically mounted on a shaft and lying in the magnetic field of said poles, in combination with a pair of electrode sustaining arms one fixed and the other movable and mechanical connections between the armature and the movable arm whereby the arc is established and regulated substantially as described.

6. An arc lamp having a pair of disk shaped electrodes sustained each by an arm, a pair of regulating magnets, the poles of which surround a disk like armature having mechanical connections with one of the electrode sustaining arms and an automatic cut out device carried by the armature and adapted to shunt the lamp for abnormal currents, substantially as described.

7. In an arc lamp the combination with a rotary carbon feeding rod of a disk pivoted eccentrically upon said rod a plurality of electro-magnets arranged around the periphery of said disk and adapted to turn the same on its pivot and connections between the disk and carbon rod whereby the latter is caused to partake of the movement of the disk, substantially as described.

8. In an arc lamp the combination with the rotary carbon feeding rod and a wheel rigid thereon, of a disk pivoted eccentrically upon said rod, a plurality of electro-magnets arranged around the periphery of said disk and adapted to turn the same on its pivot, and connections between the disk and the wheel on the carbon rod whereby the latter is caused to partake of the movement of the disk, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LUTHER H. BUCHANAN.

Witnesses:
P. M. GREEN,
J. G. ROSSITER.