(No Model.)

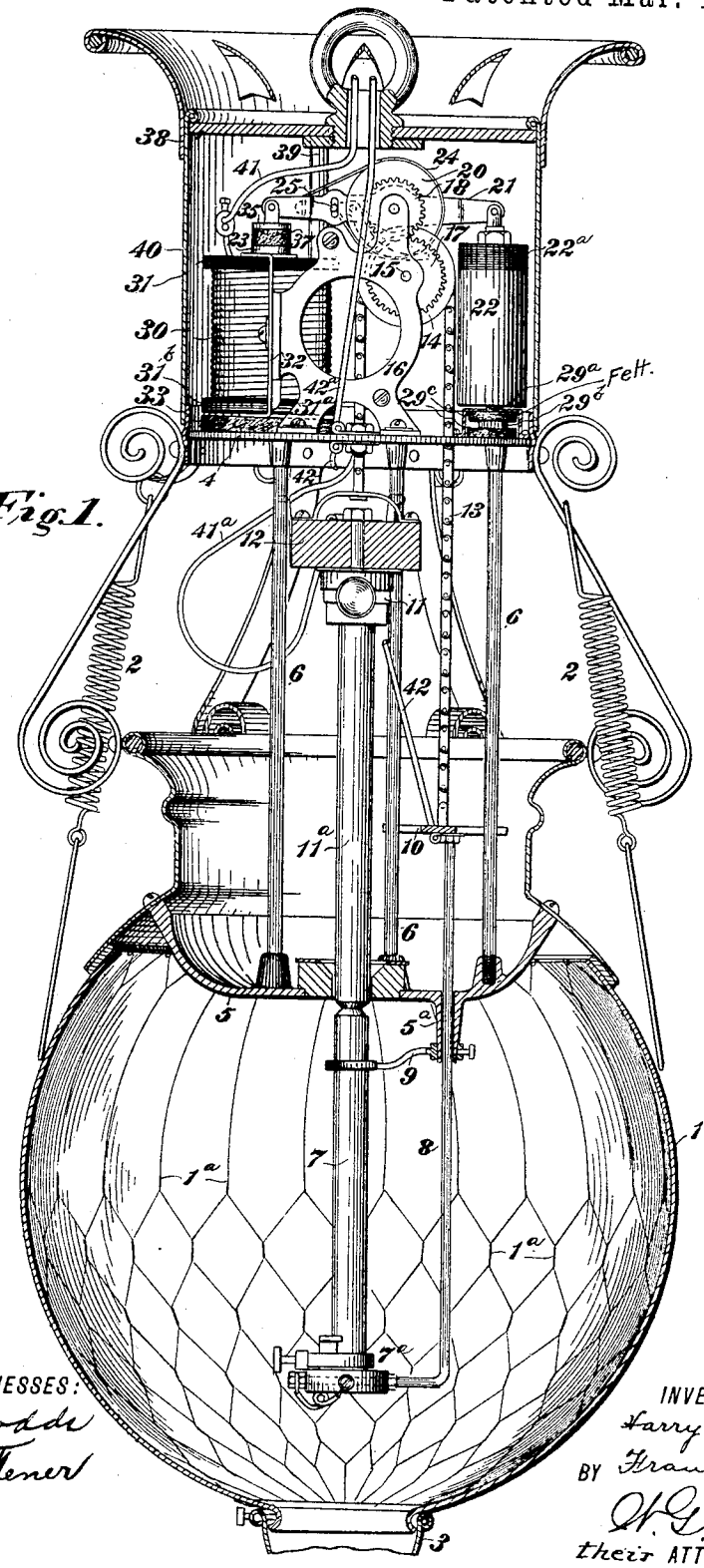
2 Sheets—Sheet 1.

H. P. DAVIS & F. CONRAD.

ELECTRIC ARC LAMP.

No. 599,931. Patented Mar. 1, 1898.

Fig. 1.



WITNESSES:

Edwin J. Dodds

Hubert C. Tener

INVENTORS

Harry P. Davis

BY Frank Conrad

H. G. Carr

their ATTORNEY.

(No Model.)

2 Sheets—Sheet 2.

H. P. DAVIS & F. CONRAD.

ELECTRIC ARC LAMP.

No. 599,931. Patented Mar. 1, 1898.

Fig. 2

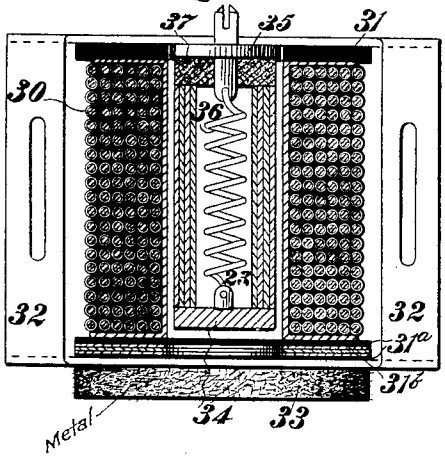


Fig. 4.

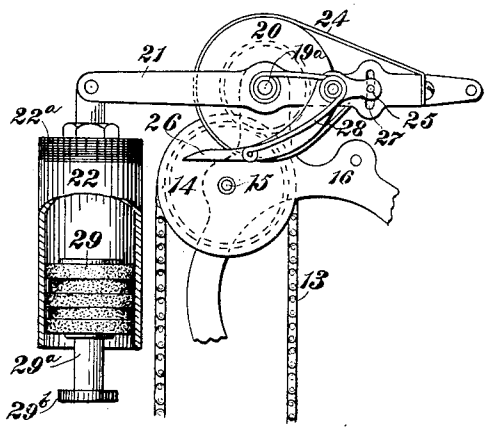


Fig. 3.

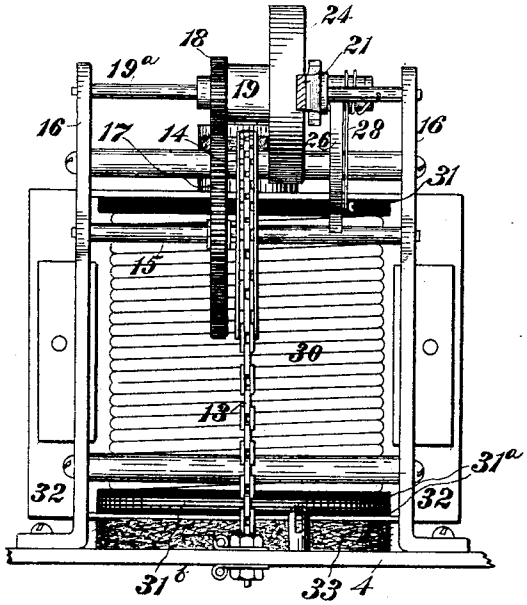


Fig. 5.

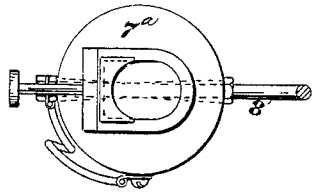


Fig. 6.

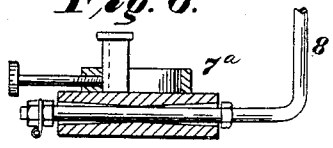
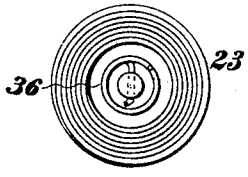


Fig. 7.



Witnesses
Ethan D. Dodd
Hubert C. Genen

Inventors
Harry P. Davis
Frank Conrad

By their Attorney
H. G. Carr

UNITED STATES PATENT OFFICE.

HARRY P. DAVIS, OF PITTSBURG, AND FRANK CONRAD, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, OF PENNSYLVANIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 599,931, dated March 1, 1898.

Application filed August 22, 1896. Serial No. 603,594. (No model.)

To all whom it may concern:

Be it known that we, HARRY P. DAVIS, residing at Pittsburg, and FRANK CONRAD, residing at Wilkinsburg, Allegheny county, Pennsylvania, citizens of the United States, have invented a new and useful Improvement in Arc-Lamps, (Case No. 711,) of which the following is a specification.

Our invention relates to arc-lamps, and more particularly to such lamps as are adapted to be operated by alternating currents.

The object of our invention is to provide a lamp which will strike the arc and burn without material pumping or sputtering and which will burn steadily without material variation in the amount of current consumed and with a minimum amount of noise. With these ends in view we have devised the means shown in the accompanying drawings, in which—

Figure 1 is a vertical section of the globe and casing, the operating parts being shown mainly in elevation. Fig. 2 is a vertical section through the feed-controlling solenoid and its core. Fig. 3 is an elevation at right angles to Fig. 1 of the carbon-feeding mechanism. Fig. 4 is a side elevation of a portion of the carbon-feeding mechanism, the dash-pot cylinder being shown partially in section. Figs. 5 and 6 are respectively a plan and a sectional view of the clamp for the lower carbon; and Fig. 7 is a plan view of the solenoid-core, the cap being removed.

Referring now to the drawings in detail, 1 is the transparent globe of the lamp, which is supported from the frame by means of a wire-netting 1^a and spring-connectors 2 and is provided at its bottom with a removable cup 3. The feeding mechanism, to be hereinafter described, is separated from the globe by a considerable air-space, the platform or base-plate 4, upon which it is supported, being connected to a plate 5 at the top of the globe 1 by means of rods 6. The under side of the plate 5 is either burnished or provided with a coating of enamel in order that it may serve as a reflector. It also serves, in connection with the plate 4 and the intervening air-space, to protect the operating mechanism of the lamp from the heat of the arc. The space between the plates 4 and 5 may be left entirely open, or it may be either partially or wholly inclosed by a casing, a construction which permits of a free circulation of air being desirable, however. The lower carbon 7 is mounted in a holder 7^a, and the latter is loosely mounted upon the horizontal arm of a rod 8, so as to form a universal joint therewith, as indicated in Fig. 6. The main portion of the rod 8 is at right angles to the portion on which the carbon-holder 7^a is mounted and extends vertically through an opening in the reflector-plate 5 and a guiding-sleeve 5^a, projecting downwardly therefrom. A guide 9 for the lower carbon 7 is removably clamped to the guiding-sleeve 5^a, the free end of which surrounds the carbon near its upper end and insures the proper location of the latter with reference to the lower end of the upper carbon. The universal-joint connection between the lower-carbon holder and its support prevents any binding action between the said carbon and its guide. The rod 8 is provided at its upper end with a head 10, which is guided by three of the rods 6, only two of the three being shown in the drawings. The holder 11 for the upper carbon 11^a is provided with a weight 12, which is also guided by three of the rods 6, only two of the three being shown. This weight 12 and the head 10 at the upper end of the supporting and guiding rod 8 are connected by a suitable chain or cord, preferably a sprocket-chain 13. This sprocket-chain 13 passes over and is supported by a sprocket-wheel 14. The sprocket-wheel 14 is rigidly mounted upon a shaft 15, and the latter is journaled in a frame 16, which rests upon and is fastened to the horizontal plate 4. A gear-wheel 17, which is also rigidly mounted upon the shaft 15, meshes with a pinion 18, which is rigid with a sleeve 19, the latter being loose upon a shaft 19^a. The sleeve 19 is also provided with a brake-wheel 20. Rigidly mounted upon the shaft 19^a is a lever 21. A dash-pot cylinder 22, provided with adjusting-weights 22^a, is pivotally supported from one end of the lever 21, and a solenoid-core 23 is pivotally supported from its other end. A strap or chain 24, preferably the former, is fastened at one end to the lever 21 near the end supporting the solenoid 23, extends over and around the brake-wheel 20, and is fastened at its other end to a pin or projection

25 on the short arm of a pivoted brake-releasing lever 26. The pin 25 on the end of the releasing-lever 26 extends through a curved slot 27 in the lever 21, and as the said lever 26 is pivoted to the lever 21 each is to a limited extent movable independently of the other. The long arm of the lever 26 extends from its pivot a sufficient distance to impinge upon a stop, which in the present instance is the shaft 15. This long arm of the lever 26 is normally pressed downward by means of a spring 28. In order to secure the close contact between the two parts of the dash-pot necessary to attain the most satisfactory results and at the same time to insure a free relative movement between the said parts at all times and under all circumstances, we have devised a plunger-head 29, formed of graphite. While we prefer to form the plunger-head entirely of graphite, it is obvious that if its peripheral surface be of this material or if the plunger be of metal and the dash-pot cylinder be lined with graphite the desired lubricating qualities will be secured. The lower end of the plunger-rod 29^a is provided with a metal disk 29^b, which is clamped between two felt disks 29^c. These disks permit of a slight lateral movement of the plunger and at the same time prevent any rattling of the parts. The solenoid 30 is supported in a metal frame 32, from which it is separated at the top by insulating material 31. Between the bottom of the solenoid and the frame 32 are insulating-rings 31^a and interposed annular iron plates or washers 21^b, the latter being employed to insure a more nearly uniform pull upon the core 23 throughout its range of movement. The frame 32 has a slot-and-screw connection with the frame 16 of the lamp, as indicated, so that the solenoid may be adjusted vertically, if found desirable.

The parts just described rest upon a yielding resilient cushion 33, which is preferably constructed of felt. This cushion serves as a buffer, against which the lower end of the solenoid-core may impinge, and it also serves to largely decrease the noise incident to the use of an alternating current for arc-lamps by reason of its deadening effect and its cushioning action with reference to the solenoid and its supporting-frame. The main body of the solenoid-core 23 consists of a strip of iron rolled into the form of a hollow cylinder. This hollow cylinder is supported upon and fastened to a solid base 34 and is provided with a cap 35, to which one end of the lever 21 is pivotally attached. The cap 35 is connected to the base 34 by means of a coiled spring 36. A yielding resilient cushion 37 is interposed between the metal cap 35 and the top of the main body of the solenoid-core. This cushion is preferably formed of felt and serves to obviate the noise which would otherwise occur upon the coming together of the parts 23 and 35, and also tends to prevent the noise due to the action of an alternating current upon metal parts not rigidly joined together and located in the magnetic field produced by it.

A plate 38 is located above the feeding mechanism and connected to the plate 4 by means of rods 39, one only of which is shown in the drawings. A casing 40, which is preferably removable, surrounds the feeding mechanism in order to protect the same from dust, &c.

The circuit through the lamp is made by the conductor 41, solenoid 30, conductor 41^a, the carbons 11 and 7, the rod 8, the conductor 42, and the conductor 42^a, and the adjustment of the parts is such that the arc is always located in close proximity to the reflecting-plate 5.

The operation of the mechanism may be briefly described as follows: When no current is flowing through the lamp, the weights of the several parts are such that the carbons will be in contact and the dash-pot cylinder will be in its lowest and the solenoid-core in its highest position. In this position of the parts the end of the long arm of the brake-releasing lever 26 will rest upon its stop and be lifted by it against the action of the spring 28. The brake-wheel 20 will therefore be released from the gripping action of the brake-band 24. As soon as the current is turned on the solenoid will serve to draw its core quickly downward. This quick action of the solenoid will obviously draw the main body of the core away from the cushioned cap, and hence the degree of pull upon the corresponding end of the lever 21 will be much less than it would be except for this lost-motion connection. The pull will be sufficient, however, to raise the end of the lever 26 from its stop and tighten the band 24 upon the brake-wheel 20. The brake-wheel and pinion 18 will therefore be moved, and the latter will turn the gear-wheel 17 and the sprocket-wheel 14 sufficiently to separate the carbons and strike the arc. By reason of the yielding action between the parts of the solenoid-core above referred to the pumping action which is apt to take place when the current is applied to an alternating-current lamp is reduced to a minimum and, in fact, very nearly obviated.

The cushion 33 also serves a useful purpose in obviating the noise and jar incident to bringing the solenoid-core quickly downward to the base when the current is turned on in the lamp.

The parts being automatically adjusted to the position last above described, they will remain in that position until the carbons become burned away sufficiently to cause the resistance of the arc to lessen the current through the solenoid 30 sufficiently to cause it to release its core. When this takes place, the dash-pot cylinder 22, which, as has already been stated, is made of such weight as to overbalance the solenoid-core when the latter is not actuated by the solenoid, will tilt the lever 21 sufficiently to bring the end

of the long arm of the lever 26 into engagement with its stop and thus loosen the band 24 on the brake-wheel 20 sufficiently to permit the weighted upper carbon to pull upon the sprocket-chain, thus rotating the gearing and bringing the two carbons sufficiently near together to reëstablish the original conditions. When this takes place, the current will obviously be strengthened sufficiently to restore all the parts to their normal position, which they will retain until the arc again becomes sufficiently long to necessitate a further feeding of the carbons.

With the mechanism described the feeding of the carbons is so gradual and is so accurately in accord with the requirements that there is almost no variation in the amount of current taken by the lamp.

While we have described specific details in carrying out our invention, we desire it to be understood that changes may be made therein without departing from the spirit and scope of the invention, and consequently we do not desire to be limited to the details of construction shown and described.

We claim as our invention—

1. A feeding and brake mechanism for arc-lamps comprising a supporting-frame, a feed-wheel and chain, a brake-wheel geared to said feed-wheel, a pivoted brake-lever connected at its respective ends to a dash-pot and a solenoid-core and provided with a transverse slot, a brake-releasing lever pivoted to said brake-lever and having a pin at one end located in said slot, a strap partially surrounding said brake-wheel and connecting one arm of said brake-lever with one arm of said brake-releasing lever and means for pressing the latter against a stop on the supporting-frame.

2. A feeding and brake mechanism for arc-lamps comprising a supporting-frame, a lever pivotally supported therein and connected at one end to a movement-retarding device and at the opposite end to a solenoid-core, a feeding-wheel journaled in said frame, a brake-wheel also journaled in said frame and geared to said feeding-wheel, a strap partially surrounding said brake-wheel and connected at one end to said lever, a brake-releasing lever pivoted to one arm of said first-named lever and having its short arm connected to said strap, a stationary stop for the long arm of said brake-releasing lever and means for pressing the latter against said stop when the solenoid-core rises.

3. A laminated solenoid-core, having a solid base, in combination with a cushioned cap normally resting upon said core, but not attached thereto, and a spring connecting said cap and said base.

4. A solenoid-core, a yielding cushion resting thereon, and a cap-plate fastened to said cushion in combination with a spring connecting said cap and the base of the core.

5. In an arc-lamp, the combination with a feeding gear-wheel and pinion and a brake, of a lever, a dash-pot having one of its members pivotally attached to one end of said lever and a solenoid-core made in two parts connected by a spring, one of said parts being pivotally attached to the opposite end of the lever.

6. A solenoid-core for arc-lamps comprising a hollow roll of sheet metal, a base therefor, a cushioned cap resting loosely upon the top of said roll and a coiled spring connecting the base and cap.

7. A tubular solenoid-core for the feeding mechanism of arc-lamps, in combination with its supporting-lever and a tensile spring located inside the core and connecting the base of the core with the supporting-lever.

8. In an arc-lamp, a stationary solenoid for controlling the feeding of the carbons, in combination with a movable core and a cushion of felt or similar material on which the solenoid is supported and against which the free end of the core impinges when drawn inward by said solenoid.

9. A dash-pot for arc-lamps comprising a longitudinally-movable cylinder, a plunger having a rod provided with a disk or plate at one end, and a pair of yielding, resilient disks or plates between which said plunger-rod disk or plate is clamped.

10. A dash-pot for arc-lamps comprising a cylinder and a plunger, one of said parts being stationary and the other longitudinally movable, in combination with a yielding, resilient cushion for the stationary member which permits lateral movement of said member from its normal position but tends at all times to restore it to such position.

In testimony whereof we have hereunto subscribed our names this 19th day of August, A. D. 1896.

HARRY P. DAVIS.
FRANK CONRAD.

Witnesses:
WESLEY G. CARR,
HUBERT C. TENER.