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PATENTED SEPT. 8, 1908.

R. E. LEVE.

ELECTRIC ARC LAMP.

APPLICATION FILED JAN. 22, 1908.

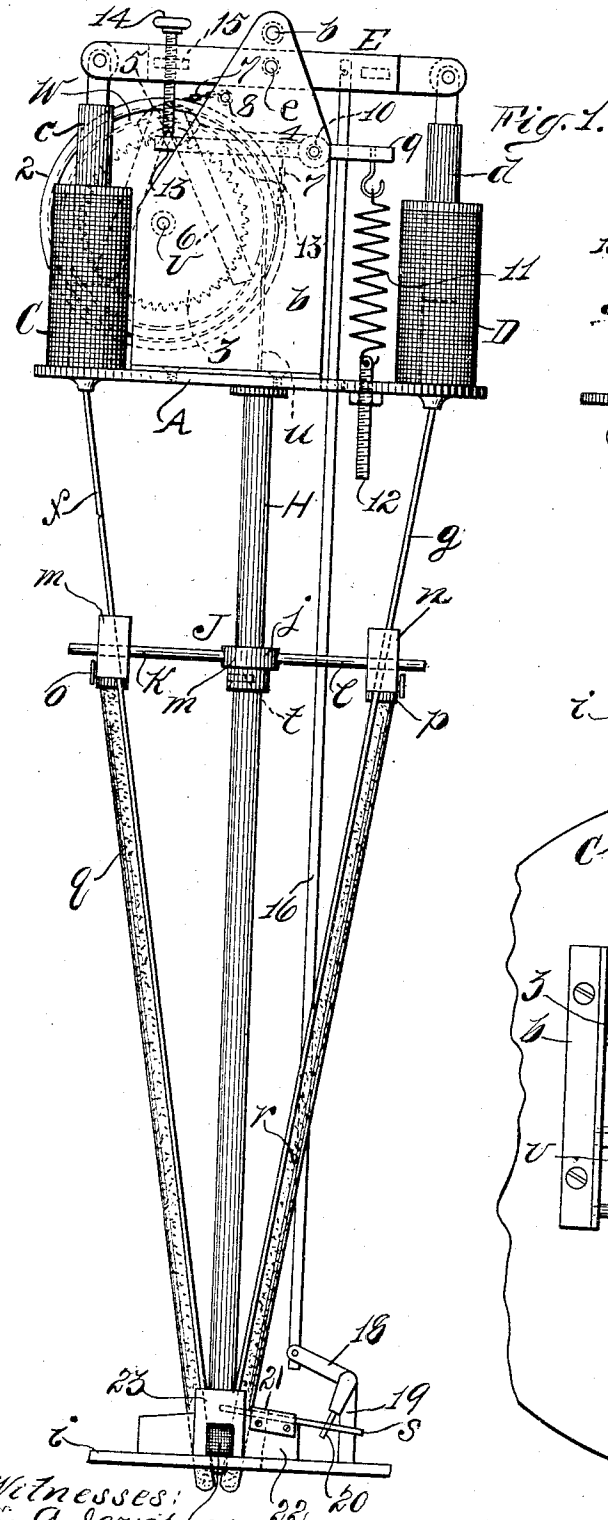

Fig. 1.

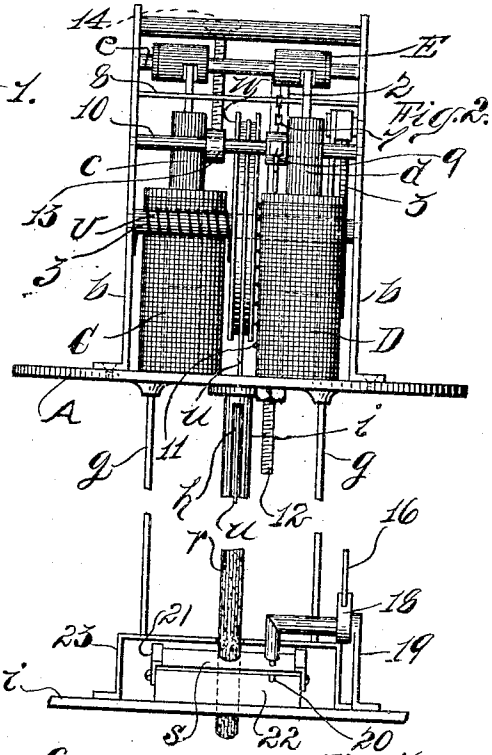

Fig. 2.

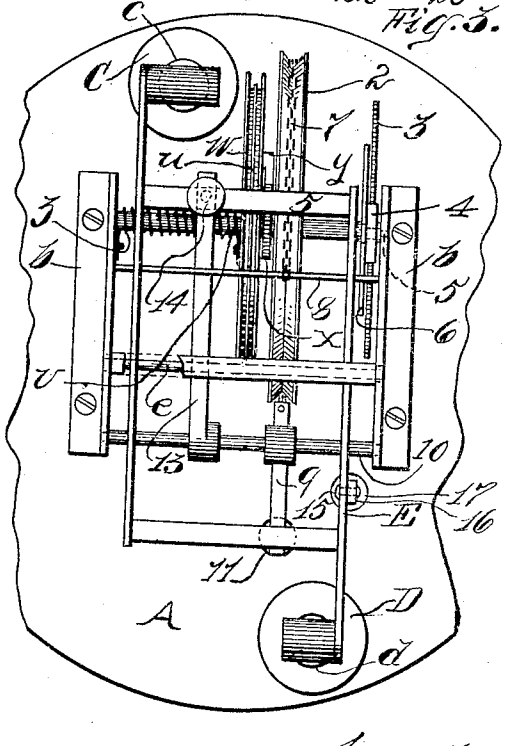

Fig. 3.

Witnesses:
C. A. Jarvis
C. E. Hauselman

Inventor:
Robert E. Leve
By Leonard Day
his Attorney

UNITED STATES PATENT OFFICE.

ROBERT E. LEVE, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

No. 898,052. Specification of Letters Patent. Patented Sept. 8, 1908.

Application filed January 22, 1908. Serial No. 412,107.

To all whom it may concern:

Be it known that I, ROBERT E. LEVE, a citizen of the United States, residing in New York, in the borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention relates to arc lamps and more particularly to the feeding and separating mechanisms for the electrodes.

Applicant is aware that, prior to his invention, an electrode carriage has been gravity fed by means of clock work operating continuously to lower the carriage during the burning of the lamp. He is also aware that an electrode carriage has been gravity fed by the release of friction brake mechanism controlled by a shunt coil. He is also aware that convergent electrodes have been fed by the differential effect of shunt and series coils, where said differential effect operated throughout its entire range to vary the brake tension; and that said differential effect has been utilized in the same mechanism to vary the relative separation of the electrode ends while at the same time varying the brake tension. This statement is made so that a clear conception of applicant's invention may be had.

In general the object of applicant's invention is to improve the feeding and control of an arc lamp, to cheapen and to simplify its construction.

Applicant has found that feeding mechanism relying upon the mere release of a friction brake to control the lowering of its electrode carriage results in irregular or jerky feeding due probably to the great decrease in friction between relatively moving surfaces. To insure proper steady feeding, applicant has devised apparatus in which he causes an inertia governor, which may be in the form of a pendulum escapement, to operate in parallel with his friction brake. By this combination the sudden decrease in friction at the brake referred to when feeding starts is counteracted by the inertia governor until the controlling mechanism automatically acts to apply the proper pressure to the brake mechanism. Applicant has also found it desirable normally to maintain a fixed tension or pressure in the brake mechanism, which is not varied throughout part of the range of the differential effect of the shunt and series coils, while their differential effect throughout its entire range is effective in controlling the relative separation of the electrode ends.

A further advantage is obtained by applicant in economy of construction by arranging his winding drum, brake sheave and escapement wheel all on a single shaft.

Further advantages will be apparent from the following description and will be set forth in the claims.

An embodiment of applicant's invention for purposes of illustration is shown in the accompanying drawings, which form a part of this application, in which like characters designate corresponding parts and in which

Figure 1 is a front elevation; Fig. 2 is a side elevation with parts broken away; and Fig. 3 is a top plan with parts broken away.

Referring now more in detail to the drawings,—A indicates a base of suitable size and configuration for supporting the feeding and controlling mechanism, part of which is mounted on the upstanding frame *b* suitably secured to the base A.

Mounted on the base A are shunt and series coils which are shown respectively as solenoids C and D separately mounted. These coils are arranged so that their differential effect may be utilized and this is accomplished in applicant's illustrative embodiment by linking the re spective solenoid cores *c* and *d* to opposite ends of a lever frame E pivoted intermediate its ends by the shaft *e* to the frame *b*. By this mechanism the joint effect of the coils is mechanically differentiated although the differentiation may be accomplished electrically or magnetically in a manner well known in connection with electro-magnetic devices.

Suitably secured to and dependent from the base A are two pairs of parallel guides *f*, *f* and *g*, *g*, the pairs of guides being downwardly convergent as shown in Fig. 1. A guide tube H is also suitably secured to the base A and depends vertically in a central position. The lower ends of the parts *f*, *f*, *g*, *g* and H are suitably secured to the lower partition *i* and serve to sustain the same in position.

The electrode carriage illustrated in its entirety by J has an up and down movement and its various parts are guided by the parts *f*, *f*, *g*, *g*, H. In the embodiment illustrated the carriage J comprises a central follower part *j* embracing the tube H and freely sliding thereon. Laterally projecting arms *k* and *l* are fixed to the follower *j* and project

through suitable bearings in two other follower members *m* and *n*. The follower member *m* is provided with suitable bearings which may embrace the ways or guides *f*, *f* while the follower member *n* is similarly related to the ways or guides *g*, *g*. In an intermediate position between the ways *f*, *f* and ways *g*, *g*, the follower members *m* and *n* are respectively provided with securing means or clamps *o* and *p* for the electrodes *q* and *r*. The electrodes *q* and *r* extend down parallel to the ways *f* and *g*. The electrode *q* projecting through a suitable guide opening in the lower partition plate *i* and the electrode *r* also through an enlarged or slotted opening in the plate *i*, after first passing through a comparatively snugly fitting opening in the adjustable slide *s* which will be described later.

Projecting into the interior of the tube H from the follower member *j* and through the slot *h* is a pin shown in dotted lines in Fig. 1, and designated by *t*. To this pin is secured suitable suspension means *u* serving to hold the entire carriage J and suspended electrodes *q* and *r* in suspension to be gravity fed and subject to control as will hereinafter be apparent.

Upon a main shaft *v* journaled in the frame *b* is suitably arranged a collection of parts operative in the control of the feeding hereinbefore referred to. A winding drum *w* is suitably positioned upon the shaft *v* and is fixed against feeding or unwinding rotation relatively to the shaft *v*. This method of securing may be that of a selfwinding drum and as shown in the drawings in which a ratchet wheel *x* is secured to the shaft *v* and a spring pressed pawl *y*, secured to the drum *w* engages the ratchet *x* permitting rotation to wind up cord *u* but preventing relative feeding rotation. A winding spring *z* is provided, one end of which is secured to the drum *w* and the other end of which is secured to the frame *b* and which has a tendency when the suspension means or cord *u* has been unwound from the drum *w* to re-wind the drum *w* by reason of the tension placed in the spring *z* by the unwinding of the drum. For some purposes the drum *w* may be secured fast to the shaft *v*, as when the drum is not to be self-winding.

A brake sheave 2 is fixed fast to the shaft *v* and also an escapement wheel 3 is fixed fast to the shaft *v*. An escapement 4, which may be pivoted to the frame *b* by the pivot 5, nominally engages the escapement wheel 3 and, as shown, may be provided with dependent pendulum like portions 6. This escapement wheel and escapement is an inertia governor by reason of the fact that, in order that a rotation of the escapement wheel 3 may take place, it is necessary that escapement 4 with its pendulum be moved back and forth constantly overcoming the inertia of the moving parts before the rotation of the escapement wheel or of the brake sheave 2 may be effected.

A suitable friction band 7 which may be in the form of a cord or chain is provided for the brake sheave 2. This friction band is held preferably under normal tension about the brake sheave 2 and is under the control of the shunt coil C, as well as under the control of the differential effect of the shunt coil C and the series coil D throughout a certain part of the range of said differential effect as will hereinafter be apparent. To insure normal fixed tension of the band 7 about the sheave 2, one end of the band 7 may be secured to the crossbar 8 of the frame *b* and the other end secured to one end of a lever 9 fulcrumed upon a shaft 10 journaled in the frame *b*. To the other end of the lever 9, is secured a tension spring 11 adjustably secured at one end by the screw 12 to the base A. A lever arm 13 is also secured to the shaft 10 and extends out towards the shunt coil C as indicated in the drawings. Suitably mounted on the frame E is an adjustable screw 14 which passes through the crosspiece 15 of the frame E, and is positioned so as to overlie the free end of the lever 13. In Fig. 1, the end of the screw 14 is shown just touching the end of the lever 13, and it is obvious that after a downward movement of the solenoid core *d* an upward movement of the screw 14 would be accomplished and there would be no effect upon the lever 13, and consequently none upon the tension of the brake band 7. However, should the effect of the shunt coil C overcome that of the series coil D and cause a downward movement of the core *c*, the screw 14 would press against the free end of the lever 13, moving it against the tension of spring 11 to decrease the tension of the brake band 7 about the brake sheave 2. This brake tension would be varied throughout the limits of the differential effect of the coils C and D measured by the movement of the end of the screw 14 from the position shown in Fig. 1 to the lowermost position for the end of screw 14 which the differential effect of the coils C and D could bring about, but not throughout any other portion of this differential effect, since an upward movement of screw 14 can never increase the brake tension above normal.

As shown the entire weight of the electrode carriage and electrodes is resisted by the feeding mechanism but by reason of the peculiar brake control and the inertia governor operating in parallel thereto very steady feeding is accomplished. In addition to this control of the feeding as described, the differential effect of the coils C and D is harnessed so as to regulate or control the relative separation of the arcing ends of the electrodes *q* and *r* by mechanism as follows:—

Pivoted to the lever frame E, as by the

stud 15, is a connecting rod 16 passing down through the hole 17 in base A and pivoted at its lower end to one end of the bell crank lever 18. The bell crank lever 18 may be journaled to the upright 19 fixed to partition *i* and the other end of the bell crank lever 19 terminates in a pin 20 passing through a hole in slide *s* and making operating connection therewith to reciprocate the slide *s* in ways 21 on one side of cross-piece 22. Whenever the lever frame E is moved, the lower end of electrode *r* is moved relatively to the lower end of electrode *q* through the medium of the mechanism just described and consequently the separation of the electrode ends is varied throughout the entire range of the differential effect of coils C and D. When the series coil D overcomes shunt coil C the electrodes are separated and vice versa. 23 indicates a bridge of suitable material between the electrodes.

It is to be understood that the electric circuit connections for the coils and the electrodes, etc., may be in accordance with well known practice in the art and need not be described in detail; also necessary insulation and other well known accessories may be embodied in the construction, such as suitable resistance, connecting wires, blow out magnet indicated by 24, etc.

Certain of the parts of my invention are useful in other combinations than those illustrated and may be modified in their embodiment all within the scope of the accompanying claims.

What I claim and desire to secure by Letters Patent is:—

1. In an arc lamp, a suspended gravity feed electrode carriage sustaining a pair of dependent converging electrodes; feeding mechanism for said carriage comprising a winding drum for a suspension cord, a brake sheave and an escapement wheel all mounted concentrically upon and secured to a single rotatable shaft; a brake band fixed at one end and normally held under fixed tension about said brake sheave; means for adjusting said fixed tension; a shunt and a series coil; provisions for differentiating the joint effect of said coils; means intermediate said provisions and said brake band for decreasing said brake tension throughout only a part of the range of the differential effect of said coils; an escapement coöperating with said escapement wheel; and means intermediate said provisions and said electrodes for changing the relative lateral separation of the electrode ends throughout the range of said differential effect of said coils.

2. In an arc lamp, a suspended gravity feed electrode carriage sustaining a pair of dependeng converging electrodes; feeding mechanism for said carriage comprising a winding drum for a suspension cord, a brake sheave and an escapement wheel all mounted concentrically upon and secured to a single rotatable shaft; a brake band fixed at one end and normally held under fixed tension about said brake sheave; means for adjusting said fixed tension; a shunt and a series coil; provisions for differentiating the joint effect of said coils; adjustable means intermediate said provisions and said brake band for decreasing said brake tension throughout only a part of the range of the differential effect of said coils; an escapement coöperating with said escapement wheel; and means intermediate said provisions and said electrodes for changing the relative lateral separation of the electrode ends throughout the range of said differential effect of said coils.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

ROBERT E. LEVE.

Witnesses:
PAUL GOEPEL,
HENRY J. SUHRBIER.