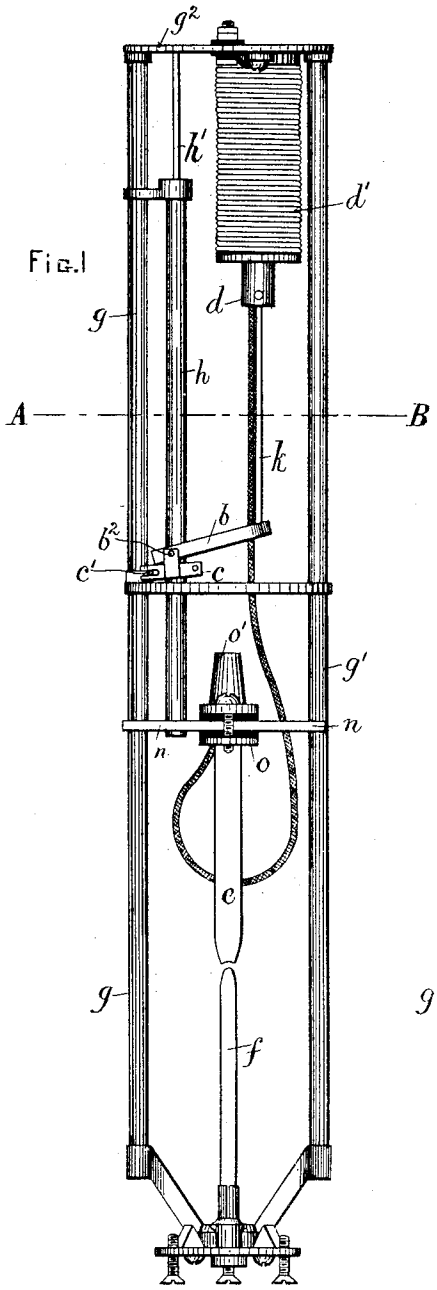
(No Model.) 4 Sheets—Sheet 1.

E. CONRADY.

ELECTRIC ARC LAMP.

No. 533,211. Patented Jan. 29, 1895.

Fig. 1



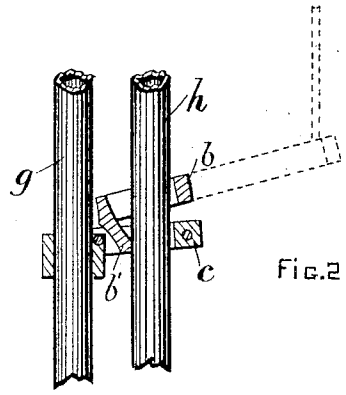


Fig. 2

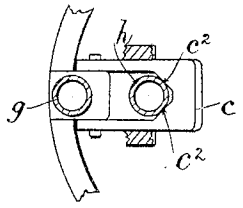
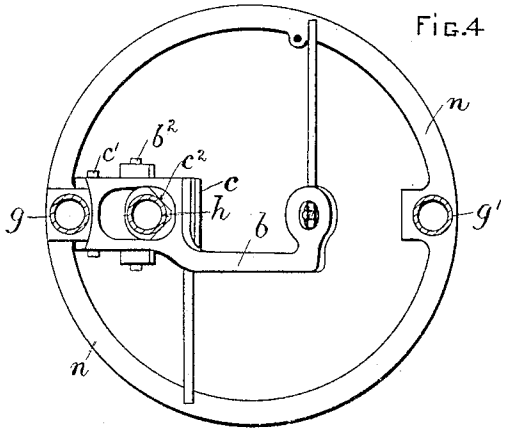


Fig. 3

Fig. 4



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ELECTRIC ARC LAMP.

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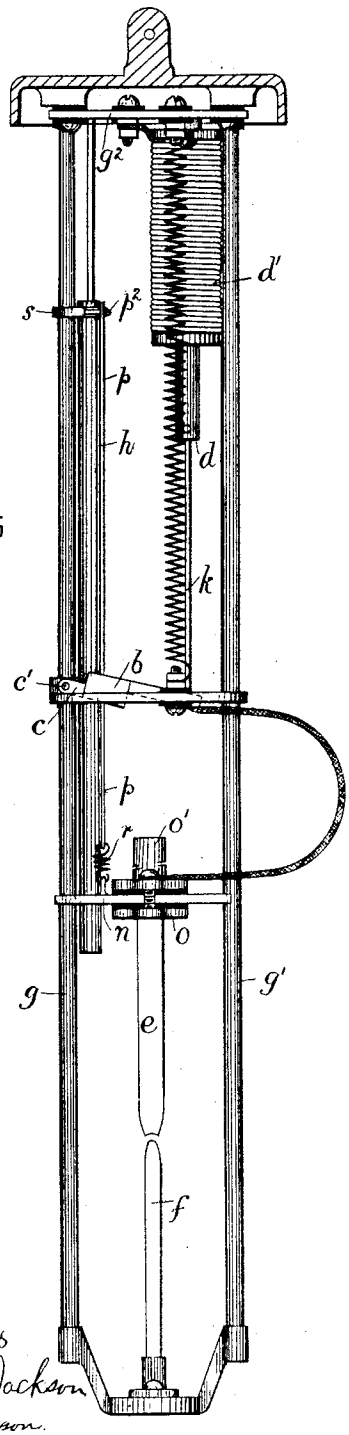

Fig. 5

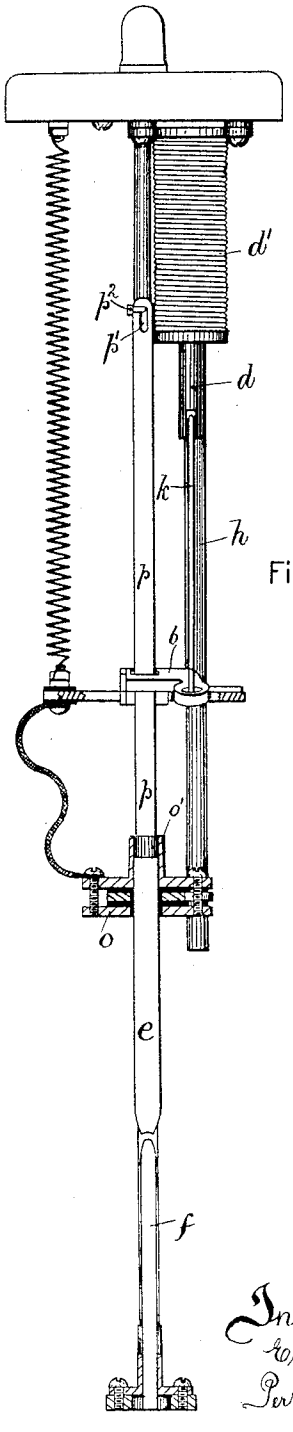

Fig. 6

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ELECTRIC ARC LAMP.

No. 533,211. Patented Jan. 29, 1895.

Fig.7

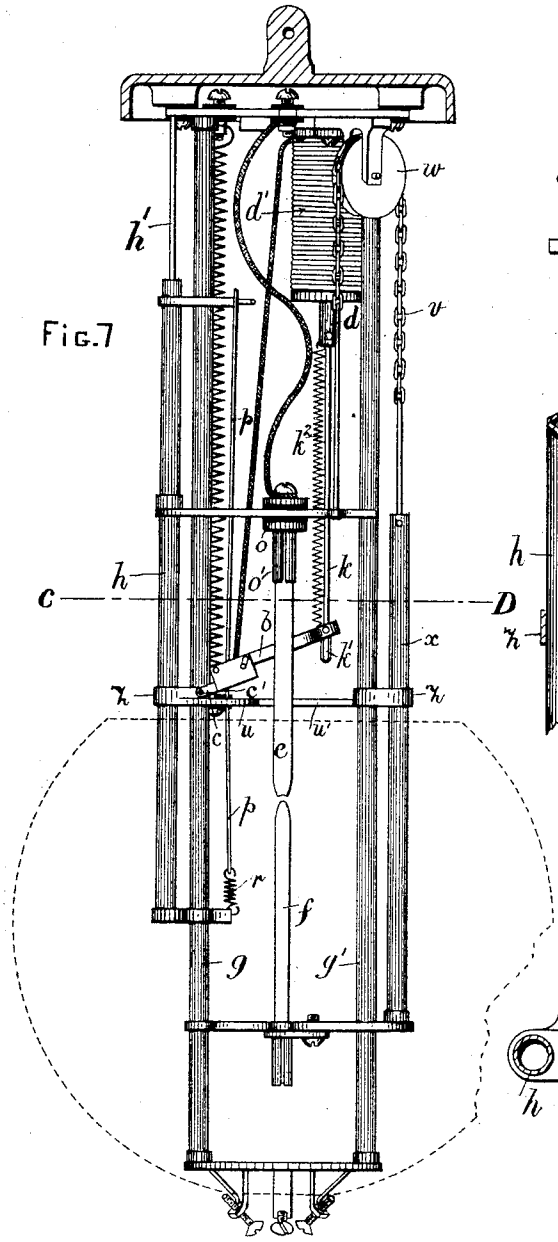
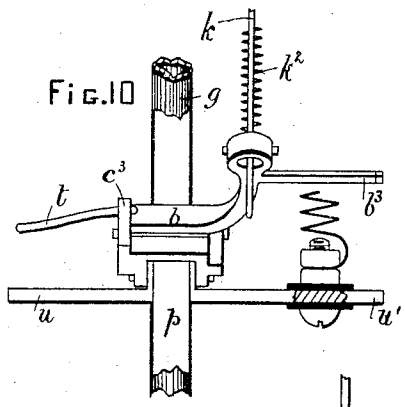


Fig.10



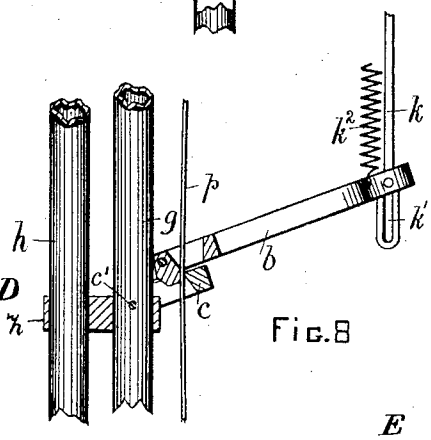


Fig.8

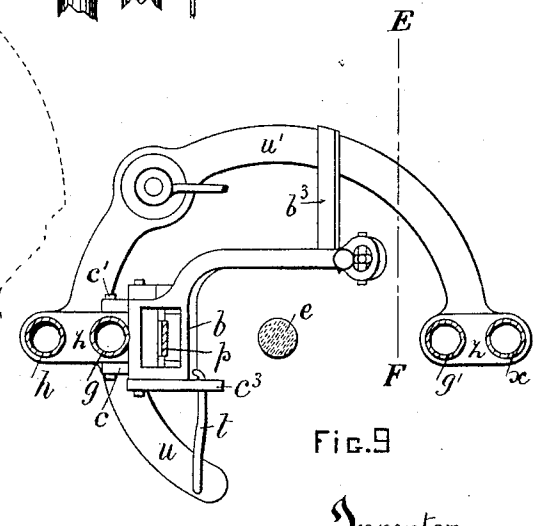


Fig.9

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(No Model.) 4 Sheets—Sheet 4.

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ELECTRIC ARC LAMP.

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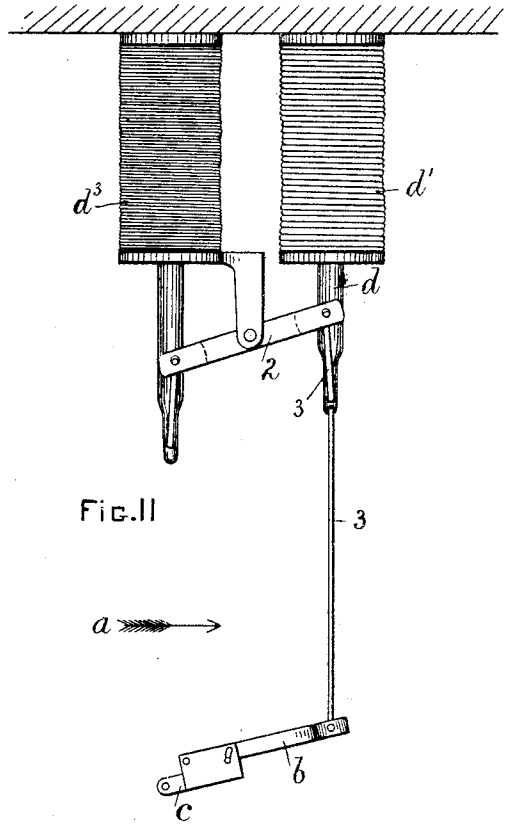


Fig. 11

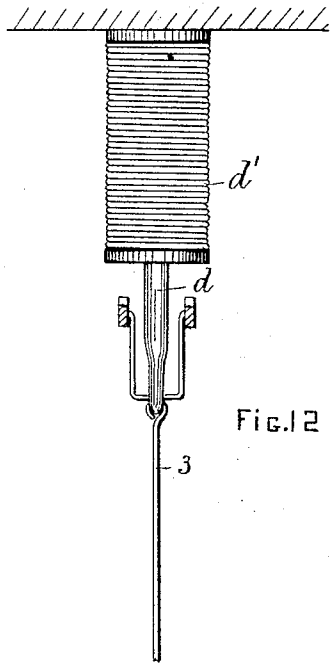


Fig. 12

Fig. 13

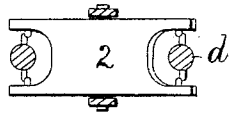
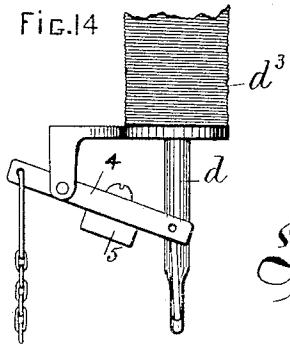


Fig. 14



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UNITED STATES PATENT OFFICE.

EUGEN CONRADY, OF KEIGHLEY, ENGLAND.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 533,211, dated January 29, 1895.

Application filed December 16, 1893. Serial No. 493,814. (No model.) Patented in England January 13, 1893, No. 775.

To all whom it may concern:

Be it known that I, EUGEN CONRADY, a subject of the Emperor of Germany, residing at Keighley, in the county of York, England, have invented a new and useful Electric-Arc Lamp, of which the following description, together with the accompanying sheets of drawings, is a specification, a British patent, No. 775, having been granted on said lamp January 13, 1893.

My invention relates to improvements in the formation, arrangement and combination of parts or means for regulating, adjusting and operating the carbons of electric-arc-lamps whereby said carbons are automatically regulated, adjusted or operated so as to maintain the arc in or as nearly as possible to a normal condition. This object I attain by the mechanism illustrated in the accompanying sheets of drawings, in which—

Figure 1 is a front elevation of a non-focusing lamp. Fig. 2 is a part sectional detail drawing, enlarged scale, showing certain parts hereinafter described. Fig. 3 is a view of the parts shown by Fig. 2 and as seen from above. Fig. 4 is a sectional view on line A B of parts shown by Fig. 1 and to the same scale as Figs. 2 and 3. Fig. 5 is a similar view to Fig. 1 but illustrates certain alternative devices hereinafter described. Fig. 6 is a sectional side elevation of the lamp illustrated by Fig. 5. Fig. 7 is a front elevation of a focusing lamp to which my improved parts are applied. Fig. 8 is a similar view to, and same scale as Fig. 2, but is illustrative of parts used in the lamps shown by Figs. 5, 6 and 7. Fig. 9 is a sectional view on line C D of parts shown by Fig. 7 and as seen from above. Fig. 10 is a sectional elevation on line E F, of parts shown by Fig. 9. Figs. 8, 9 and 10 are to same scale as Figs. 2, 3 and 4. Fig. 11 is a front elevation showing a method of arranging certain of my improved parts when used in lamps with two solenoids as hereinafter described. Fig. 12 is illustrative of parts shown by Fig. 11 and as seen in the direction of the arrow *a*. Fig. 13 is a sectional detail drawing of parts shown by Fig. 11 and as seen from above. Fig. 14 is a modification adapted for alternating currents.

The same letters and figures are used to indicate the same parts in all the drawings.

In accordance with my invention I make use of an arrangement of differential or compound levers *b* and *c* which are to be operated by the core *d* of a solenoid *d'* (or its equivalent—the armature of an electro-magnet, but preferably the former, which is therefore hereinafter alone illustrated and referred to) for regulating as by lowering or raising, the carbon or carbons *e* and *f* of an arc-lamp as the conditions of the arc thereof from time to time require. The lever *b* which may be styled the primary lever, is mounted upon the other or supplementary lever *c*, this lever *c* being pivoted at *c'*, upon any suitable part of the lamp's frame work as upon the rod *g*. The pivotal mounting of the lever *c* is arranged by a slot being made in it to span the pin *c'* (or in place of this formation of the lever *c* any well known arrangement of additional link or lever might be employed) so that in addition to its usual freedom to oscillate about said pin *c'* it may move laterally (for the purpose hereinafter described) while its extending arm is made to encircle the tube *h* (which may either form the carbon holder or be a separate tube attachment but preferably the latter), in order that the same may be gripped and held between a projecting piece *b'* and the suitably formed interior edge c^2 c^2 (Fig. 3) of the lever *c*. This projecting piece *b'* is formed on the lever *b* in a suitable position relatively with the fulcrum b^2 of said lever *b* so that as its extending arm is moved by the core *d* of the solenoid *d'* to which it is coupled by the rod *k*, such movement, if in one direction (that is, vertical in case of all the several arrangements illustrated) first causes the levers *b* and *c* to grip the tube *h* (or other part *p* hereinafter described) passing between them and then to move same by both levers *b* and *c* acting as one with the pivotal pin *c'* as fulcrum, while if in the other direction then these levers *b* and *c* release said tube (or other part); and by these levers being thus formed to act, the extending arm of the lever *b* for attachment to the core *d* is considerably prolonged in order to gain leverage so that little power is required for effecting their movements.

To prevent the carbons *e* and *f* from approaching or receding from each other too

quickly on being gripped by or on being released from the grip of said levers *b* and *c*, I employ a tube *h*, which may be arranged to form the carbon-holder or which may be attached to the cross-piece *n* on which the carbon-holder *o* is mounted (this latter arrangement being preferred, and consequently is the only one shown, since by the extremities of this cross-piece *n* being made to slide upon the vertical rods *g* and *g'* forming the lamp's framework, it answers the purpose of a guide for the carbon *e*) and in this tube *h* I arrange a piston suspended by a rigid rod *h'* from the upper part g^2 of the lamp's framework to operate against the retarding effects of a viscous substance as glycerine, oil or the like contained by said tube *h*. When the lamps are for use on fairly steady currents this viscous retarding substance may be entirely dispensed with as they will work properly without it.

Instead of the levers *b* and *c* being arranged to grip the tube *h*, they may be formed to grip a strip of metal *p* which is attached to the cross-piece *n* by the spring *r* and to the guide pieces *s* on the said tube *h*, on which the lever *c* does not require its slotted formation for laying hold of the pivotal pin *c'*, since the yielding or bending of this strip of metal *p* allows the necessary lateral movement to enable the levers *b* and *c* to work freely, while by its attachment to the cross piece *n* by the spring *r* the necessary yield is allowed to this strip *p* in a vertical direction when it is suddenly and violently operated by the levers *b* and *c*. The slot *p'* in said strip *p* allows it this independent motion while the hooked holder p^2 prevents it from moving out of position with the guide *s*. To further counteract any sudden and violent action of the core *d* so that such action is not centered upon or imparted to the levers *b* and *c*, I form a slot *k'* in the end of the rod *k* to take over the coupling pin in the end of the lever *b*, which latter I further couple or join to the core *d* by a spring k^2, by which means the core *d* is allowed to move the length of the slot *k'* without positively moving the lever *b*, the movement of this lever *b* being at such times effected by the resilience of the spring k^2.

In order that the levers *b* and *c* may be easily moved from gripping the tube *h* or the strip *p* on approaching their lowest positions so that the said tube *h* or strip *p* is allowed to slide through or between the jaws of these levers *b* and *c* at such times, the lever *t* is made to pass loosely through an opening in the parts c^3 of the lever *c* which forms a fulcrum for this lever *t* while its bent end enters an opening in the lever *b*. Thus on the levers *b* and *c* being raised so that the extremity of the lever *t* is clear of the fixed bearing *u* they are free to grip and operate the tube *h* or strip *p* as desired, but on their descent so that this extremity of the lever *t* comes in contact with the bearing *u* it is arrested and the levers *b* and *c* are brought together. Thus their gripping jaws are separated and the tube *h* or strip *p* may freely descend. The arm b^3 is formed on the lever *b* so that when the lamp is not in work, the bearing *u'* may support the levers *b* and *c*.

In connection with lamps of the non-focusing types, I preferably arrange the upper-carbon *e* to be the movable one. I also preferably electrically insulate this upper carbon *e* in order to keep the temperature of the upper and motor parts of the lamp as low as possible, since it is well known most electrically insulating materials are also bad conductors of heat. In this style of lamp the cross-piece *n* carrying the retarding tube *h* and the carbon holder *o* as hereinbefore described, may also be advantageously employed inasmuch as by the additional attachment *s* to the upper part of the tube *h* to act as side-support or guiding-piece, the movements of the sliding parts are considerably relieved of friction that would otherwise be produced had guiding surfaces to be employed, which were a less distance apart, and for this same reason the pivotal mounting *c'* of the lever *c* is arranged to allow it to have a slight lateral movement, when the strip *p* is not employed, so that the gripping parts of both levers *b* and *c* and all the parts moved by them may travel in a straight line, while by the carbon holder *o* being made to retain said carbon *e* in position by the friction of a yielding tube *o'* encircling and pressing same, carbon of considerable length might be employed which when partly consumed might be slid or pressed farther through said tube *o'* to continue the light. Consequently the loss incident to the use of shorter carbons, as at all times a portion of each carbon has to be wasted, is diminished.

As will be understood the compound levers *b* and *c* above described may be used with equal advantage either in arc-lamps with series wound solenoids or in those with shunt wound solenoids. However as the former act in the opposite direction to the latter, the levers *b* and *c* are arranged so that their gripping sections are reversed.

Focusing lamps are produced by arranging the well known cord, or string or chain *v*, pulley *w* and guide rod *x* to move the carbon *f*. When the carbon *e* is moved, the guide rod *x* for the carbon *f* and the guide rod for the carbon *e* which in this case is the tube *h* are arranged to pass through bearings *z* placed only a little above the arc's level so that in all cases the carbons *e* and *f* are held as nearly as possible straight in line with each other; and to avoid the throwing of deep or many shadows, all the guiding rods and framework tubes *x*, *h*, *g* and *g'* and the strip *p* are arranged to be in one and the same vertical plane.

When the two solenoids *d'* and d^3, arranged to counteract each other, one being series wound and the other shunt-wound, are employed as the regulating means for governing the movements of the carbons in order to maintain a constant resistance of the arc, I

preferably arrange them so that one operates one end of a lever as the lever 2 while the other operates its other end, the fulcrum of said lever 2 being between its said two ends, a connecting link 3 joining one or the other of the arms of said lever 2 to the extending arm of the lever *b*. This arrangement of the intermediate lever 2, causes the core of one solenoid to counterbalance that of the other so that in this case, the differential force to be exerted by the solenoids is reduced to a minimum.

For shunt wound lamps which I preferably use for alternating currents, the solenoid d^3 is made to operate the lever 4 as shown by Fig. 14, this lever 4 having a sliding weight 5 arranged so that it may be adjusted for the right difference of potential between the two carbons.

The part referred to in the claims hereinafter as an elongated member may be a rigid member as the rod, *h*, or a flexible member as the strip, *p*.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A feed mechanism for electric lamps, comprising in its construction an elongated member coupled to the movable carbon through elastic connections, and gripping devices to act on said elongated member, substantially as described.

2. A feed mechanism for electric lamps, comprising in its construction a resilient strip, elastic connections between the same and the movable carbon, compound gripping levers to act on said strip, and means for controlling said levers.

3. In an arc-lamp, the combination of a carbon-supporting slide engaging suitable guides, an elongated strip, an elastic connection between the same and the said slide, a guide-piece engaging a slot in said strip and embracing one of the slide-guides, compound gripping levers to act on the strip, and means for controlling said levers.

4. A feed mechanism for electric arc lamps, comprising in its construction compound gripping levers, means for controlling the same, a releasing lever fulcrumed to one of said gripping levers and engaging the other, and an abutment for said releasing lever to encounter, whereby it is caused to establish an inoperative adjustment of the gripping levers.

5. In a feed mechanism for electric-arc lamps, a gripping lever, an elastic connection between the same and the core of a solenoid or equivalent controlling device, and a rigid connecting device with provision for longitudinal play, substantially as described.

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