R. E. LEVE.

PLURAL ARC LAMP.

APPLICATION FILED AUG. 17, 1908.

916,462.

Patented Mar. 30, 1909.

2 SHEETS—SHEET 1.

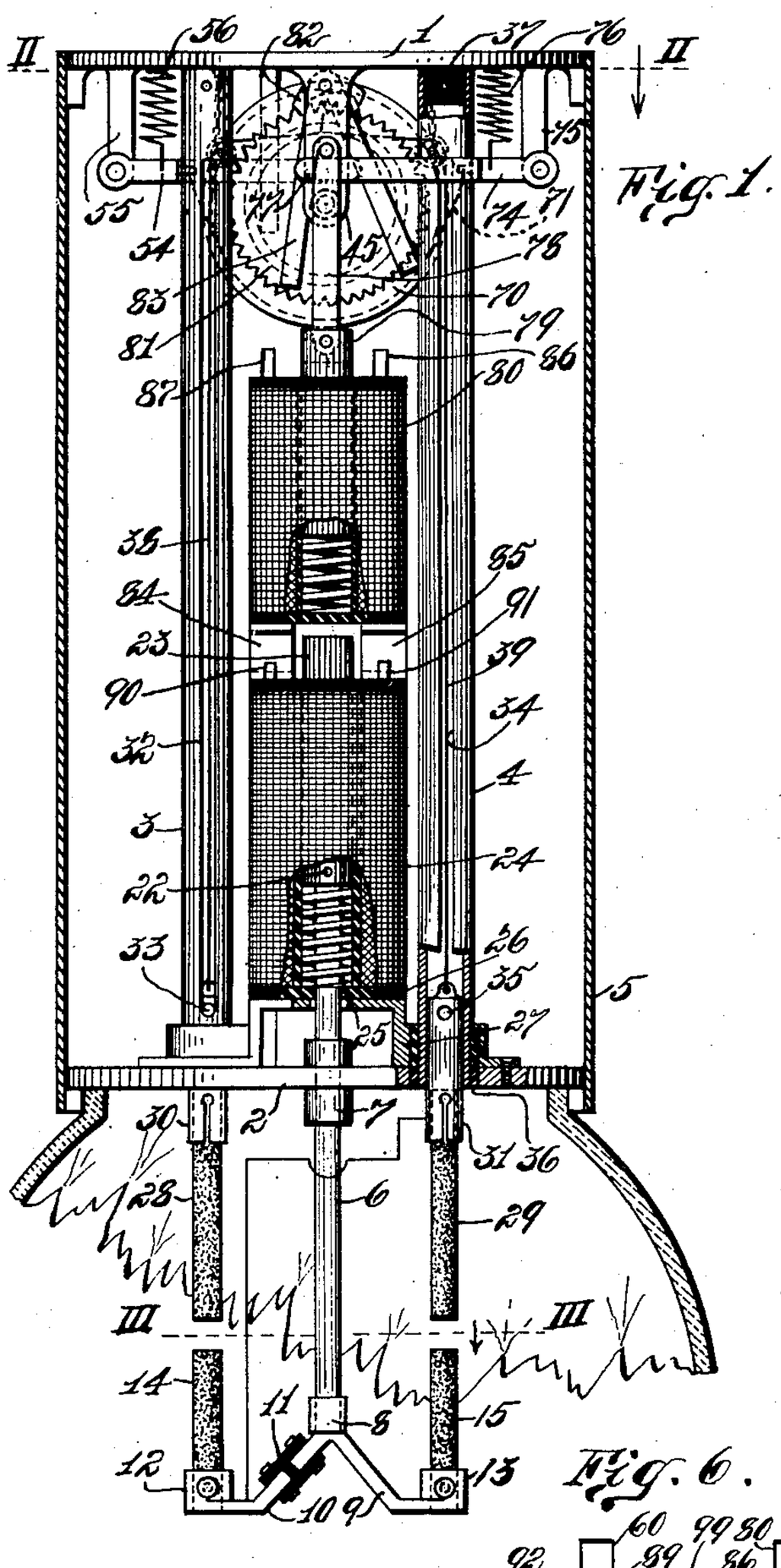


Fig. 1.

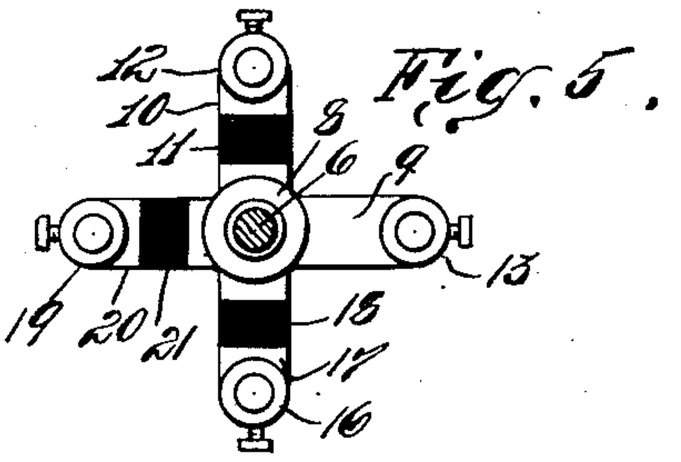
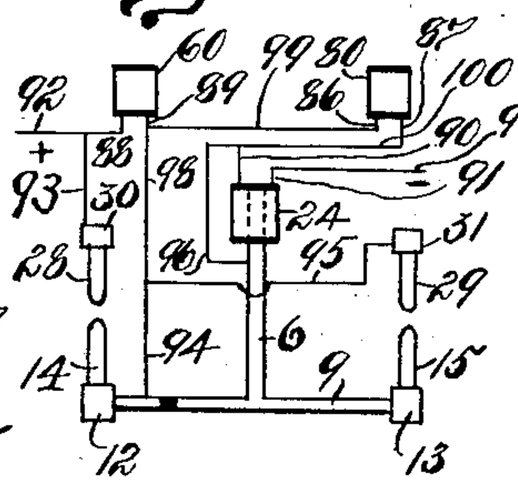


Fig. 5.

Fig. 3.



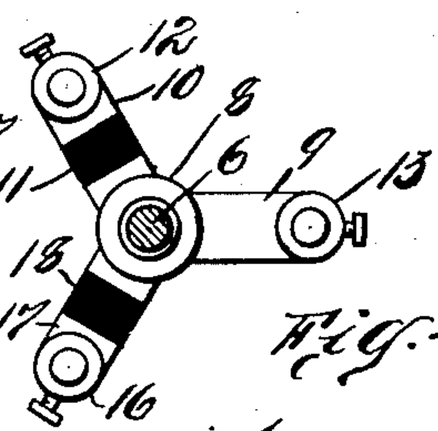


Fig. 4.

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2 SHEETS—SHEET 2.

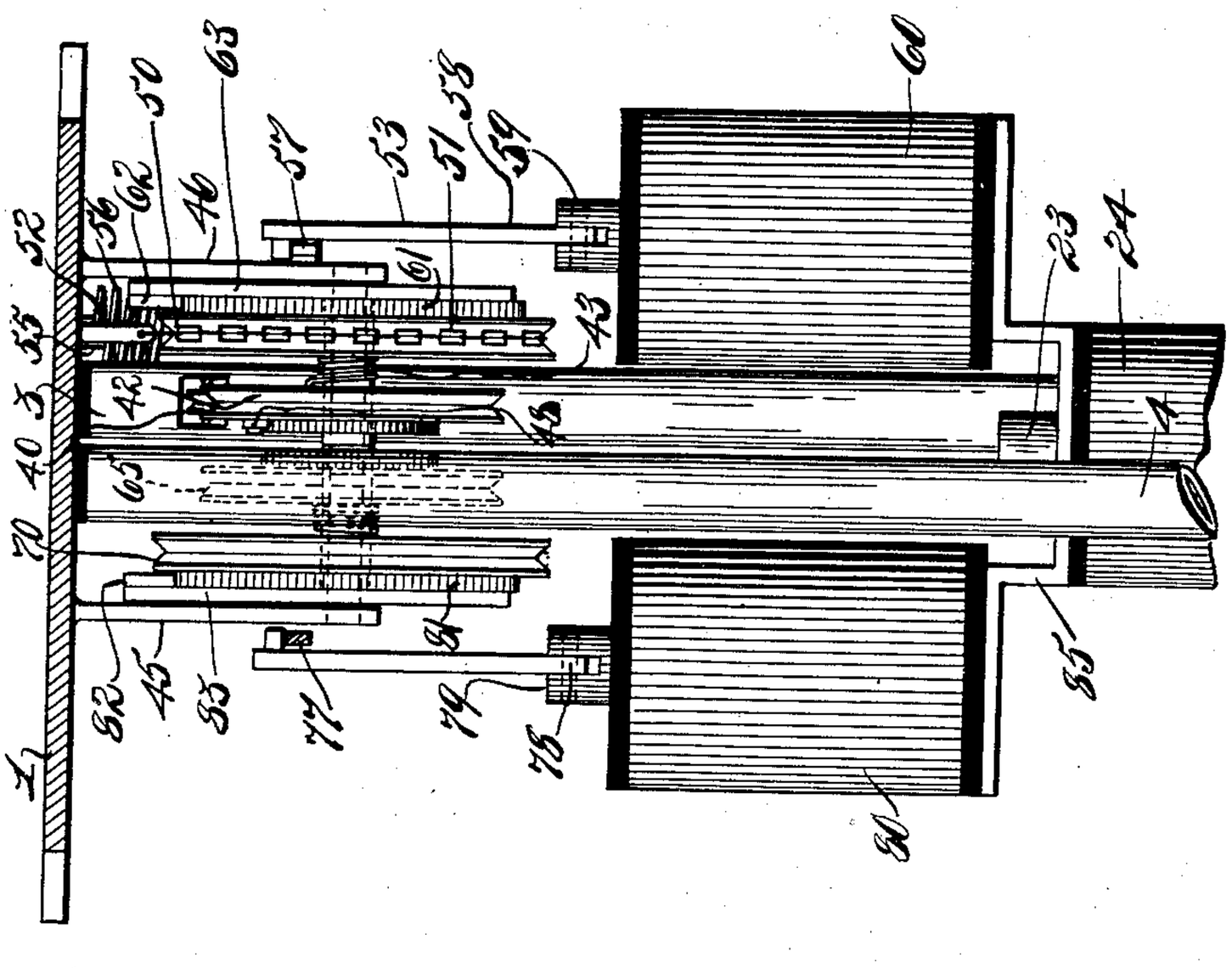

Fig. 1.

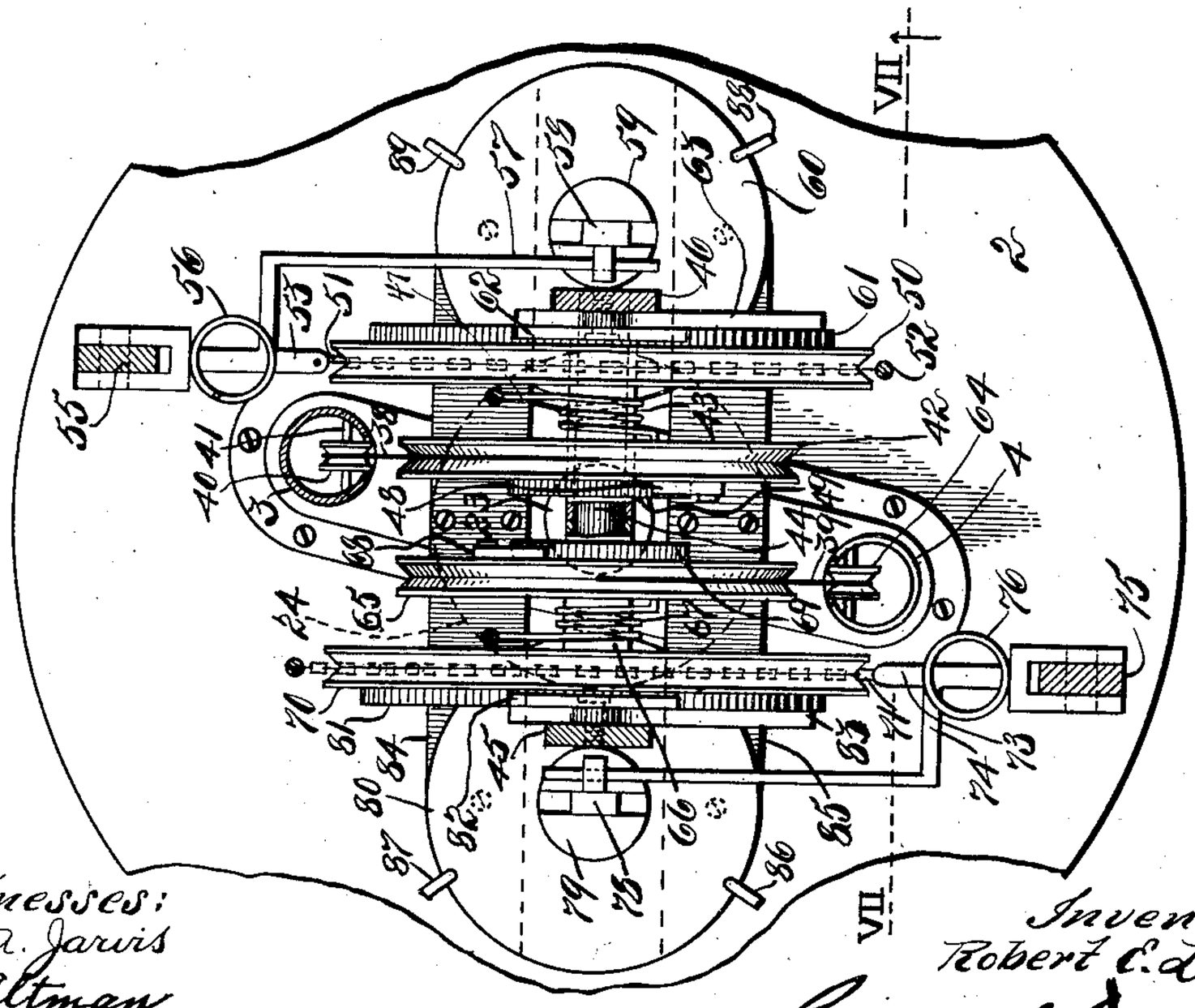

Fig. 2.

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UNITED STATES PATENT OFFICE.

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PLURAL-ARC LAMP.

No. 916,462. Specification of Letters Patent. Patented March 30, 1909.

Application filed August 17, 1908. Serial No. 448,807.

To all whom it may concern:

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

This invention relates to arc lamps in general.

An object is to accomplish the efficient and satisfactory automatic maintenance of a plurality of arcs at the same time in a single lamp structure.

A further object is to accomplish the efficient automatic striking of all the arcs at one operation and the independent feeding of an independent electrode for each arc.

Still a further object is to improve arc lamp mechanism in general and to prevent side shadows when the lamp is operating.

The above and further objects of the invention will be clear from the accompanying description read in connection with the accompanying drawings which form part of this application, in which like characters represent corresponding parts and in which—

Figure 1 is a sectional elevation showing the invention but with parts broken away; Fig. 2 a cross section through line II—II of Fig. 1; Fig. 3 is a cross section through line III—III of Fig. 1; Fig. 4 is a view similar to Fig. 3 but showing a three socket frame; Fig. 5 is a view similar to Fig. 3 but showing a four socket frame; Fig. 6 is a diagram showing circuit connections; and Fig. 7 is an enlarged side elevation partly in vertical section of the apparatus shown in Fig. 1 but with parts broken away.

Referring now more in detail to the drawings: 1 and 2 indicate respectively the top and bottom plates for the controlling mechanism. The plates 1 and 2 may conveniently be stayed together by the hollow uprights 3 and 4 which may be two or more in number, and which also serve as ways for the upper or positive electrode holders, as will hereinafter be described. Any suitable casing such as 5 may inclose the controlling mechanism as shown. Likewise, any and all other well known accessories to arc lamp structure are contemplated, such as hangers, insulated connections, suitable insulation, etc.

A central sustaining stem 6 extends through the insulating bushing 7, centrally positioned in the bottom plate 2. This stem 6 sustains at its lower end a gang frame or spider 8, which comprises a plurality of radiating arms as shown and indicated by 9 and 10 in Figs. 1 and 3. These arms may be two or more in number and they should be mutually insulated. The insulating joint 11 serves the purpose of insulating arm 10 from arm 9. At the end of each arm is provided an electrode holder or electrode socket. In Fig. 1 these holders are indicated by 12 and 13, which carry negative electrodes 14 and 15.

As has just been stated, the number of electrode sockets for the negative electrodes need not be limited to two. It is merely desirable that the electrode sockets be symmetrically positioned about the sustaining stem 6. For instance in Fig. 4, three electrode sockets, 12, 13 and 16 are illustrated symmetrically positioned about the same stem 6. The extra socket 16 is provided at the end of the third arm 17, which also is provided with an insulating joint 18. In Fig. 5 there is illustrated a gang frame providing four sockets which are likewise symmetrically positioned about the sustaining stem 6. In this figure the fourth socket is indicated by 19, it being located at the end of arm 20, also provided with an insulating joint 21.

The stem 6 is connected at its upper end, by the pin 22, to the core 23 of the low resistance series coil 24. The pin 22 may likewise serve as means for preventing rotation of the stem 6 and consequently of the gang frame 8, by coöperating with the spool of coil 24 in any well known manner. The stem, however, has a reciprocating movement through the bushing 7 in unison with the core 23. A compression spring 25 as shown located about the stem 6 within the solenoid, rests at one end against the washer 26 of the solenoid 24 and in turn is supported by the supporting yoke 27. The opposite end of the compression spring 25 reacts against the lower end of core 23, so as normally to support the weight of core 23, sustaining stem 6, and the entire gang frame 8 with the negative electrodes. Corresponding to each negative electrode is a positive electrode. Those positive electrodes corresponding to negative electrodes 14 and 15 are indicated by 28 and 29. Positive

electrode 28 is supported by positive electrode holder 30, which has an up and down movement in upright 3, which serves as a guideway for the holder 30. This upright 3 may be provided with a longitudinal slot 32 in which travels the pin 33, preventing relative rotation of the holder 30 to the upright 3. Tne similar electrode holder 31 for the electrode 29 moves up and down in the upright 4 which likewise is provided with a slot 34, through which the pin 35, similar to pin 33 may travel. The uprights 3 and 4 may be insulated from the rest of the lamp structure as is shown in detail for upright 4. The insulating bushing 36 insulates the lower end of the upright while the insulating plug 37 insulates the upper end of the upright 4.

38 and 39 indicate respectively suitable suspension means for the electrode holders 30 and 31. These means may be cords, chains or the like. The cord 38 first passes over the idler 40, running on the pin 41 fixed to the upper end of the upright 3. The cord 38 passes out laterally through a suitable opening from the upright 3 over the periphery of the winding drum 42, to which it is secured. This winding drum 42 is carried loosely on the sleeve 43, which in turn is journaled on the shaft 44, supported by arms 45 and 46 depending from the top plate 1. A spiral spring 47 is normally under tension and tends to wind up the cord 38 on the drum 42, independently of the movement of the sleeve 43. Secured to the side of the drum 42 is a pawl 48, engaging into the ratchet 49 secured fast to the sleeve 43. The pawl and ratchet 48, 49 permit the winding rotation of drum 42, relatively to sleeve 43 but prevent the opposite relative rotation. Fixed to the other end of sleeve 43 is the friction sheave 50. A friction band 51 shown in the form of a chain is secured at one end 52, to the top plate 1. This band passes beneath the sheave 50, as indicated by broken lines, and its opposite end is secured to the projecting arm 53 of a lever construction 54 fulcrumed on the bracket arm 55. A tension spring 56 attached to the top plate 1 and also to the lever construction 54, tends normally to tighten the chain 51 about the friction sheave 50. This lever construction 54 also comprises the offset extension arm 57, the extreme end of which is pivoted to link 58 which in turn is pivoted to core 59 of shunt coil or solenoid 60. Secured fast to the sleeve 43 is an escapement wheel 61. The escapement 62 is provided with a pendulum 63 and is pivotally supported by the bracket arm 46 in operative engagement with the teeth of escapement wheel 61. These parts constitute an inertia governor for controlling the rotation of drum 42, preventing too sudden unwinding on the release of the brake sheave 50. A similar controlling mechanism is provided for the suspension cords for all the independently movable electrode holders, and such mechanism is also illustrated for the suspension cord 39. The cord 39 passes over idler 64 and its end is secured to winding drum 65 loose upon sleeve 66 carried by shaft 44. 67 is the spiral spring normally tending to wind up the drum 65, movement of drum 65 relative to 66 being permitted by pawl and ratchet 68, 69. The friction drum 70 is secured to sleeve 66 and the friction band 71 passes beneath and partly around drum 70, its end 72 being secured to the top plate 1 and its opposite end being secured to arm 73 of lever construction 74, which is fulcrumed to the bracket 75. The tension spring 76 tends normally to tighten the band 71 about drum 70. The extension arm 77 of lever construction 74 is pivoted at its extreme end to link 78 which in turn is pivoted to core 79 of shunt coil or solenoid 80. 81 is an escapement wheel secured to sleeve 66 and 82 is an escapement for wheel 81 pivoted to bracket arm 45 and provided with a pendulum 83. All these parts are similar in construction and operation to those described in connection with cord 38.

The shunt solenoids 60 and 80 may be supported upon suitable brackets 84 and 85, carried by the series coil 24. There should be one shunt coil for each independently feeding electrode holder such as 30 and 31.

86 and 87 are the terminals for solenoid 80, and 88 and 89 are the terminals for solenoid 60. The terminals of series coil 24 are indicated by 90 and 91.

Fig. 6 is a diagram showing the electric connections for the various parts. The positive terminal 92 is connected to the holder 30 for positive electrode 28, by wire 93. The holder 12 for negative electrode 14 is connected by wires 94 and 95 to holder 31 for positive electrode 29. Holder 13 for negative electrode 15 is electrically connected through the arm 9, stem 6 and wire 96 to the terminal 90 of series coil 24. The terminal 91 of series coil 24 leads directly to the negative terminal 97. One terminal 88 of shunt coil 60 is connected to the positive electrode holder 30 by wire 93, while the other terminal 89 is connected to the holder 12 of negative electrode 14 by wires 98 and 94. One terminal 86 of shunt coil 80 is connected to the holder 31 of the positive electrode 29, by wires 99, 98 and 95. The other terminal 87 of shunt coil 80 is connected to holder 13 of negative electrode 15 by wires 100 and 96, stem 6 and arm 9. Thus the main circuit includes all the electrodes and the series coil 24 in series, the connection being such that the top electrodes are the positive electrodes. Also one shunt coil has its terminal directly connected respectively with the two electrode holders for each set of electrodes as 14, 28 and 15, 29.

The lamp may be trimmed so that the positive electrodes contact with the negative electrodes. In case this contact does not exist for all electrodes when the current is turned on to the lamp, that shunt coil which corresponds to the set of electrodes which are not touching will increase its pull upon its core so as to cause the feeding of the top electrode of this set until it makes contact with the bottom electrode. Current then traverses all sets of electrodes and the series coil 24 in series. The core 23 is depressed against spring 24, lowering all the negative electrodes in unison and simultaneously striking all the arcs for the several sets of electrodes. The pull of the series coil 24 on its core 23 varies with the strength of the current and regulates the length of all the arcs in unison.

Inasmuch as it has been found that some electrodes burn away at different rates from others, it is quite important that independent feeding for each set of electrodes be provided. This is accomplished by the mechanism controlled by the shunt coils previously described. The potential across each individual arc causes a direct variation in the strength of the pull of its shunt coil upon its core, as for instance the pull of shunt coil 60 upon core 59. Thus, if the potential across the corresponding arc to coil 60 should increase beyond the desired maximum, the tension of friction band 51 about friction sheave 50 is decreased sufficiently to allow a slight rotation of sheave 50, which is effected by the weight of the suspended electrode and electrode holder on suspension cord 38 tending to unwind the winding drum 42. This feeding movement is kept from being jerky by an inertia governor shown in the form of a pendulum escapement as previously described. It has been found in this mechanism that the feeding of the electrode is so gradual that it cannot be observed by the naked eye without the aid of a vernier scale.

It is of course to be understood that my invention contemplates the construction of a gang arc lamp comprising any number of sets of electrodes, each set of electrodes providing an arc. I have illustrated and described in detail the controlling mechanism for such a lamp comprising two sets of two electrodes each, thus furnishing two arcs burning in series in the same lamp structure. In this construction all the negative electrodes may be moved simultaneously for control, while each one of the positive electrodes is fed independently under shunt control.

Although I have illustrated and described certain embodiments of my invention which at present have been found to give satisfactory results, it is to be understood that these embodiments are for purposes of illustration merely and that many changes are contemplated. The diagram connections illustrated in Fig. 6 are merely illustrative, and suitable circuits can of course be accomplished by other connections. I am also aware that for some purposes it is not necessary that all the arcs of my lamp mechanism be connected in series. The diagram of Fig. 6 is clearly illustrative of the circuits for a plurality of sets of two electrodes in series relation, and would be precisely similar if the number of sets were three or more instead of two.

What is claimed and what is desired to be secured by Letters Patent of the United States is:

1. In an arc lamp, a set of two or more negative electrodes; means for moving said set as an entirety; a second set of two or more coöperating positive electrodes; and electric connections for connecting each negative electrode to the next positive electrode.

2. In a plural series arc lamp, a gang electrode carriage having a plurality of mutually insulated electrode sockets all constrained to move in unison; and a plurality of opposing electrode-holders fed independently of each other and one for each of said sockets.

3. In a plural arc lamp, a gang carriage having a plurality of electrode sockets; means comprising a series coil for moving said gang carriage; an independent electrode holder corresponding to each of the sockets of said carriage; and independent means comprising a shunt coil for causing feeding for each of said electrode holders.

4. In a plural arc lamp, a plurality of similar electrodes; suitably controlled means for moving said similar electrodes in unison to strike the arcs; a plurality of opposing electrodes one for each of said similar electrodes and completing a plurality of sets of coöperating electrodes; and means for each of said opposite electrodes for feeding it independently of the other said opposite electrodes.

5. In a plural arc lamp, a plurality of similar electrodes; suitably controlled means for moving said similar electrodes in unison to strike the arcs; a plurality of opposing electrodes one for each of said similar electrodes and completing a plurality of sets of coöperating electrodes; and means for each of said opposite electrodes for feeding it independently of the other said opposite electrodes, said means comprising electric means controlled by the potential across the arc between the coöperating electrodes of the set.

6. In a plural arc lamp, a plurality of sets of electrodes, all sets being capable of maintaining electric arcs, one for each set, comprising a plurality of bottom electrodes and a plurality of coöperating top electrodes; electric connections for connecting said sets of electrodes in series; means controlled by the series current traversing said electrodes for

lowering said bottom electrodes in unison to strike the arcs; means tending to elevate said bottom electrodes; and a plurality of means, one for each of said top electrodes and operating independently of each other, for effecting the lowering of each top electrode in response to an increase in potential of its arc.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ROBERT E. LEVE.

Witnesses:
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M. T. O'BRIEN.