C. A. B. HALVORSON, Jr.

ARC LAMP.

APPLICATION FILED MAR. 7, 1907.

913,209.

Patented Feb. 23, 1909.

2 SHEETS—SHEET 1

Fig. 1.

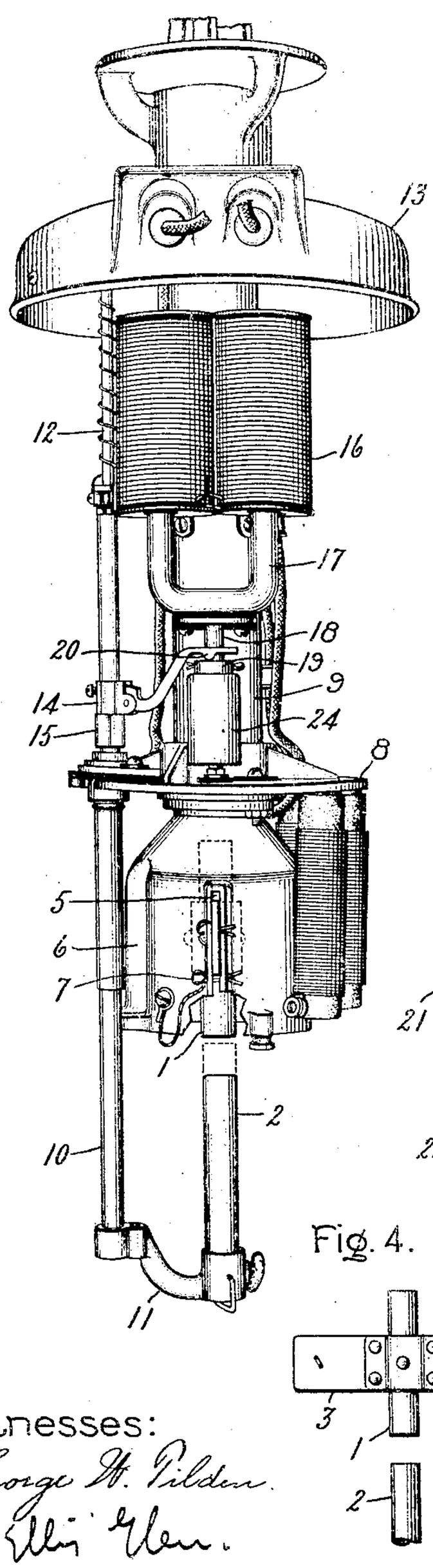

Fig. 2.

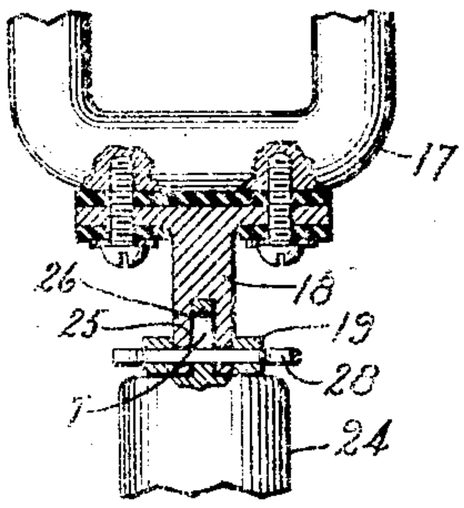

Fig. 3.

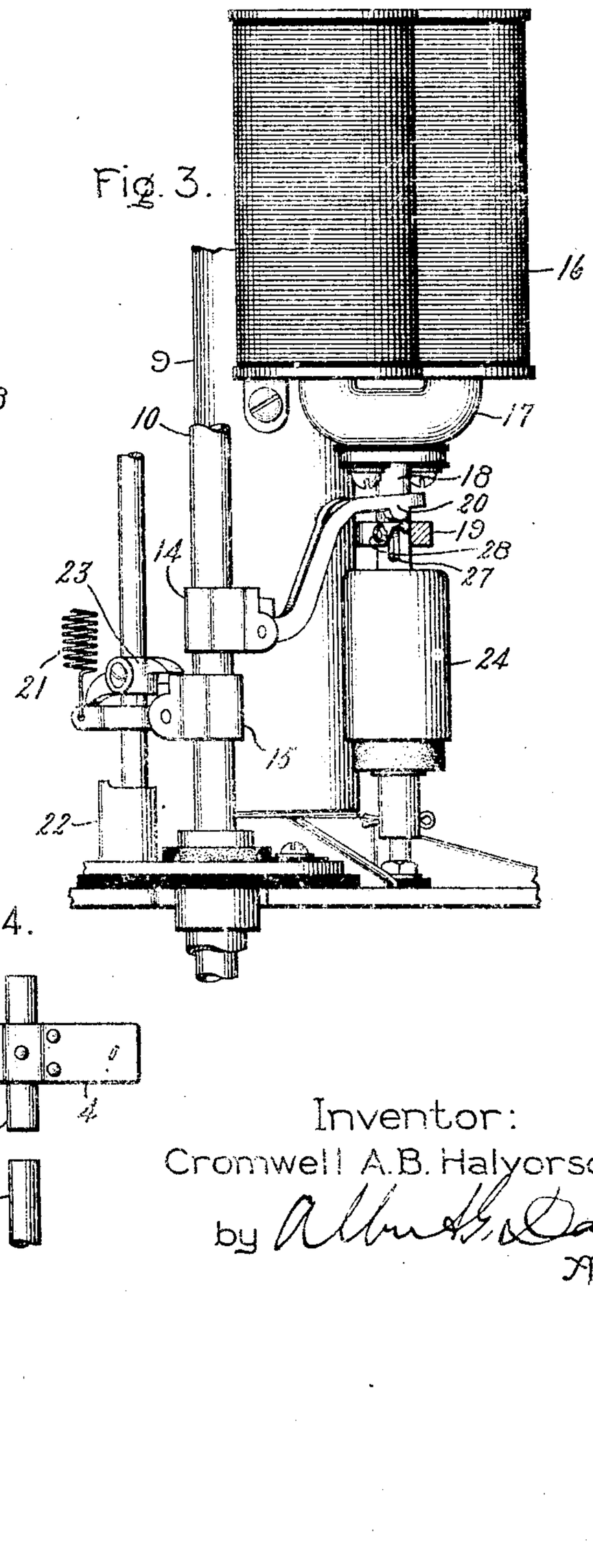

Fig. 4.

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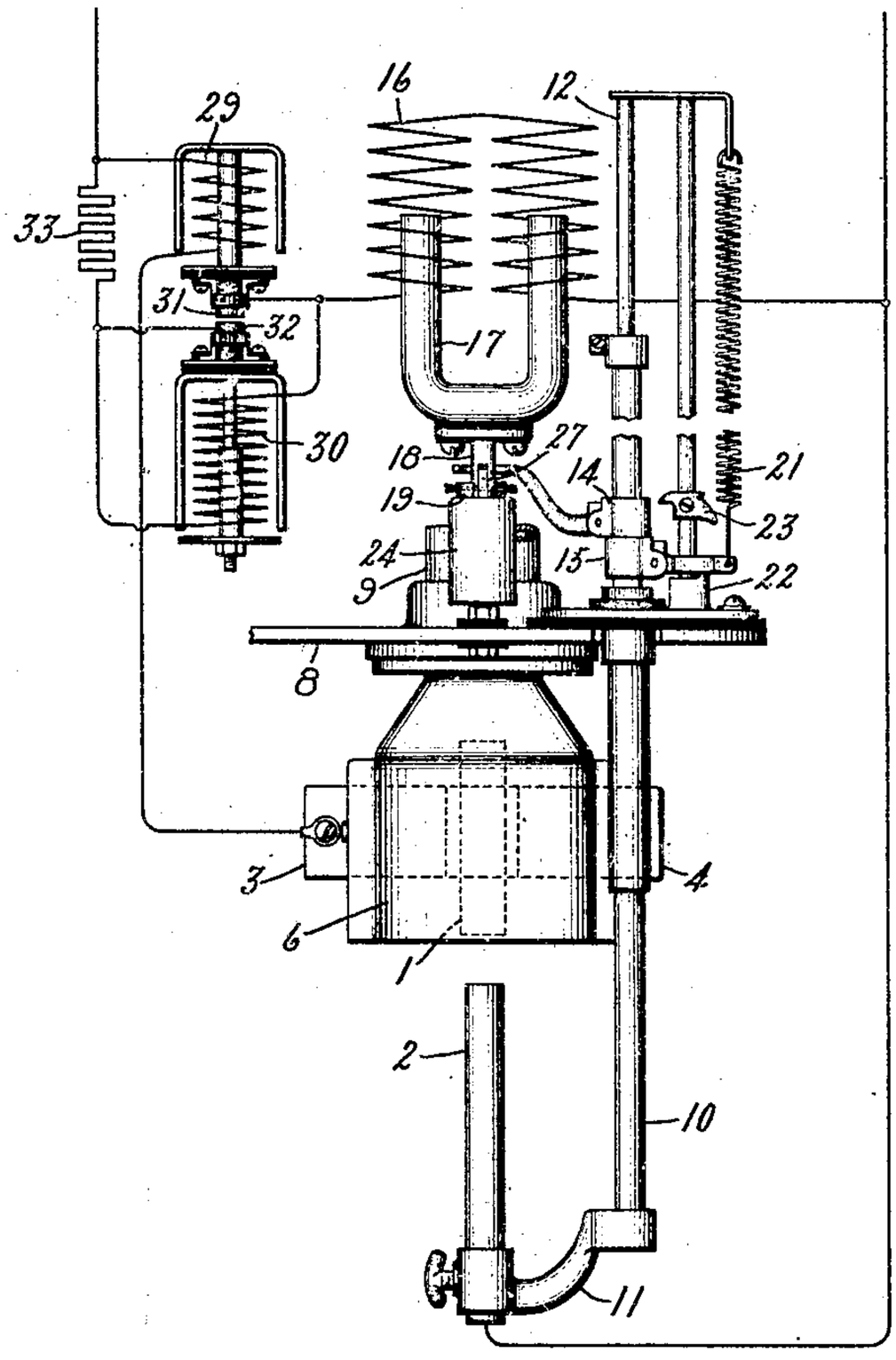
2 SHEETS—SHEET 2.

Fig. 5.



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UNITED STATES PATENT OFFICE.

CROMWELL A. B. HALVORSON, JR., OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LAMP.

No. 913,209. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed March 7, 1907. Serial No. 361,051.

To all whom it may concern:

Be it known that I, CROMWELL A. B. HALVORSON, Jr., a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

In electric arc lamps, particularly those having negative electrodes which give luminous or flaming arcs, there is danger that the electrodes, when brought into engagement with each other during the feeding operation of the lamp, will fuse or weld together on account of the softening of the arcing end of one or both electrodes under the influence of the arc; and the object of my invention is to prevent the occurrence of such welding together of electrodes.

In the ordinary luminous arc lamp having a negative electrode of magnetite, for example, feeding is effected by bringing that electrode into engagement with the positive electrode and then allowing it to drop a sufficient distance to give the proper arc length. In order that the separation of the electrodes shall not take place too suddenly and thus cause the arc to be broken, it is necessary to employ a dash-pot or other retarding means whereby the movement of the negative electrode in the arc striking direction is maintained slow enough to permit the arc to be gradually lengthened out. The use of this dash-pot, however, introduces the disadvantage of maintaining the electrodes in engagement with each other for an appreciable length of time before the negative electrode begins to descend. Therefore, after the lamp has been burning for some time and the end of the negative electrode has softened, the engagement between the two electrodes during the feeding operation may be of sufficient duration to permit the two electrodes to weld together so that the negative electrode fails to descend and strike the arc. In accordance with my invention the retarding means is so arranged that the initial separation of the electrodes may be quickly made so that the electrodes are not given an opportunity to weld together. Specifically stated, one electrode is permitted to drop freely through a limited distance which, while great enough to carry it out of engagement with the other electrode, is not sufficient to cause the arc to break.

The various features of novelty which characterize my invention will be hereinafter particularly pointed out in the claims; but for a full understanding of the invention in its various aspects, reference is to be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation of an arc lamp arranged in accordance with a preferred form of my invention, the casing and globe being removed; Fig. 2 is a detail showing the connection between the core or armature of the regulating magnet and the dash-pot; Fig. 3 is a side elevation showing, however, only a portion of the lamp, and the parts being in the position which they occupy when the regulating magnet is energized; Fig. 4 shows the electrodes of the lamp; and Fig. 5 is a diagram of connections.

Referring to the drawings, 1 and 2 indicate, respectively, the positive and negative electrode of a focusing luminous arc lamp. The positive electrode is shown as taking the form of a non-consuming copper member having wing-like portions 3 and 4 which extend through slots 5 in the walls of a fume box 6. The slots in the fume box have greater depths than the widths of the wings 3 and 4, so that the positive electrode is capable of limited movements in a vertical direction. Normally, the electrode is held in a predetermined position through the engagement of the lower edges of the wings 3 and 4 with cotter pins or other suitable stops 7 at the lower end of the slots. The fume box is located below the main platform 8 of the lamp and communicates with a chamber 9 which may form the backbone of the lamp. All these parts are of old and well-known construction and require no further description. The negative electrode is also illustrated as being supported and operated in a well-known manner, namely: a tube 10 passes vertically through the platform and carries at its lower end a holder 11 of the negative electrode; and it is guided at its upper end by means of the rod 12 which projects downwards from the hood 13 of the lamp into the interior of the tube.

14 and 15 are, respectively, the holding and lifting clutches of any usual construction; the function of the lifting clutch being to engage the supporting tube of the

lower electrode and move it vertically until the lower electrode has come into engagement with the upper electrode and forced the latter electrode upwards as far as it will go. The function of the holding clutch is to coöperate with the support for the lower electrode so as to permit this electrode to drop a predetermined distance away from the upper electrode after the two electrodes have been brought into engagement by means of the lifting clutch. The lifting clutch is operated by a suitable regulating magnet 16, which is in turn controlled, as will be hereinafter described, so as to become deënergized after the two electrodes have come into engagement, and thus permit the separation of the electrode to establish the arc. The core 17 of the electro-magnet has attached thereto a stem 18 provided with a shoulder or collar 19 upon which the end of the arm 20 of the lifting clutch rests. When the magnet is énergized, the core is drawn upward, the lifting clutch is brought into operative engagement with the tubular support in the lower electrode, and is then carried vertically through a variable distance until the lower electrode is brought into engagement with the upper electrode. The extent of this lifting movement is determined by the distance which separated the two electrodes before the movement began, since the lifting movement continues until the magnet is deënergized upon the engagement of the two electrodes with each other. The holding clutch is illustrated as being of the usual floating type normally locked to the tubular support for the lower electrode by means of an elongated spring 21. Normally this clutch rests upon a fixed stop 22 extending upwards from the platform. When the lifting movement begins the holding clutch travels with the electrode-supporting tube until it comes into engagement with a second fixed stop 23 which is arranged at some distance above stop 22. The stop 23 arrests the movement of the holding clutch which, however, permits the electrode-supporting tube to continue its upward movement. When the electromagnet is deënergized, the lower electrode and its supporting tube begin to drop, but the holding clutch immediately grips the tube and is carried downward with it until the stop 22 is reached. At this point both the clutch and the electrode are brought to rest. It will therefore be seen that the distance between the two stops 22 and 23 determines the length of arc which in the form of lamp shown is equal to this distance minus the distance through which the upper electrode is free to move.

The speed at which the lower electrode drops is determined by a dash-pot 24, the movable member of which is connected to a stem 18 which projects downward from the core of the armature of the regulating magnet. The connection between the stem and the dash-pot member is a loose one which permits of relative movements in a vertical direction between these parts. This is most clearly shown in Fig. 2. The lower end of the stem 18 is slotted so as to form a jaw 25, and into this jaw projects a member 26 secured to or forming part of the movable member of the dash-pot. The member 26 is provided with an elongated slot 27, through which projects a pin 28 carried upon the stem 18. The relative movements between the dash-pot and the armature of the magnet are therefore limited by the slot 27 and pin 28. The pin 28 is shown as serving an additional function, namely, that of securing the collar 19 to the stem 18.

In Figs. 1 and 2 the parts are shown in the positions which they occupy when the magnet is deënergized. It will be seen that when the regulating magnet is energized, its armature is drawn upward the length of the slot 27 before the movable member of the dash-pot begins to move. The armature of the magnet and the movable member of the dash-pot then continue their upward movement together; the pin 28 remaining in the upper end of the slot in the dash-pot member as indicated in Fig. 3. When the magnet is deënergized, it will be seen that the armature, and therefore the lifting clutch, holding clutch and lower electrode are free to drop the length of the slot 27 before the retarding influence of the dash-pot comes into play. Thereafter, however the pin 28 engages the wall at the lower end of the slot and further downward movement is in unison with the movable member of the dash-pot. The length of the slot 27 is such that the lower electrode, while free of the dash-pot, may drop through a distance equal to the distance through which the upper electrode drops, and a slight additional amount which will carry the lower electrode out of engagement with the upper electrode but not far enough to rupture the arc which is started.

In Fig. 1 the parts are shown in the normal running positions in full lines, while the position of the lower electrode at the moment it comes under the influence of the dash-pot is shown in dotted lines. It will be seen that at this moment the two electrodes are separated only a slight distance from each other, but this is quite sufficient to prevent them from welding together and at the same time does not interfere with the proper striking of the arc.

In Fig. 5 I have shown the lamp diagrammatically. Thus, in addition to the main regulating magnet there are two auxiliary magnets: the one 29 having a coil which in series with the electrode; and the other 30, a coil which is in series with the coil

the main magnet. To the respective cores of the auxiliary magnets are attached contacts 31 and 32, which, when they engage, place a shunt about the coil of electromagnet 30 and connect the coil of the main magnet across the line in series with a resistance 33. This arrangement of parts is exactly the same as that shown in an application filed by Richard Fleming, December 28, 1905, Serial No. 293,590, namely: when both magnets 29 and 30 are deënergized, contacts 31 and 32 engage; while during the substantial deënergization of magnet 30 and the energization of magnet 29, the contacts are out of engagement. When current is turned on the lamp, the contacts 31 and 32 being in engagement, a circuit is established through the main electromagnet, while the electromagnet 30 remains deënergized. The lower electrode is therefore raised in the manner described until it engages with and raises the upper electrode to the top of the slots in the fume box. Current now flows through the electrodes in series with the coil of electromagnet 29 and this magnet, being energized, lifts contact 31 out of engagement with contact 32, thereby connecting the coil of magnet 30 in series with the coil of the main magnet. The current through the main magnet is now so diminished that the core drops, carrying with it the lower electrode; the descent of these parts being first rapid and then slow, as previously described. As the arc lengthens, magnet 29 becomes weaker and magnet 30 stronger until a point is reached where the contacts 31 and 32 are brought together; whereupon the main magnet is again operatively energized and the lower electrode is lifted as before.

While I have illustrated and described my invention in detail as incorporated in a luminous arc lamp having a non-consuming positive electrode, I do not desire to limit the invention, in its application, to this form of lamp, although it is particularly well adapted thereto. In its broader aspects my invention contemplates any arrangement whereby the initial separation of two electrodes may be made quickly, while thereafter the electrodes continue to separate slowly so as to draw the arc to its proper length; and the type of lamp or the specific physical embodiment of the features constituting my invention are immaterial.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an arc lamp, the combination of a pair of electrodes, an electro-magnet and armature, the latter coöperating with one of the electrodes to permit the same to separate by gravity from the other to strike an arc, a retarding device and a lost motion connection between the same and the armature, whereby the initial arc striking movement of the electrode is free and the remainder of the movement is retarded.

2. In an arc lamp, an electrode tending normally to occupy a predetermined position, a second electrode, means for moving the latter electrode into engagement with the other electrode and carrying that electrode out of its normal position, said means being arranged to permit the said second electrode to drop by gravity to strike an arc, a dash-pot for retarding the dropping of said second electrode, and a loose connection between the latter electrode and the dash-pot which permits that electrode to drop freely until the other electrode has resumed its normal position and the arcing ends have separated slightly.

In witness whereof I have hereunto set my hand this fourth day of March, 1907.

CROMWELL A. B. HALVORSON, JR.

Witnesses:
JOHN A. MCMANUS, JR.,
PHILIP F. HARRINGTON.