C. A. B. HALVORSON, Jr.

ARC LAMP.

APPLICATION FILED JAN. 28, 1909.

973,653.

Patented Oct. 25, 1910.

Fig. 1.

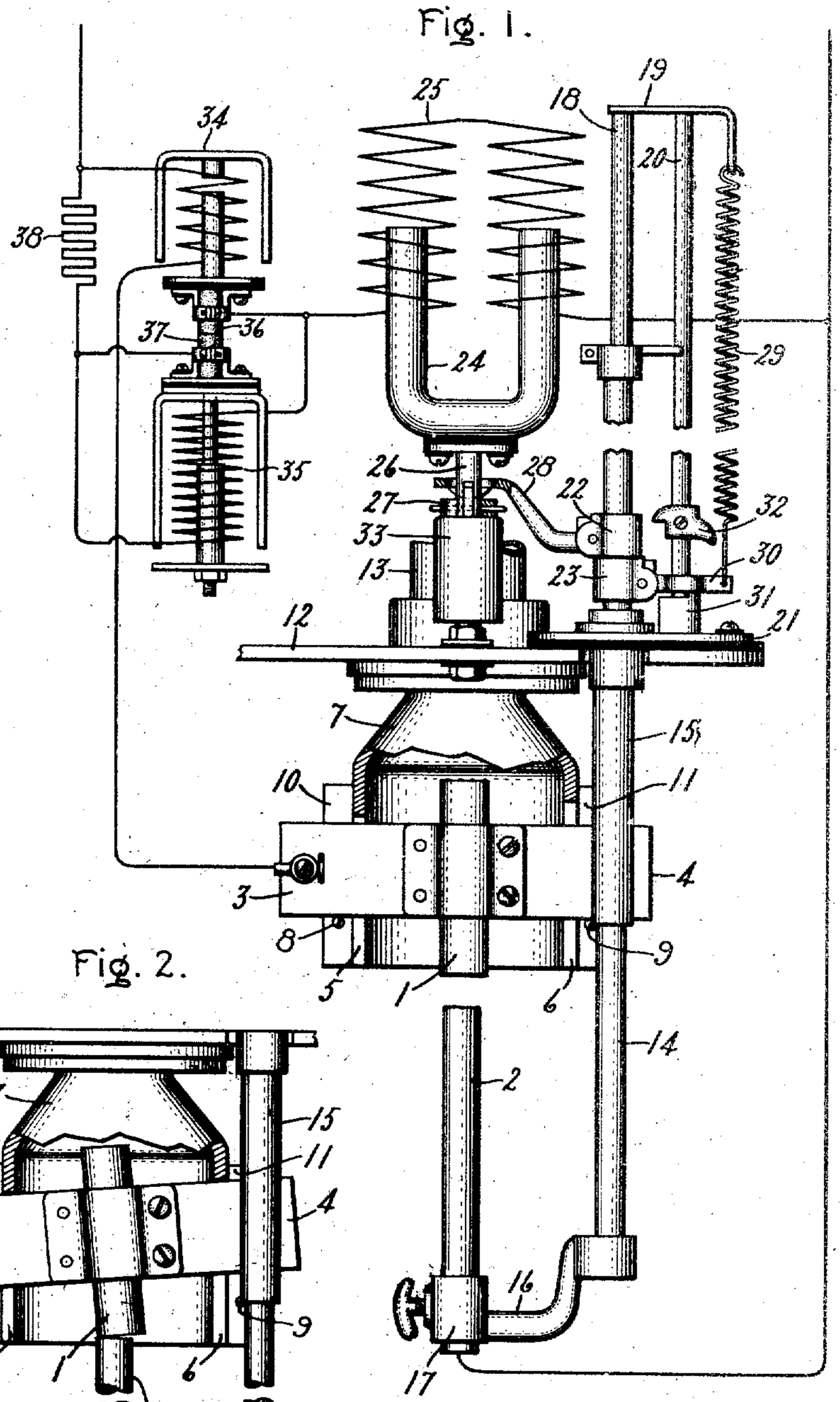
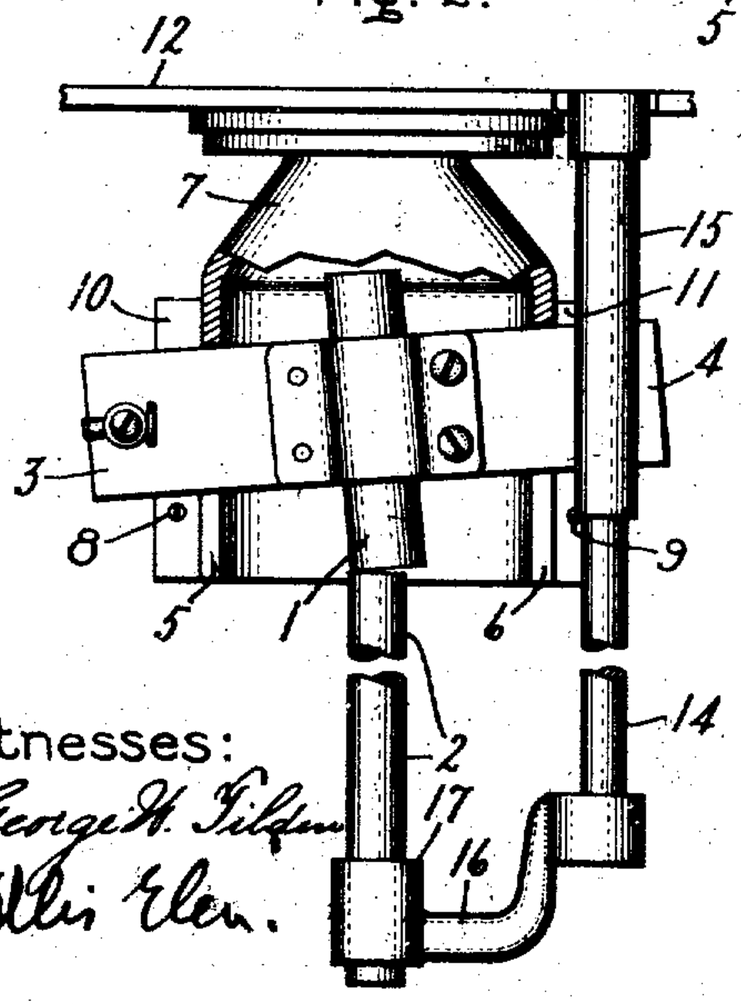


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ARC-LAMP.

973,653. Specification of Letters Patent. **Patented Oct. 25, 1910.**

Application filed January 28, 1909. Serial No. 474,721.

To all whom it may concern:

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

My invention has reference to improvements in arc lamps of the kind in which for the establishment of the arc and also at intervals during the feeding operation the two electrodes are brought together and are then separated to the arcing distance. In these lamps cathodes are employed which in consuming yield the gases or vapors which maintain the arc, while the anode is, as a rule, a piece of metal of good conductivity of heat and electricity and which, theoretically speaking, is not at all consumed, although in practice it has proved to become consumed at a slow rate. The cathode is usually made of a material which becomes fused at the arcing end, forming there a little pool from which the arc springs. In these lamps the inconvenience has been experienced that when the cathode, which is usually the lower electrode, is forcibly brought into contact with the anode the two electrodes become superficially fused together, and this phenomenon is spoken of as the freezing together of the electrodes. When this happens the electrodes are held together so tenaciously that they cannot be separated and the arc cannot be established, and the unduly great amount of current which is thus allowed to pass is liable to injure the parts.

My invention is designed to overcome this freezing together of the electrodes, and it consists in a peculiar mounting of one of the electrodes in such manner that when during the feeding operation the two electrodes are brought forcibly together one of these electrodes is caused to turn upon a pivotal point so as to be out of alinement with the other electrode, whereby the arcing faces of the two electrodes form a considerable angle with each other so as to be out of contact throughout their greater part, whereby the fused pool of the cathode is prevented from sticking to the anode or, if it has temporarily stuck to the same, is again peeled off before the pool has congealed and hardened. All this will more fully appear from the following description with reference to the accompanying drawing, in which:

Figure 1 represents an elevation of the operating mechanism of an electric arc lamp of the kind to which my invention applies, with its circuit connections and electromagnets diagrammatically indicated, the electrodes being shown separated; and Fig. 2 represents a portion of the same lamp mechanism in the condition after the electrodes have come into contact.

Like numerals of reference indicate like parts throughout the drawing.

In these drawings, 1 and 2 represent respectively a positive and a negative electrode of a luminous arc lamp. The positive electrode 1 is shown in the form of a copper rod having wing-like extensions 3, 4 which pass through diametrically opposite slots 5, 6 in the walls of the fume box 7. In these slots the wings of the electrode can move up and down but normally rest upon cotter pins 8, 9 which pass through flanges 10, 11 extending from the fume box near the slots 5, 6. When the wings of the electrode 1 rest upon these cotter pins the wings themselves are horizontal and the electrode 1 is vertical and in axial alinement with the electrode 2, as shown in Fig. 1. In accordance with my invention the slots 5, 6 are made of unequal length, as is clearly indicated in the drawing in which the slot 6 is shown as extending considerably higher up into the wall of the fume box than the slot 5, and this is the special feature of my invention as embodied in a lamp of the character here illustrated, as will appear farther on.

The platform 12 supports the fume box and from the upper side of the platform extends a chimney 13, it being understood that the platform has a wide opening registering with the upper end of the fume box and with the lower end of the chimney. In the drawing the chimney is shown as broken off.

The negative electrode 2 is shown sup-

ported and operated in a well-known manner. The tube 14 passes vertically through the platform and through the guide tube 15 and carries at its lower end an arm 16 which terminates in a socket 17 in which the negative electrode is clamped. The tube 14 is guided at its upper end by a rod 18 which projects downward from a bracket 19 supported by a standard 20 which is mounted on a plate 21 insulated from the platform 12.

22 and 23 are the lifting and holding clutches, of any usual construction. The function of the lifting clutch is to engage the supporting tube of the lower electrode and move it vertically until this electrode has come into forcible engagement with the upper electrode. 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 having an armature 24 and an energizing coil 25, and this magnet is so controlled as to become deënergized after the two electrodes have come into engagement and thus permit the separation of the electrodes for the establishment of the arc. The core of the electromagnet has attached to its yoke a stem 26 provided with a collar 27 upon which the end of the pawl arm 28 of the lifting clutch 22 rests. When the magnet is energized the core is drawn upward, the lifting clutch is brought into operative engagement with the tubular portion 14 of the carrier of the lower electrode and is then carried vertically upward until the lower electrode is brought into engagement with the upper electrode. The holding clutch 23 is of the usual floating type, normally locked to the tubular support of the lower electrode by means of the long spring 29, the upper end of which is hooked to the bracket 19 and the lower end to the pawl 30 of the clutch 23. Normally this clutch rests upon the fixed stop 31 rising from the insulated plate or platform 21. When the lifting movement begins, the holding clutch travels with the electrode-carrying tube 14 until it comes into engagement with a second stop 32 which is arranged at some distance above the stop 31. The position of the stop 32 may be adjusted to the desired height above the stop 31 on the rod 20 in any suitable manner. This stop 32 arrests the upward movement of the holding clutch which, however, permits the electrode-supporting tube to continue its upward movement, since by the engagement of this clutch with the stop 32 the clutch releases the tube 14. When the electromagnet is deënergized, the lower electrode and its supporting tube begin to drop, but the holding clutch immediately again grips the tube 14 and is carried downward with it until it again strikes the stop 31, when both the clutch and electrode are brought to rest. The dashpot controls the speed of descent of the lower electrode; the movable member 33 of this dashpot being connected to the stem 26, while the stationary member is fixed to the platform 12.

In Fig. 1 the parts are shown in the normal running position of the lamp, which is also the position when the current is turned off from the lamp.

In addition to the main magnet, there are two auxiliary magnets 34, 35; the first having a coil which is in series with the electrodes, and the other a coil which is in series with the coil of the main magnet. To the respective cores of the auxiliary magnets are attached contacts 36, 37 which, when they engage, place a shunt around the coil of the electromagnet 35 and connect the coil of the main magnet across the line in series with the resistance 38. When both magnets 34, 35 are deënergized the contacts 36, 37 engage, while during the subsequent deenergization of magnet 35 and the energization of magnet 34 the contacts are out of engagement. When current is thrown on, the contacts 36, 37 being in engagement, a circuit is established through the main electromagnet while the electromagnet 35 remains deënergized. The lower electrode 2 is, therefore, raised in the manner hereinbefore described until it engages with the upper electrode. Current now flows through the electrodes in series with the coil of electromagnet 34, and this magnet being energized lifts the contact 36 out of engagement with contact 37, thereby connecting the coil of magnet 35 in series with the coil of the main magnet. The current through the main magnet is now so diminished that its armature drops, freeing the tube 14, which now also drops, carrying with it the lower electrode. As the arc lengthens magnet 34 becomes weaker and magnet 35 stronger until a point is reached when the contacts 36, 37 are brought together; whereupon the main magnet is again operatively energized and the lower electrode is lifted as before.

The lamp so far described is of a well-known construction, and I have here described this lamp only as exemplifying the general character of lamp to which my invention applies; namely, as one in which the lower electrode is brought into forcible contact with the upper electrode and is then allowed to drop away from the same for the establishment of the arc, both in the beginning of the operation when current is first turned on and at each feeding operation, and it is during these feeding operations

that the phenomenon of welding or freezing together of the electrodes frequently happens, and which my invention is designed to avoid. It will readily be understood that when the lower electrode is forcibly thrown up into engagement with the upper electrode at a time when a molten pool has formed at the arcing end of either electrode, but generally at the face of the lower electrode, and if the upper electrode were either fixed in position or were guided so that it would after contact with the lower electrode move upwardly in axial alinement with the same, the molten pool would superficially fuse the surface of the upper electrode, and, since the arc at that time is extinguished, the pool would congeal and hold the two electrodes together, so that they could not be separated for the reëstablishment of the arc. This is the phenomenon which actually happens in lamps of this general character. With the construction herein shown this welding or freezing is avoided because, by reason of the unequal height of the two slots 5, 6 in which the wings 3, 4 of the upper electrode are guided, this upper electrode, when thrown upwardly by the impingement of the lower electrode therewith, will move upwardly in axial alinement with the lower electrode only an extremely short distance; namely, until the upper edge of the wing 3 is arrested by the upper end of the slot 5. After this the upper electrode continues to move upwardly, but no longer in axial alinement with the lower electrode, but inclined to that axis, since the upper end of the slot 5 now acts as a pivot for the electrode 1 upon which the same turns upwardly until the upper edge of the wing 4 comes into contact with the upper end of the slot 6, which is at a considerably higher level than the upper end of the slot 5. The position of the two electrodes during this phase of the operation is clearly indicated in Fig. 2, where it is seen that the arcing faces of the two electrodes are out of contact throughout their greater part and are only in contact at a point at their edges. Therefore, if during the initial upward movement of the two electrodes it should happen that the molten pool in the arcing face of the lower electrode incipiently fuses to the upper electrode, this incipient fusion will instantly be broken by the subsequent angular movement of the upper electrode; the fusion is, so to speak, peeled off, and the two electrodes become again as free from each other as before contact between them was established. I have found that by this arrangement the welding, sticking, or freezing together of the two electrodes is effectively prevented; and it will be clear from the foregoing description that I am not confined to the identical construction herein shown and described, since any construction whereby the axial alinement of the two electrodes, or the parallelism of their arcing faces, immediately after contact, is disturbed, will prevent the welding of the electrodes, and the greater this deviation from the axial alinement or from parallelism of the arcing faces is made and the more promptly it is produced, the more surely will the welding of the electrodes be prevented.

While in the foregoing description and in the drawing I have explained and illustrated my invention with reference to a lamp in which the electrodes are apart when the current is off, it is quite evident that the invention is equally applicable to lamps in which the electrodes are in contact when the current is off.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In an arc lamp with electrodes having weldable contacting surfaces, means for contacting the electrodes and bodily moving one of them and then separating them for establishing the arc, and means for angularly displacing one arcing face with reference to the other during contact.

2. In an arc lamp with weldable electrodes, means for forcibly impacting the electrodes and bodily moving one of them and then separating them for establishing the arc, and means for angularly separating the arcing faces by the force of the impact.

3. In an arc lamp with weldable electrodes, means for forcibly impacting the electrodes and bodily moving one of them and then separating them for establishing the arc, and means for turning the arcing face of one electrode at an angle to the face of and by the impact of the other electrode.

4. In an arc lamp with weldable electrodes, means for feeding one electrode into forcible contact with the other and moving it bodily and then separating them for establishing the arc, and means for tilting the arcing face of one of the electrodes by the force of the contact with the other.

5. In an arc lamp, a positive metal electrode normally maintained in a predetermined position, a negative electrode of a material developing a fused pool in its arcing face under the action of the arc, means for moving the negative electrode into contact with the positive electrode and then separating it therefrom to strike the arc, and means for bodily lifting and simultaneously tilting the face of the positive electrode from the fused pool during contact.

6. In an arc lamp, the combination of an upper electrode, two vertical guides of unequal height affording freedom of upward movement for the electrode, a lower electrode, and means for feeding it into contact

with the upper electrode and tilting the latter about the upper end of the guide of lesser height.

7. In an arc lamp, a draft tube having diametrically opposite vertical slots of unequal height, a winged upper electrode whose wings freely extend through the slots, means for normally supporting the electrode with its wings in a predetermined horizontal position, a lower electrode, and means for feeding the same into contact with the upper electrode and forcing the wings of the latter each to the upper end of its guiding slot.

In witness whereof, I have hereunto set my hand this twelfth day of January 1909.

CROMWELL A. B. HALVORSON, JR

Witnesses:

JOHN A. MCMANUS, JR.,

CHARLES A. BARNARD.