

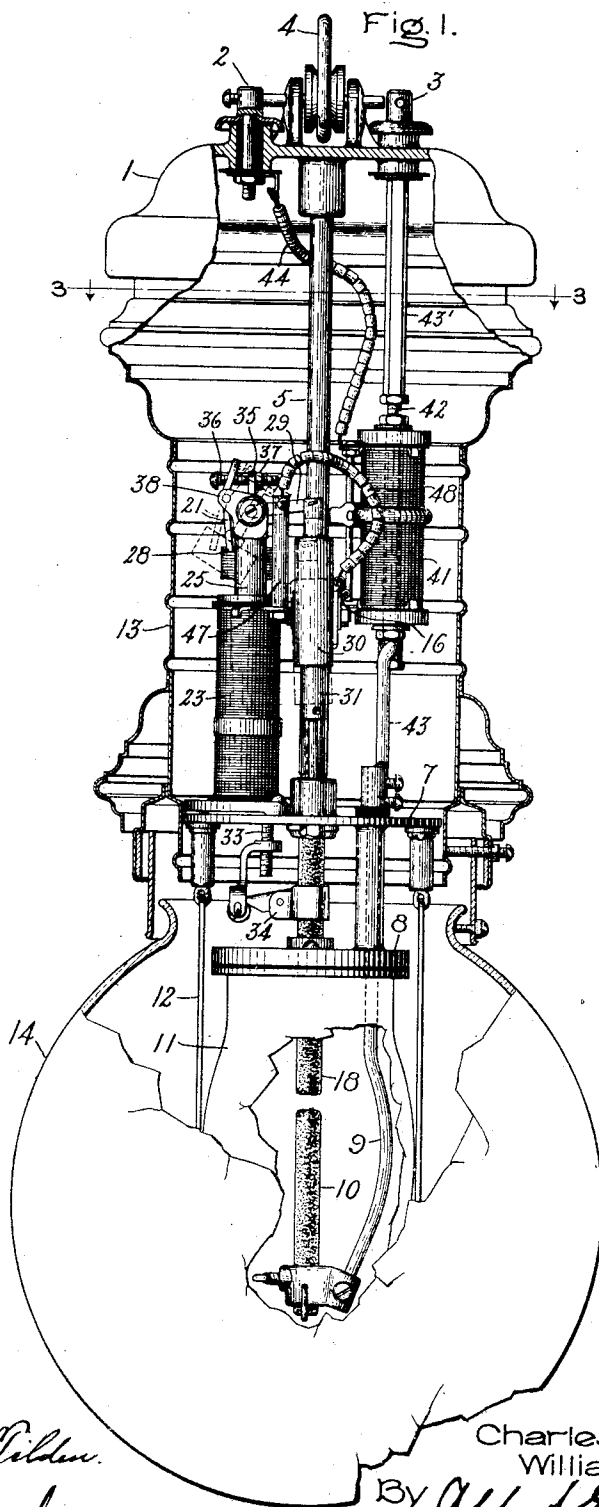
C. E. HARTHAN & W. H. DALTON.
ARC LAMP.

APPLICATION FILED DEC. 10, 1904.

945,942.

Patented Jan. 11, 1910.

4 SHEETS—SHEET 1.



Witnesses:

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4 SHEETS—SHEET 2.

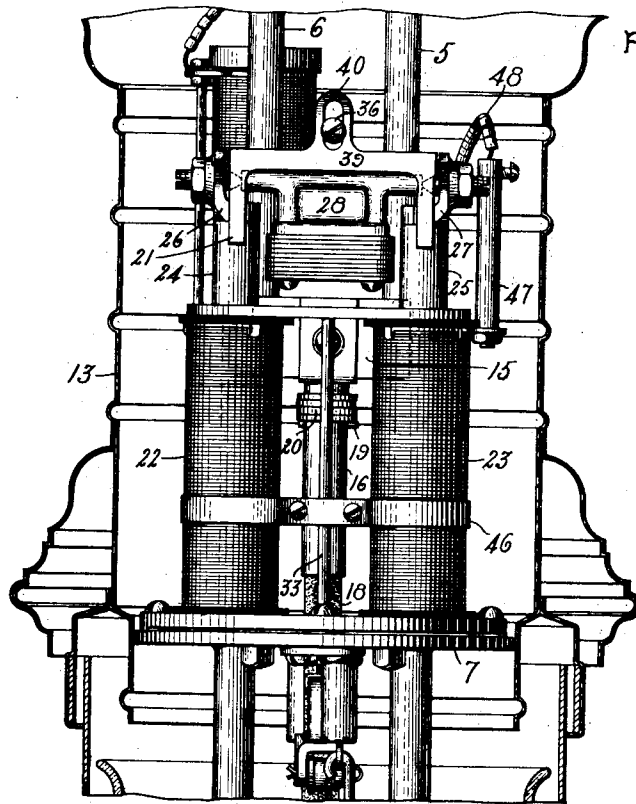


Fig 2.

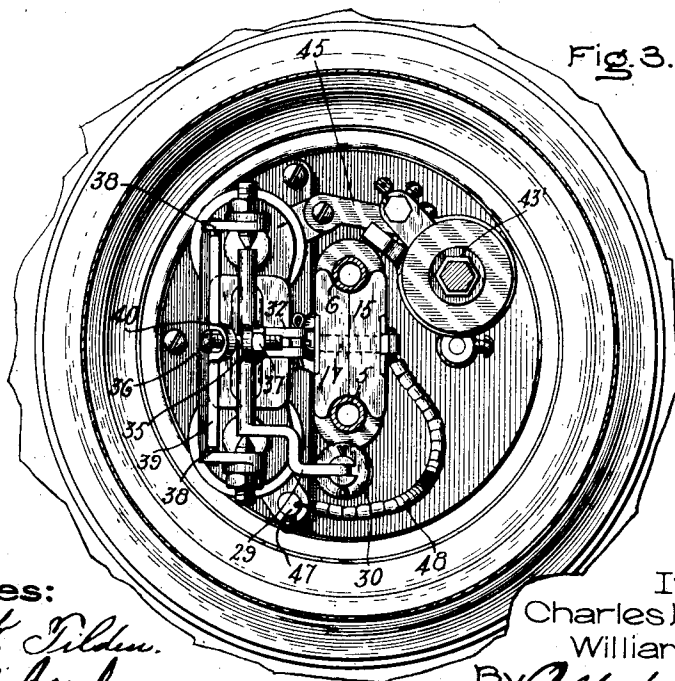


Fig 3.

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4 SHEETS—SHEET 3.

Fig. 4.

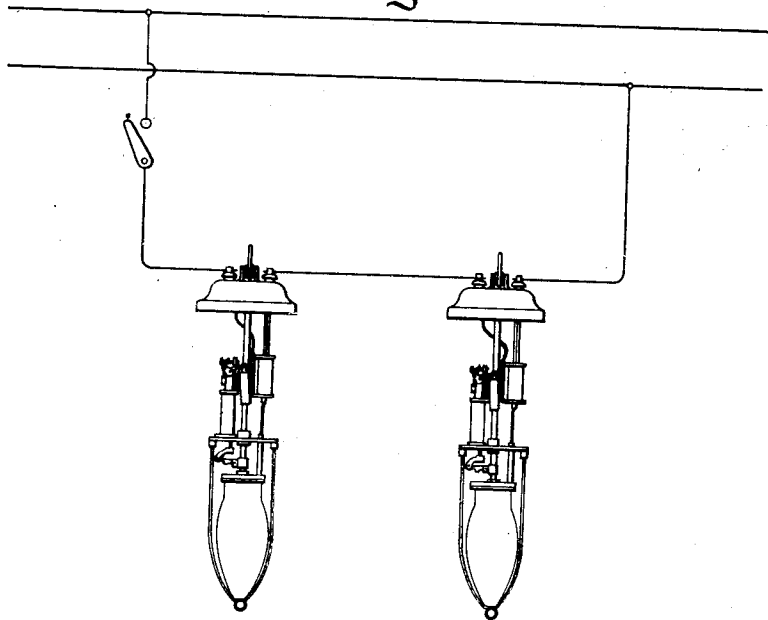
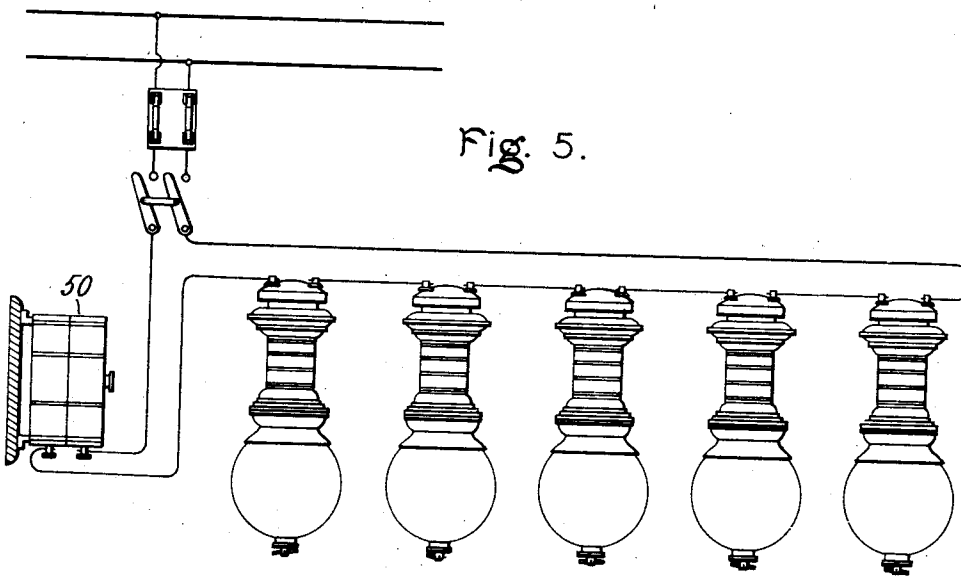


Fig. 5.



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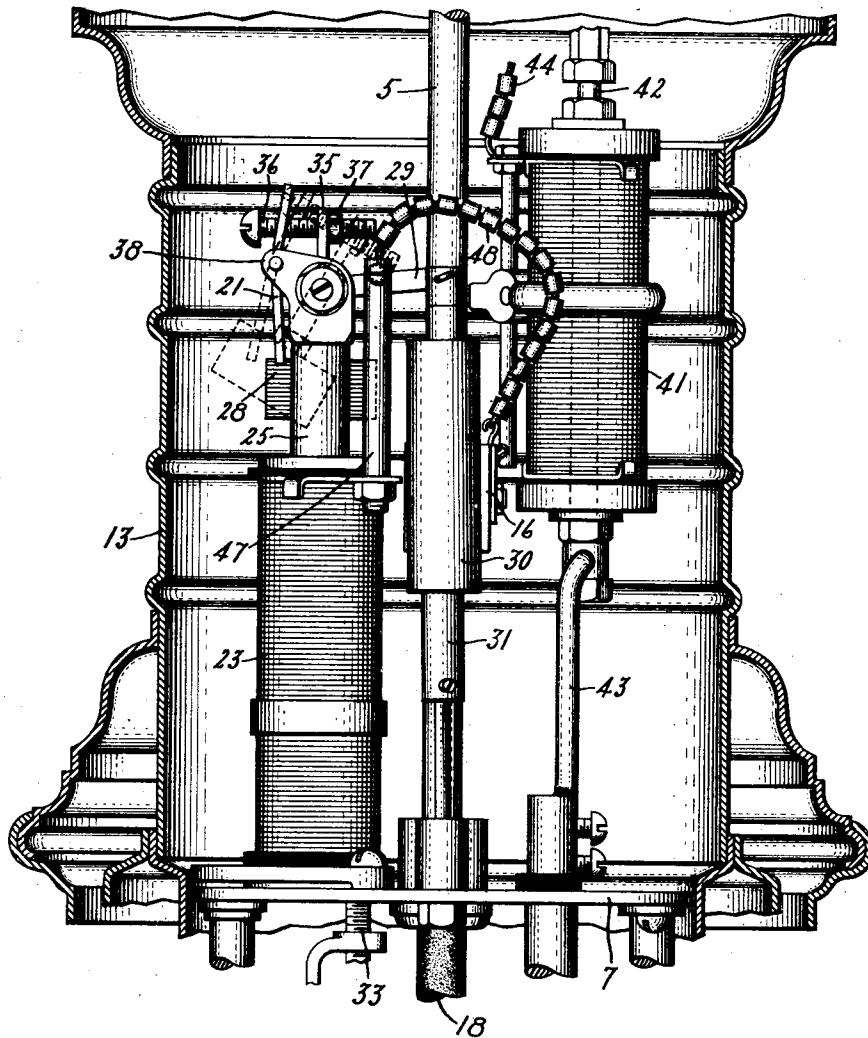
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4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

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ARC-LAMP.

945,942.

Specification of Letters Patent.

Patented Jan. 11, 1910.

Application filed December 10, 1904. Serial No. 236,276.

To all whom it may concern:

Be it known that we, CHARLES E. HARTHAN and WILLIAM H. DALTON, citizens 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.

This invention relates to arc lamps and particularly to constant potential arc lamps designed for operation with two or more sets of electrodes connected in series.

One type of arc lamp in which our invention is of special utility is that known as a power circuit lamp for operation with two or more lamps connected in series across approximately constant potential mains of higher voltage than those across which constant potential lamps are ordinarily used.

Power circuit lamps as constructed prior to our invention have been provided with shunt coils or other auxiliary mechanism governing the feed of the movable electrode. Without such mechanism one lamp of the series would be apt to rob another or others of voltage and a poor regulation would result; one lamp might burn much brighter than another or others, and this difference might increase until finally one lamp would go out, reducing the number in the series by one, and the arcs of the other lamps would be abnormally long. It is desirable to dispense with shunt coils if possible as they are expensive and not as well adapted to constant potential circuits as to constant current circuits.

It is one of the objects of our invention to provide a power circuit lamp which will not require shunt coils or other auxiliary mechanism governing the feed of the movable electrode and which will regulate properly when two or more of the lamps are burned in series across approximately constant potential mains. We accomplish this by providing in each lamp, in combination with the feeding and regulating mechanism thereof, means for causing a constantly increasing instability of the arcs in the several lamps; this instability finally reaches a point where the arcs of one or more of the lamps snap, thus opening the circuit

through the group of lamps and all of them have their arcs restruck and their regulating mechanisms restored to a condition of equal stability. If the electrodes in one lamp are consumed more rapidly than those in another the mechanism in that lamp for increasing the instability of the arc is brought into action sooner than that in the other lamp or lamps to reduce the freedom of armature movement in that lamp and the arc finally snaps, breaking the circuit and causing a new pick-up to take place in all the lamps simultaneously.

In addition to this, and as a more specific feature, our invention comprises an electromagnetic stop by which movement of the movable electrode of the lamp is arrested after it has been fed forward a definite amount until the circuit through the lamp is broken. This stop prevents one arc from becoming abnormally long and robbing the others of voltage so that all the lamps burn with equal luminosity and at the proper time the circuit through the series of lamps is broken and new arcs are struck.

We are aware that prior to our invention twin-arc lamps having two sets of electrodes connected in series have been provided with stops to arrest the movement of the regulating mechanism but in these lamps both pairs of electrodes are in one lamp so that all the light comes from practically one source and a single regulating mechanism governs them both.

Our invention contemplates the use of a plurality of separate and independent lamps connected in series across constant potential mains and each provided with a single pair of electrodes and its own individual regulating mechanism so that the several lamps of the series may be placed in the positions best adapted for the distribution of light desired and will burn with equal luminosity although no shunt coils or other auxiliary mechanism controlling the feed is provided.

Our invention further comprises novel features in the construction of arc lamps all of which will be definitely indicated in the claims appended hereto.

The details of construction and the mode of operation of our improved arc lamp will

be better understood by reference to the following description taken in connection with the accompanying drawings which illustrate the preferred embodiment and in which—

5 Figure 1 is a sectional elevation of a lamp equipped with our improvements; Fig. 2 is a sectional elevation of a portion of the lamp on a plane at right angles to that of Fig. 1; Fig. 3 is a section on line 3—3 of Fig. 1; Figs. 4 and 5 are diagrammatic views showing electrical connections, and Fig. 6 shows a sectional elevation of a portion of the lamp equipped with our improvements, substantially as shown in Fig. 1 but on a larger scale.

Referring to the drawings, 1 indicates the lamp-top on which are mounted binding-posts 2 and 3 and the insulated suspension-link 4. Depending from the under side of the lamp-top 1 are two parallel lamp rods 5 and 6 which carry at their lower ends the platform 7. Rigidly suspended from the under side of platform 7 is a gas-cap 8. A rod 9 extends down through the leg which supports the gas-cap 8 and is insulated therefrom, and at its lower end carries the lower electrode 10. The inclosing globe 11 is held against the gas-cap 8 by a spring-supported bail 12. A suitable casing 13 incloses the regulating mechanism of the lamp, and at its lower end supports the outer globe 14.

Mounted to slide vertically on the two parallel rods 5 and 6 is a follower-block 15 to which is secured a holder 16 for the movable electrode. The follower-block 15 preferably consists of two blocks of porcelain or other insulating non-combustible material, as shown in Fig. 3, secured together and to the holder 16 for the movable electrode by a bolt 17 which passes through extensions on the upper end of holder 16 and through the two pieces of porcelain which form the follower-block. The movable electrode 18 is held in the holder 16 and extends down through platform 7 and an insulating bushing in the gas-cap 8. Supported on the holder 16 by means of a pin 19 are a number of weights 20 made in the form of washers. By withdrawing the pin 19 and changing the number of weights 20 held on the holder 16 thereby, the total weight tending to force the movable electrode downward and hence the current consumed in the lamp may be adjusted.

55 Mounted on the platform 7 are two magnets 22 and 23 each consisting preferably of ribbon conductor wound on edge about an iron core to form a helix having the turns suitably insulated one from another, as such a coil is self-sustaining and can be made practically indestructible. The cores 24 and 25 of these magnets are extended upward and carry end-pieces 26 and 27 in which is pivoted an armature 28. Secured to the

armature is an arm 29 which is pivoted to the cylinder 30 of a dash-pot, the plunger 31 of which is pivotally connected to the platform 7. Also secured to arm 29 is an arm 32 which is pivotally connected to a clutch-connecting rod 33; at its lower end this rod is pivotally connected to the clutch 34 for the movable electrode. Integral with the armature 28 and extending upward therefrom is a projection 35 having a threaded opening therein in which a screw 36 may be secured in any desired position by means of a lock-nut 37. Pivoted in offsets 38 on the end-pieces 26 and 27 is a member 39 of iron or other magnetic material having downwardly extending legs 21 adapted to be drawn into engagement with the magnet cores 24 and 25, and an upwardly extending portion 40 provided with a slot, as shown in Fig. 2, through which the screw 36 extends.

Within the lamp casing is an adjustable resistance 41, preferably consisting of ribbon conductor wound on edge. This resistance is mounted on a rod 42 and insulated therefrom in any desired manner and rod 42 is secured between the lamp-top 1 and the platform 7 by legs 43 and 43', the lower one of which is secured to the upper end of rod 9, and the upper one of which is electrically connected to the binding-post 3.

Current enters the lamp at the binding-post 2 and is carried by the lead 44 to so much of the resistance 41 as is connected in circuit and from the bottom of coil 41 a connecting member 45 carries the current to the top of the magnet coil 22. A connecting member 46 cross-connects coil 22 with coil 23 for the purpose of adjustment, and at the top of coil 23 is a connecting member 47 to which is connected one end of a flexible lead 48, the other end of which is secured to the carbon holder 16, preferably by the same bolt which secures the two parts of the follower-block and the carbon holder together. From the lower electrode 10 the current is carried by rod 9, leg 43, rod 42 and leg 43' to the negative binding-post 3.

As above described, power circuit lamps as thus constructed are designed for operation with a plurality of lamps connected in series across mains of approximately constant potential. Fig. 4 shows two of the lamps connected in series across a 220 volt circuit; in this case the resistance 41 necessary to steady the arcs is usually placed within the casing of the lamps. Fig. 5 shows five of the lamps connected in series across a 550 volt circuit, as, for instance, a direct current trolley circuit; in this case it is sometimes more convenient to provide a separate resistance 50 for all of the lamps in the series as illustrated. When the circuit is closed the magnets 22 and 23 are energized and rock the pivoted armature 28 in each

lamp to the position shown in full lines in Fig. 1. By this movement the movable electrode is lifted to strike the arc by means of the arm 32, clutch-connecting rod 33 and clutch 34. The magnets also turn the member 39 on its pivots drawing the legs 21 into engagement with the magnet cores 24 and 25. As the electrodes of the lamp are consumed the armature 28 in each lamp turns slowly on its pivots to feed the movable electrode forward until finally the head of screw 36 engages with the sides of the slot in the extension 40 on the member 39 and prevents further movement of the armature 28 in a direction to cause feeding of the electrode. This increases the instability of the arc in each lamp by stretching it and finally one or more of the arcs snap and the circuit through the series of lamps is broken. The legs 21 of member 39 are then released by the magnets 22 and 23 and member 39 and armature 28 turn on their pivots dropping the movable electrodes 18 and tripping the clutches 34 in the several lamps. This position of the parts is illustrated by the dotted lines in Fig. 1. The circuit is thus closed again and the magnets in each lamp attract their armature thus lifting the movable electrode so that new arcs are struck in all the lamps in the series simultaneously.

If by reason of differences in friction, adjustment of dash-pots or for any other cause, one of the lamps in starting, should draw its arc more quickly than the others, the armature in that lamp would initially swing to the position shown in full lines in Fig. 1; but it would not remain in that position after the other arcs had started, since the decrease of current would leave the magnet too weak to support the electrode unassisted and the weight of the electrode would cause the armature to swing about its pivot until the weight of the armature (now acting as a gradually increasing counterweight) and the pull of the electromagnet balanced the weight of the electrode. In the other lamps, however, the armatures would not assume the extreme position, but would be gradually drawn into approximately the adjusted position of the first armature, so that the arc lengths in all of the lamps would be substantially uniform. The armatures are therefore regulating.

Although we have shown and described herein a power circuit arc lamp of the magnet type, we wish it understood that our invention, in its broad aspects, is applicable to power circuit lamps of the solenoid or other types; also that the novel features of construction of our invention are applicable generally to arc lamps of all types; and also that the construction illustrated may be modified in many respects without departing from the spirit of our invention.

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

1. An arc lamp having a movable electrode, a magnet, an armature pivoted in co-operative relation to the core thereof, means whereby movement of the armature positions the movable electrode, and an electromagnetic stop actuated by said magnet to arrest the movement of the pivoted armature.

2. An arc lamp having a movable electrode, two magnets, an armature pivoted in extensions of the cores thereof and actuated thereby to position the movable electrode, and electromagnetic means for holding the pivoted armature and the movable electrode against movement until the circuit through the lamp is broken.

3. An arc lamp having a movable electrode, a magnet, a pivoted armature actuated thereby to position the movable electrode, and a member of magnetic material pivoted adjacent to the magnet and arranged to be actuated thereby to arrest the movement of the pivoted armature when the latter is in a definite position.

4. An arc lamp having a movable electrode, two magnets, an armature pivoted in extensions of the cores thereof and actuated thereby to position the movable electrode, and a member of magnetic material also pivoted in said extensions and arranged to arrest the movement of the pivoted armature when the latter is in a definite position.

5. An arc lamp having a movable electrode, a magnet, a pivoted armature actuated thereby to position the movable electrode, and a member of magnetic material pivoted adjacent to the magnet and adapted to be drawn into engagement therewith, said member being interlocked with said armature so as to arrest the movement of the armature when it reaches a definite position.

6. An arc lamp having a movable electrode, a magnet, two pivoted members actuated thereby, one of said members being arranged to position the movable electrode and the other being adapted to be drawn into engagement with the magnet core, and a projection on one of said members adapted to engage the other member to arrest movement thereof.

7. An arc lamp having a movable electrode, a magnet, two pivoted members actuated thereby, one of said members being arranged to position the movable electrode and the other being adapted to be drawn into engagement with the magnet core, and an adjustable projection on one of said members adapted to engage the other member to arrest movement thereof.

8. In an arc lamp, a lamp-top and a plat-

form, means uniting them, a rod secured to
but insulated from the platform, a holder
for a stationary electrode at the lower end of
said rod, a metallic supporting member be-
5 tween the lamp-top and platform secured to
said rod and electrically connected to a
binding-post of the lamp, and a resistance
coil mounted on but insulated from said sup-
porting member.

In witness whereof, we have hereunto set 10
our hands this eighth day of December,
1904.

CHARLES E. HARTMAN.
WILLIAM H. DALTON.

Witnesses:

JOHN A. McMANUS, Jr.,
DUGALD McK. McKILLOP.