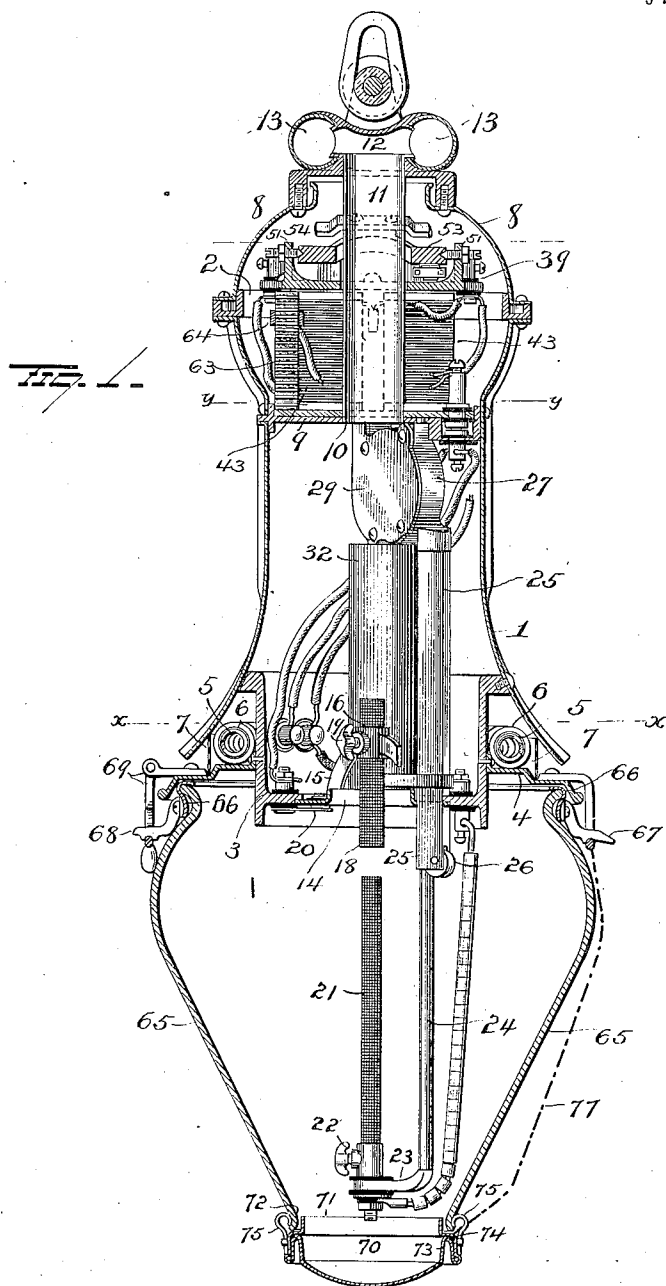


T. E. ADAMS.
ELECTRIC ARC LAMP.
APPLICATION FILED OCT. 15, 1908.

1,032,262.

Patented July 9, 1912.

5 SHEETS—SHEET 1.



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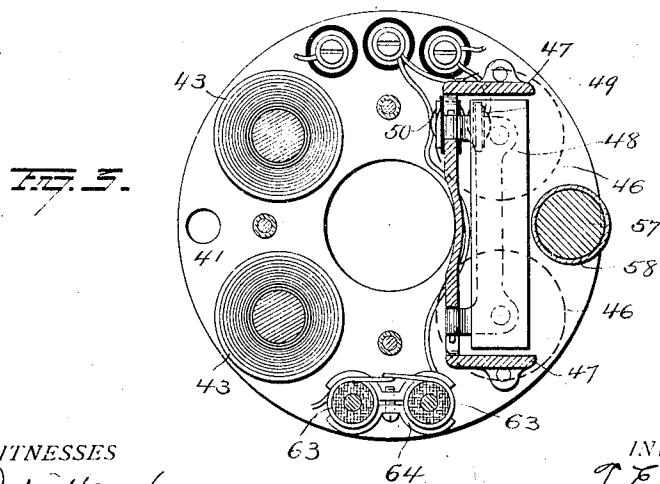
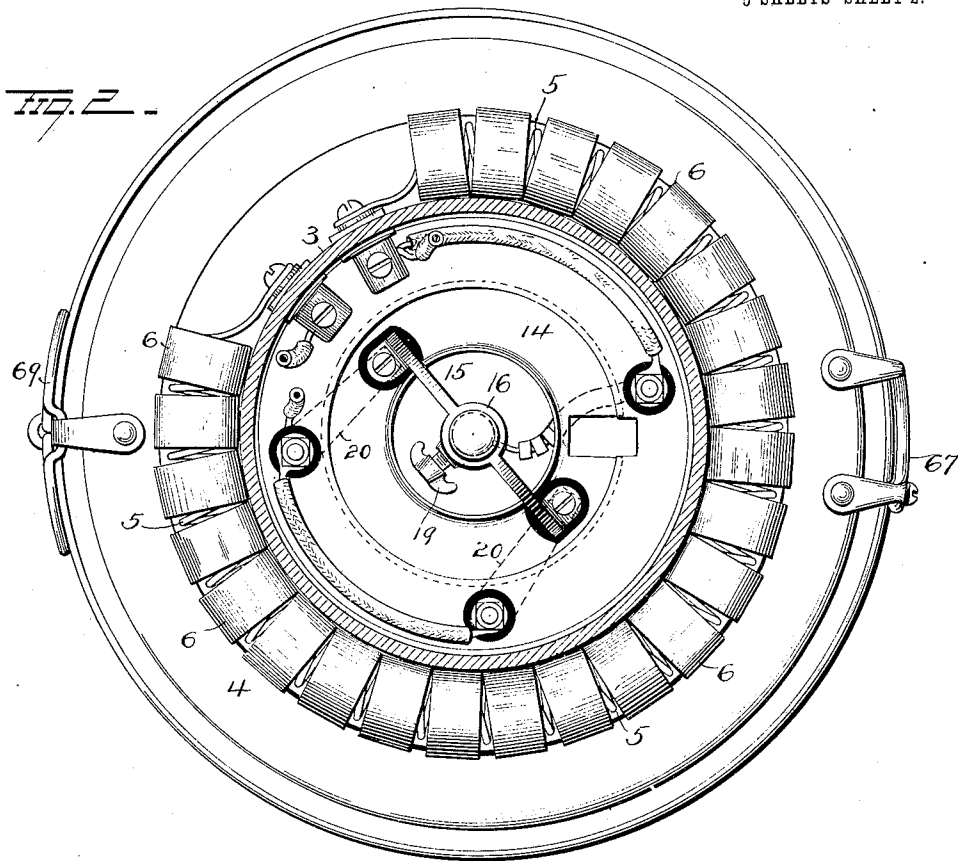
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5 SHEETS—SHEET 2.



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6 SHEETS—SHEET 3.

FIG. 4.

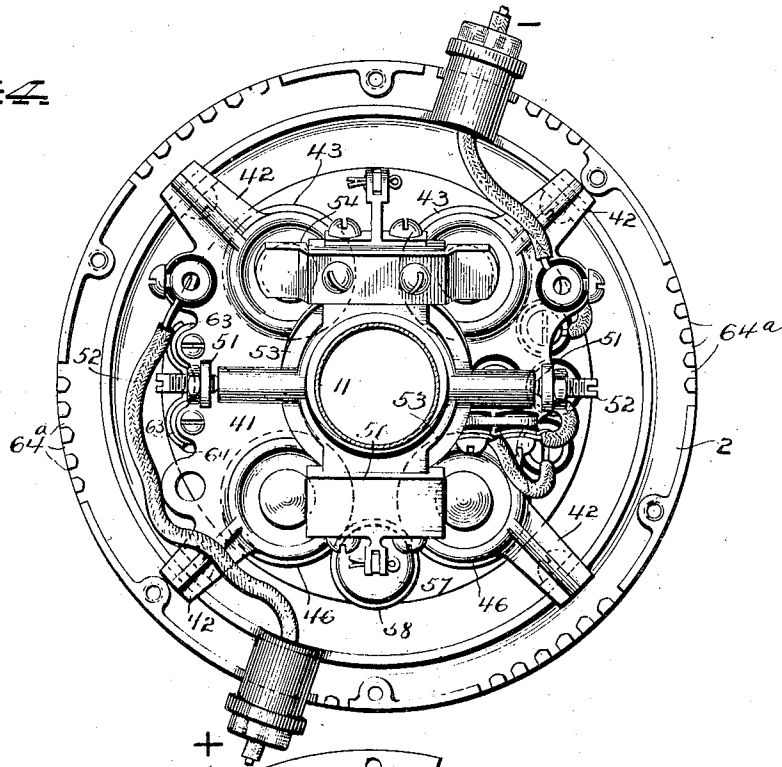
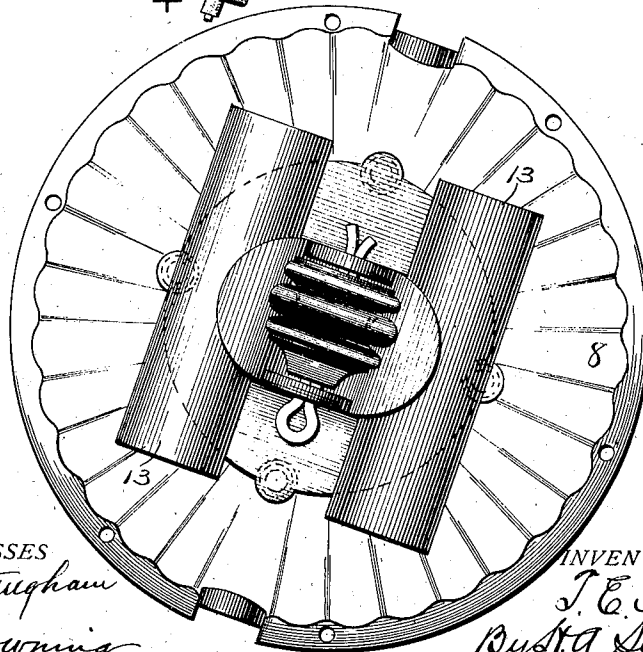


FIG. 5.



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5 SHEETS—SHEET 5.

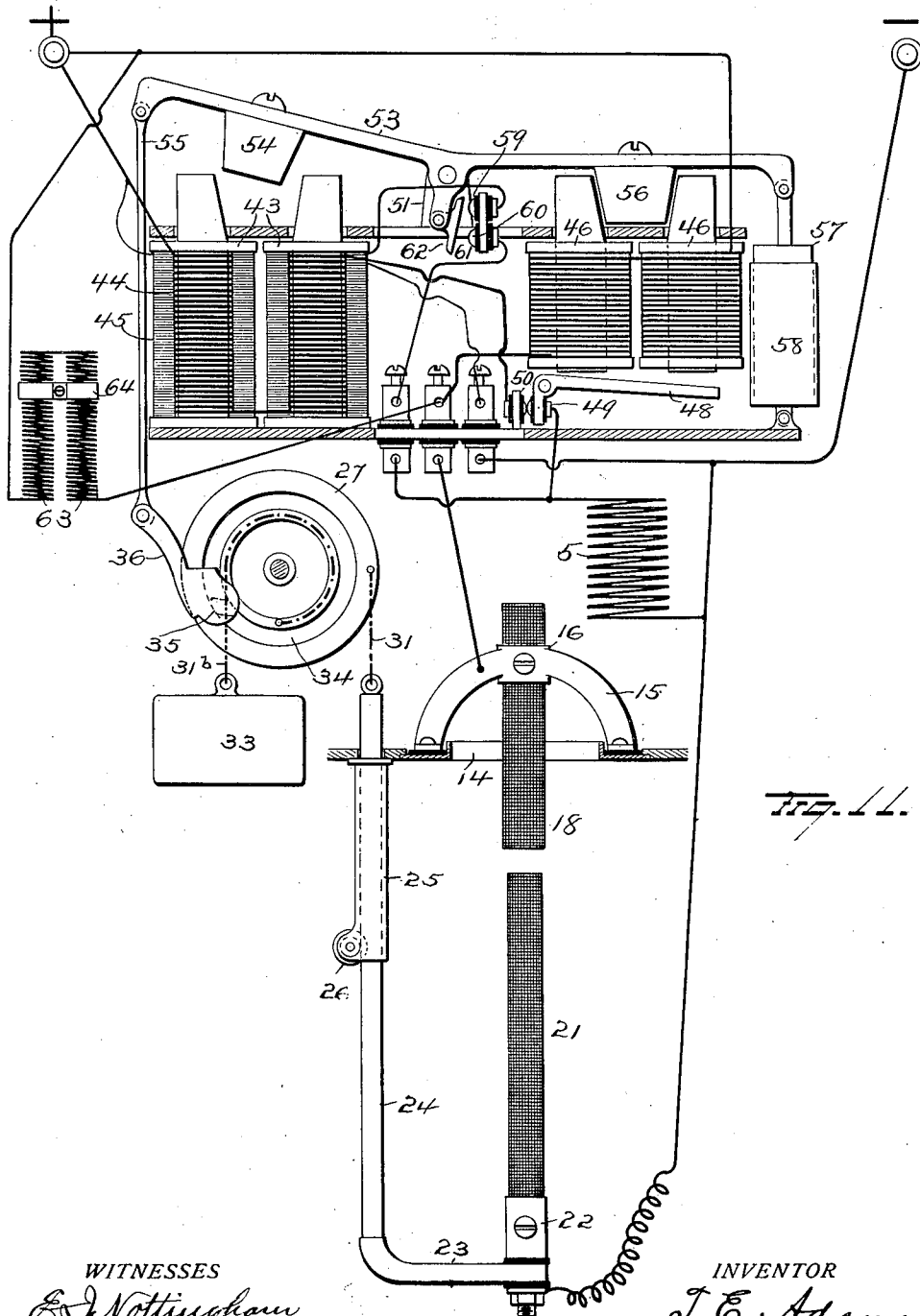


Fig. 11.

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UNITED STATES PATENT OFFICE.

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ELECTRIC-ARC LAMP.

1,032,262.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed October 15, 1908. Serial No. 457,843.

To all whom it may concern:

Be it known that I, THOMAS E. ADAMS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in electric arc lamps,—one object of the invention being to provide a lamp which will operate accurately and effectually with metallic electrodes.

A further object is to so construct an electric arc lamp that it will start in establishing the arc in a manner similar to a lamp of the "shunt" type and afterward act to maintain and regulate the arc as in a lamp of the "differential" type.

A further object is to improve and simplify the construction and arrangement of parts of an electric arc lamp, to the end that the latter shall be accurate in operation as well as effectual in the performance of all the functions required of it.

With these objects in view the invention consists in certain novel features of construction and combinations of parts as hereinafter set forth and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view of an arc lamp embodying my invention; Fig. 2 is a sectional view on the line $x-x$ of Fig. 1 with some of the parts removed; Fig. 3 is a similar sectional view on the line $y-y$ of Fig. 1; Fig. 4 is an enlarged plan view with the cap of the casing removed; Fig. 5 is an enlarged plan view of the cap of the casing; Fig. 6 is an enlarged view of the operating mechanism, and Figs. 7, 8, 9 and 10 are views illustrating the clutch devices and co-operating parts, and Fig. 11 is a diagrammatical view.

1 represents a casing preferably of sheet metal to the upper end of which a cast metal ring 2 is secured and within the lower portion of said casing or shell, a bowl 3 is secured and depends therefrom. A globe cover 4 is secured to the lower portion of the bowl and upon this cover a resistance coil 5 is supported and is utilized in the operation of the lamp as hereinafter explained. The

resistance coil 5 is supported within suitable insulating rings 6 and covered by the flaring lower end of the shell or casing 1 and inclosed by a perforated ring or flange 7 rising from the globe cover. The top of the shell or casing 1 is closed by a cap or cover 8 secured to the ring 2.

A platform 9 is located within the shell or casing 1 a suitable distance below the upper end thereof and serves to segregate the electrical devices of the regulator mechanism from the lower portions of the casing. This platform is provided centrally with a hole 10 which communicates with a tube 11 depending from the cover 8 of the shell or casing. The upper end of this tube 11 communicates with a hollow casting 12 mounted upon the cap or cover 8 and said hollow casting communicates at diametrically opposite sides with chimneys 13 which may be disposed horizontally and each open at both ends. The platform 9 serves to protect the electrical devices of the regulator mechanism from the action of gases generated at the arc and the tube 11 will act as a conveyer for such gases and cause their discharge through the chimneys 13 to the atmosphere.

The bowl 3 at the bottom of the shell or casing may be made of cast iron and its bottom (which constitutes the floor of the lamp) is provided centrally with an opening of considerable size and in this opening an annular disk 14 is secured,—the opening formed by this disk being also of considerable size. A bracket 15 is mounted upon the disk 14 and insulated therefrom, the central portion of this bracket being provided with socket 16 for the reception of the upper electrode 18 which is rigidly secured in said socket by a thumb-screw 19. In the present instance the upper electrode 18 is made solid and contains ferro-titanium. The screws which secure the bracket 15 to the disk 14 are insulated from the latter and against the lower ends of these screws, contact fingers 20 bear. These contact fingers are secured to and insulated from the bottom of the bowl 3 and are electrically connected together within the bowl by a suitable electrical conductor and are also electrically connected with the positive terminal of the lamp. The lower electrode 21 (which in the present instance may consist of an iron tube containing powdered ferro-titanium) is secured in

a socket piece 22 carried by an arm 23 at the lower end of a rod 24. The rod 24 passes upwardly through a guide tube 25, at the lower end of which a guide roller 26 is mounted. The guide tube 25 extends upwardly within the casing 1 and communicates at its upper end with the casing 27 of a wheel 28. The wheel 28 has mountings in the back of the casing 27 and also in the removable front plate 29 of said casing and is provided with a grooved periphery 30 in which a chain 31 is secured. This chain depends within the guide tube 25 and is secured to the upper end of the vertically movable rod 24 which carries the lower carbon holder. The wheel 28 is provided with a smaller grooved wheel 31^a from which a chain 31^b depends within a casing 32 which incloses a vertically movable weight 33, secured to the lower end of the chain 31^b. The guide tube 25, the casing 27 and the casing 32 serve to protect the movable parts located within the shell below the platform 9 from the action of gases which may enter said shell from the globe. The wheel 28 also constitutes a part of the clutch devices and for this reason, it is provided in one face with an annular groove 34, into which a lug 35 on a clutch arm 36 enters so that when one end of the clutch arm is raised the lug 35 will be caused to engage the respective walls of the groove 34 and by its frictional contact with said walls, cause the wheel to be turned when the clutch arm is pulled upwardly. When the means which operate the clutch arm are permitted to descend the forward end of said clutch arm will engage a flange 37 on the front plate 29 of casing 27 and said clutch arm will be caused to turn sufficiently to relieve the frictional engagement of the clutch lug 35 with the walls of the groove 34 and thus release the wheel and permit it to be turned by the action of the weight 33.

A removable frame 39 is located within the casing above platform 9 for supporting the regulator mechanism. This frame comprises a bottom plate 40 disposed over the platform 9, and a spider 41 located above and spaced from the bottom plate and rigidly connected with the latter by means of suitable connecting rods 41^a. The frame 39 is supported within the casing, by means of arms 42 projecting from the spider 41 and resting upon the ring 2, said arms being also secured to the ring 2 by means of screws.

A magnet 43 is disposed between the plate 40 and spider 41, and the latter is made with holes through which the poles of this magnet pass. The core pieces of the magnet 43 are provided with coarse wire helices 44 and fine wire helices 45, the latter being included in a circuit between the lamp terminals and shunting the arc, while the coarse wire helices are included in a starting circuit as here-

inafter explained. A coarse wire magnet 46 is also located within the frame 39 and is spaced from the bottom plate 40 thereof, by means of a bracket 47. The upper pole-ends of the magnet 46 project upwardly through holes in the spider 41, and the lower ends of the cores of magnet 46 are located in holes in the bracket 47, so as to actuate an armature yoke 48 hinged in the bracket 47. The yoke 48 carries a contact 49 to cooperate with a stationary contact 50 for controlling the starting circuit of the lamp. This starting circuit shunts the arc and includes the coarse wire coils of magnet 43, contacts 49—50 and the resistance 5 and is normally closed when the lamp is not in operation by the engagement of the movable contact 49 on yoke 48 with the fixed contact 50. The coils of magnet 46 are included in series with the electrodes.

The spider 41 is provided at diametrically opposite points with posts 51 in which screws 52 are mounted and serve as bearings for an armature lever 53. This armature lever is made with an annular central portion disposed in line with the open center of the spider 41 for the accommodation of the tube 11. At one side of the annular portion of the lever 53, an armature 54 is secured to cooperate with the poles of the magnet 43 and to this armature, the upper end of an adjustable rod 55 is pivotally connected,—the lower end of said rod being pivoted to one end of the clutch arm 35. At the opposite side or end of the armature lever, an armature 56 is secured to cooperate with the poles of the magnet 46. The plunger 57 of an air pot 58 is attached to the armature 56 and this plunger is made of considerable weight for a reason which will hereinafter appear.

The contacts 59, 60, of a cut-out switch 61 are supported by and insulated from the spider 41 and the movable contact 62 of this cut-out switch is carried by the armature lever 53. The cut-out switch (which is open during the normal operation of the lamp), is included in a shunt circuit in parallel with the contacts 49—50 of the starting circuit and in series with the resistance 5.

Normally, the electrodes are spaced apart when no current is passing, by the action of the heavy plunger 57 operating through the medium of the armature lever 53, rod 55, clutch devices and against the weight 33. When current first enters the lamp, it will traverse the shunt starting circuit including the coarse wire coils of magnet 43, contacts 49—50 and the resistance 5. The armature lever will now be actuated by the magnet 43 and moved sufficiently (against the resistance of the weighted plunger 57) to cause the release of the clutch devices; when the weight 33 will be free to raise the lower electrode into contact with the upper electrode and thus close the circuit which in-

cludes said electrodes in series with the coils of magnet 46. The resistance of the starting circuit will be such as to cause the passage of sufficient current through the circuit of the magnet 46 and the electrode to cause said magnet to actuate the armature yoke 48 and separate the starting contacts 49—50 to open the starting circuits. The weighted plunger 57 will now cause the armature lever 53 to rock, and this movement of said lever will be transmitted through the clutch devices, to the weight 33 and lower electrode, for raising the former and lowering the latter to establish the arc between the electrodes. The arc thus established will be regulated and controlled differentially by the fine wire shunt windings of magnet 43 acting against the main coarse wire series windings of magnet 46. The magnets 43 and 46 will operate differentially to oscillate the armature lever 53,—which action will, through the medium of the clutch devices, control the feed of the lower electrode and the maintenance of the normal arc.

Should any part of the regulator mechanism fail to operate properly, or "stick" so that the arc would become of abnormal resistance, sufficient current would be shunted through the fine-wire winding of magnet 43 to cause said magnet to move the armature lever 53 far enough to close the cut-out switch 61. The magnet 46 will then become weakened and will release the armature yoke 48, thus closing the starting circuit that will act to hold the cut-out contacts closed in parallel with the starting contacts 49—50 and in series with the resistance 5 until the current ceases, or normal operation be restored.

From the above it will be seen that the starting action of the lamp is similar to a lamp of the "shunt" type, but that after starting, the mechanism will operate after the manner of a lamp of the "differential" type to maintain and regulate the arc.

The length of the arc may be controlled by varying the strength of the magnet 46, and this may be accomplished by the provision of an adjustable shunt around said magnet. For this purpose, a resistance 63 is secured within the frame 39 and included in a circuit which shunts the magnet 46, an adjustable slide 64 being provided for cutting more or less of said resistance into or out of the circuit. The length of the arc may also be adjusted by adjusting the yoke 48 relatively to the magnet 46.

In order that suitable ventilation may be provided for the electrical devices of the controlling mechanism, the flange of the ring 2 may be provided with numerous notches 64^a for the passage of air.

The globe 65 of the lamp is provided at its upper end with a ring 66 constructed to engage the flange at the upper end of the

globe. At diametrically opposite points, the ring 66 is provided with outwardly projecting arms 67 and 68,—the former adapted to engage a fixed loop depending from the globe cover and the arm 68 is notched and adapted to be engaged by a pivoted bail 69 on the globe cover. In this manner the globe is supported with the ring 66 in proximity to the under face of the globe cover but not sufficiently tight against the latter to prevent the admission of air.

The smaller lower end of the globe is covered by means of a closure 70 which fits the same tightly but no attempt is made to effect an air-tight connection of the closure 70 with the lower end of the globe. This closure may be made of sheet metal and dish-shape, having a shallow flange 71 which enters the neck 72 at the lower end of the globe, and also an upwardly projecting flange 73,—the shoulder 74 between these flanges constituting a seat for the closure against the mouth or neck of the globe. A series of spring clamps 75 secured to the flange 73 engage the neck 72 and hold the closure in place. From the above it will be seen that the closure 70 is removably connected with the globe and, when removed from the latter is supported by a chain 76 and the globe, when removed will be supported by a chain 77 connecting the chain 76 with the lamp cover.

In electric arc lamps, when the globe fits neatly to the case, it is important in order to prevent the formation of a film on the globe, that provision shall be made for conducting the gases generated at the arc, from the interior of the globe in such manner as to prevent the possibility of their return. With the construction and arrangement of lamp herein described, sufficient air will be permitted to enter the globe either at the bottom or between the top thereof and the globe cover to permit a draft to be created upwardly from the globe through the large opening in the floor of the casing; through the casing and thence through the tube 11 and the chimneys with which the upper end of said tube communicates. The opening in the floor of the lamp casing and the tube 11 are in line with the arc formed between the electrodes and the draft of air above described will carry the gases formed at the arc upwardly through the casing and the tube 11 and discharge them through the chimneys into the atmosphere. The interior of the casing between the floor thereof and the platform will constitute an expansion chamber for the gases entering through opening in the lamp floor from the globe. The gases, after rising through the opening in the lamp floor and entering the casing, will spread, or become expanded within the casing. By thus utilizing the casing as an expansion chamber, much soot lodges on the

walls thereof and the amount escaping at the top of the lamp is minimized. The tube 11 will not, therefore, become clogged sufficiently to interfere with proper ventilation.

5 Slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting the scope and hence I do not wish to restrict myself to the precise details herein set forth.

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

1. In an electric arc lamp, the combination 15 with a casing having an opening in its bottom and a globe in free communication with said casing through the opening in the bottom thereof, of a platform in the upper portion of the casing and having a central opening, regulator mechanism supported above 20 said platform, a cap or cover on the casing, a tube open at its upper end, depending from said cap or cover and communicating with the opening in the platform, means for supporting an upper electrode, a lower electrode holder, clutch devices located within 25 the casing below said platform, means connecting the lower electrode holder with said clutch devices, means connecting said clutch devices with the regulator mechanism, and 30 means for inclosing said clutch devices.

2. In an electric arc lamp, the combination with a shell or casing, a platform in the 35 upper portion thereof and regulator mechanism supported above said platform, of a casing located within said shell, a clutch wheel mounted in said casing, a guide tube depending from the casing, a rod movable in said guide tube, a lower electrode holder

carried by said rod, a chain connecting said 40 rod with the clutch wheel, a weight also connected with the clutch wheel, means for inclosing said weight, said clutch wheel having a groove, a clutch arm, a clutch lug or 45 dog projecting from said arm and entering the groove in the clutch wheel, means for connecting said clutch arm with the regulator mechanism, means for tripping said clutch arm and lug or dog, and means for supporting an upper electrode. 50

3. In an electric arc lamp, the combination with a casing provided in its bottom with an opening, a cap or cover for said casing, and electrode supports, of a platform located within the casing below the 55 cap or cover and having a central opening, a tube open at its upper end and depending from the cap or cover, said tube communicating at its lower end with the opening in the platform, regulator mechanism supported 60 above said platform, clutch mechanism located within the casing below the platform, a connection between said clutch mechanism and regulator mechanism, means for inclosing the clutch mechanism, means 65 connecting the clutch mechanism with the lower electrode support, and a globe supported by the shell and in open communication with the interior thereof through the opening in the bottom of said shell. 70

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

THOMAS EDGAR ADAMS.

Witnesses:

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A. L. HOHNG.