

No. 637,060.

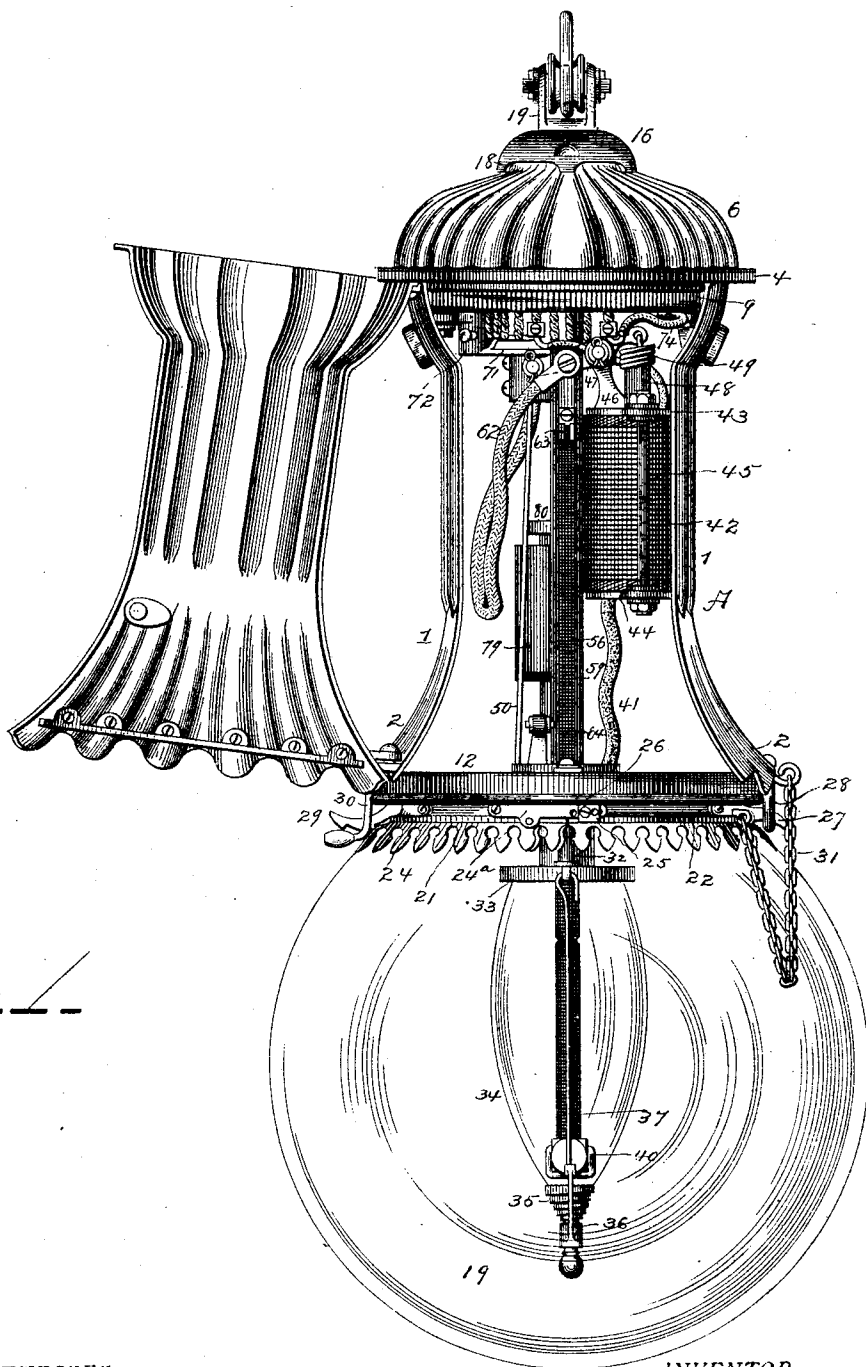
Patented Nov. 14, 1899.

T. E. ADAMS.
ELECTRIC ARC LAMP.

(Application filed Nov. 8, 1898.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES
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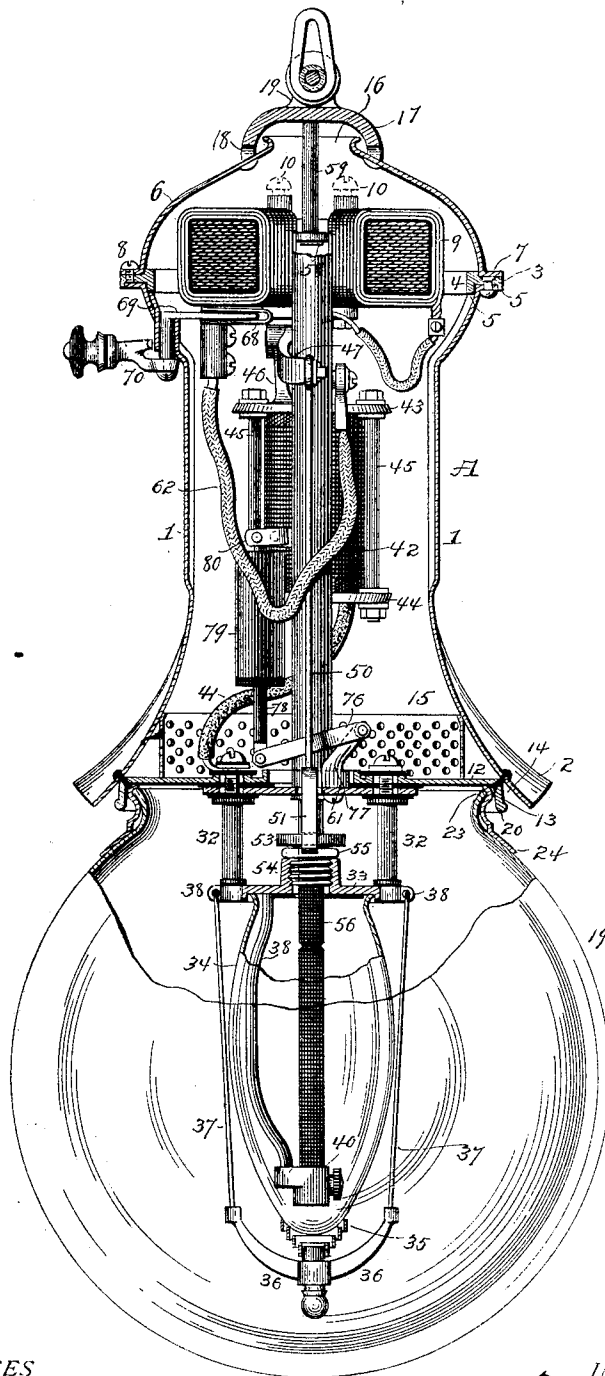
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FIG. 2.



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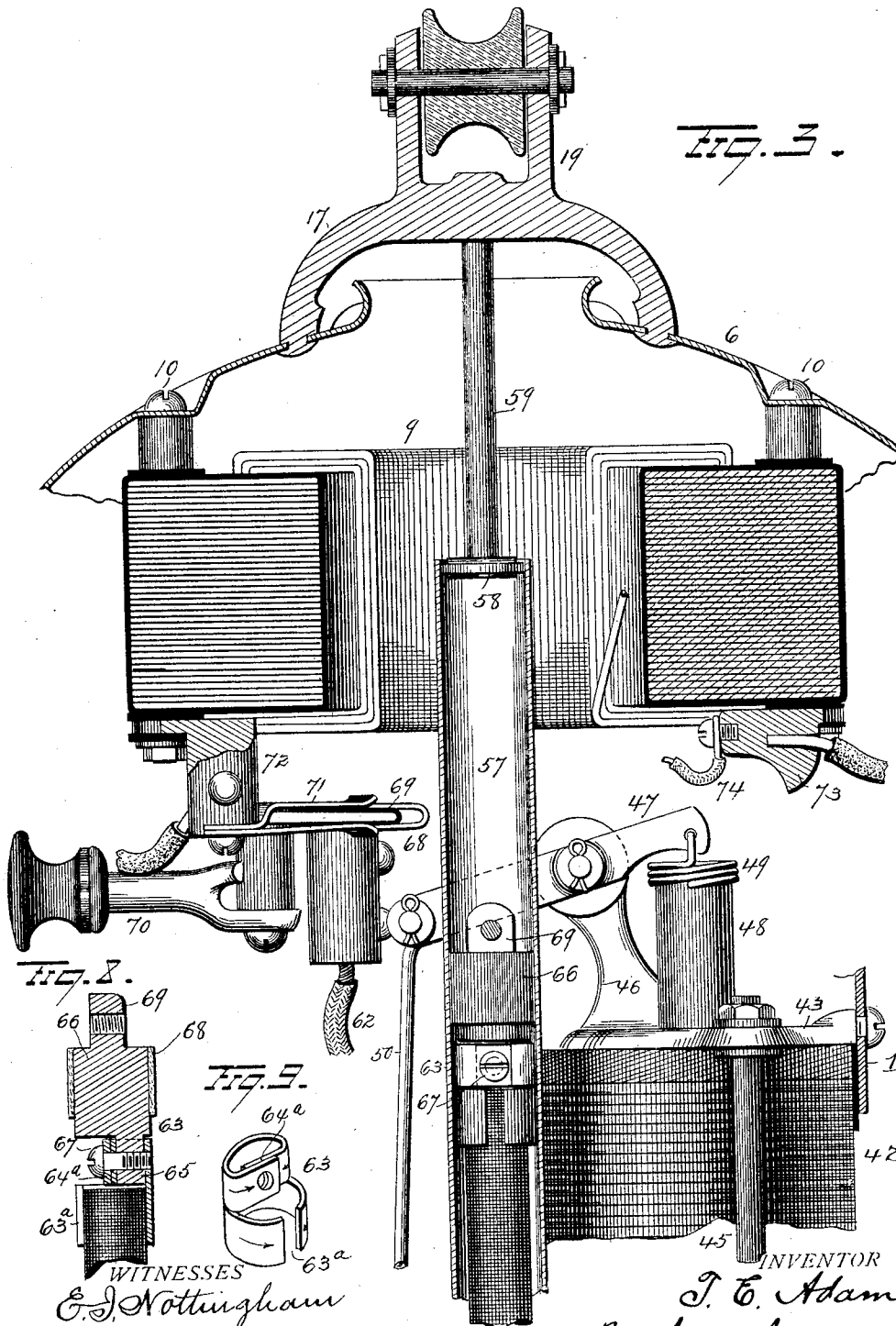
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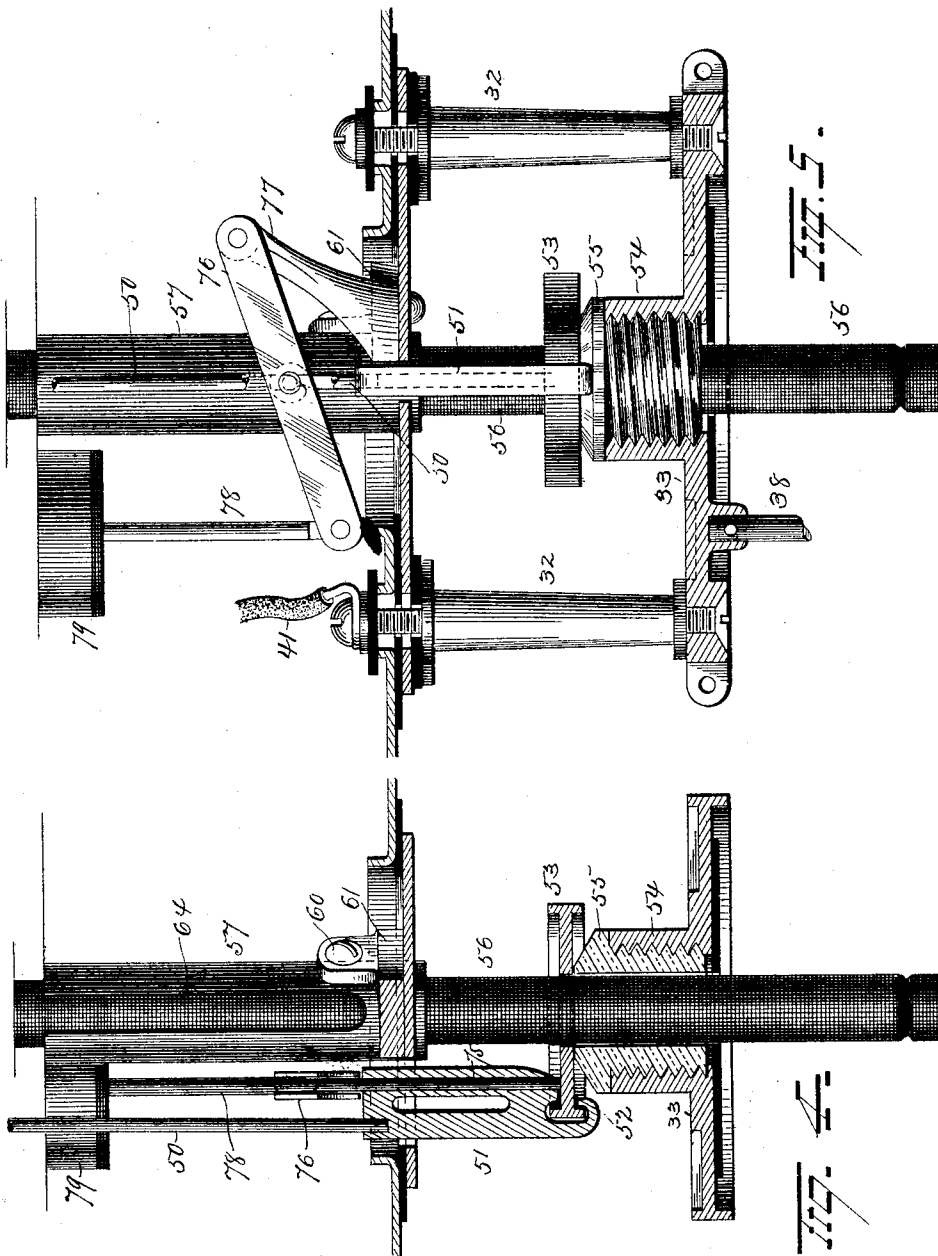
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5 Sheets—Sheet 4.



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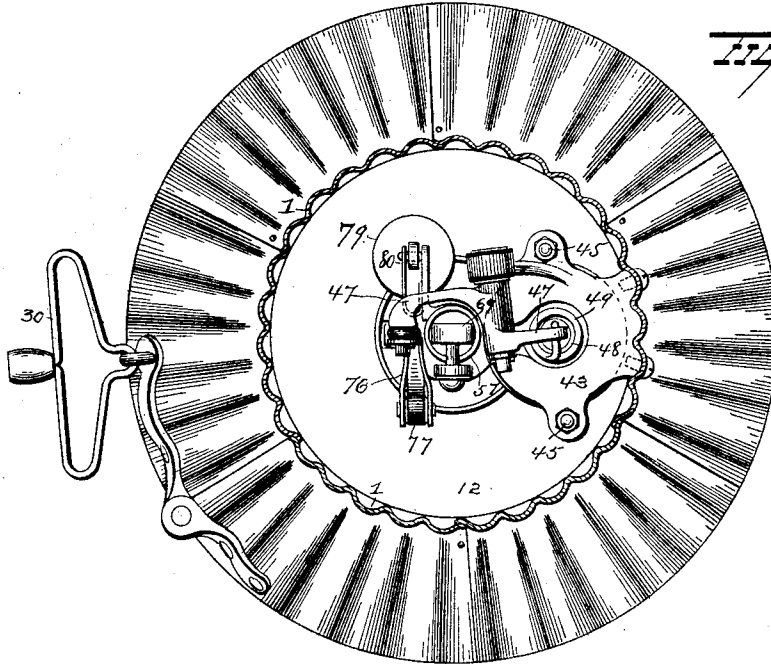


Fig. 6.

Fig. 7.

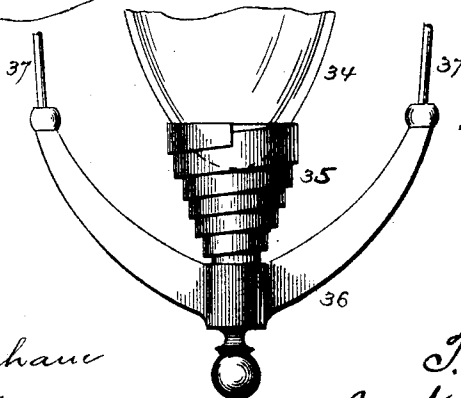
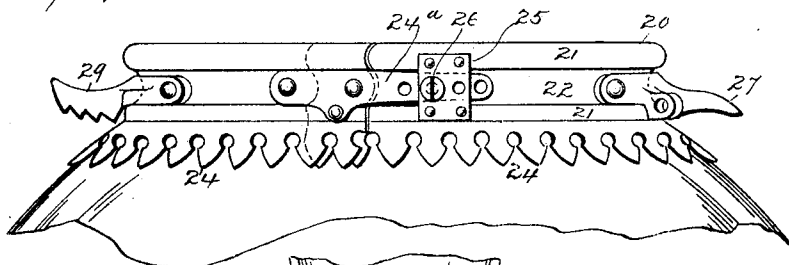


Fig. 8.

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UNITED STATES PATENT OFFICE.

THOMAS EDGAR ADAMS, OF CLEVELAND, OHIO.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 637,060, dated November 14, 1899.

Application filed November 8, 1898. Serial No. 695,840. (No model.)

To all whom it may concern:

Be it known that I, THOMAS EDGAR 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.

My invention relates to an improvement in electric-arc lamps, and more particularly to such as are adapted to operate with alternating electric currents, one object of the invention being to produce an arc-inclosed electric-arc lamp adapted to burn on multiple-arc circuits which shall be of simple construction and comprise a minimum number of movable parts.

A further object is to provide efficient means whereby to overcome the liability of the carbon "shaking through" the clutch on account of the violent vibrations incident to an arc-lamp when used with an alternating current.

A further object is to so construct a lamp-casing of sheet metal as to render it capable of supporting the regulating mechanism without danger of derangement of said mechanism on account of strain to which the casing may be subjected.

A further object is to provide a casing for an arc-lamp which shall be strong and durable and at the same time light in weight.

A further object is to so construct a casing for an arc-lamp that all the mechanism shall be readily accessible and removable for repair, cleaning, or inspection.

A further object is to provide means whereby to convey current direct to an upper carbon moving in a tube without the use of sliding contacts.

A further object is to so arrange an annular or ring clutch that it shall be free to turn and assume new positions upon the surface of the carbon to distribute the wear over the entire inner face of the clutch and at the same time prevent the clutch from escaping from its position in the lamp and causing inconvenience in trimming.

A further object is to so suspend an arc-inclosing globe that it shall be elastically sup-

ported against its seat without producing objectionable shadows and yet be very convenient for removal in trimming.

A further object is to provide improved means for supporting the outer globe and to so construct said means that they will be adaptable to globes of different sizes, be capable of being readily attached to and detached from the globe, and which shall not be liable to break the globe on account of expansion and contraction of the glass.

A further object is to permit adequate ventilation and at the same time exclude rain and insects.

A further object is to so construct the bottom of the lamp-casing that it shall serve also as a reflector to eliminate shadows in the lower portion of the globe.

A further object is to improve and simplify the construction and arrangement of an electric-arc lamp and to produce an arc-lamp which will successfully burn with the use of an alternating current.

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

In the accompanying drawings, Figure 1 is a view in elevation of my improved lamp with the door open. Fig. 2 is a longitudinal sectional view of the lamp, partly in elevation. Figs. 3, 4, and 5 are enlarged views of a portion of the lamp, showing the clutch and coöperating parts. Fig. 6 is a horizontal sectional view. Figs. 7 and 8 are detailed views of the globe-holders. Figs. 8 and 9 are detail views of the upper-carbon holder.

Heretofore in the construction of the casings which inclose the regulator of electric-arc lamps various metals have been employed, but much difficulty has been experienced in constructing a casing which will be sufficiently substantial to properly support the parts of the regulator and prevent the derangement thereof (especially when the lamps are used with alternating currents) and at the same time not be open to objection of weight and liability to be seriously affected and rendered practically useless by the action of varying temperatures and by moisture. Steel and iron have been employed; but these

metals are liable to rust. Brass is liable, in many sections of the country, to become cracked, while aluminium and zinc are not of uniform strength and of sufficient rigidity for the purpose. Copper is the most desirable metal for use in making the casings, but has the objection urged against it that it can be easily bent and result in throwing the mechanism of the lamp out of line, and thus impairing the proper operation of the lamp.

To overcome the various defects and objectionable features incident to lamp-casings as heretofore constructed, I propose to make a casing of sheet-copper and to so form it that it shall possess maximum rigidity, serve to support the heaviest parts of the lamp mechanism, and be capable of withstanding any tendency of the casing to bend. To this end the sheet-copper casing A of the lamp is made in sections and is circular, (in cross-section,) so that every portion will be curved, and each section is formed with a number of vertical ribs 1. The lower portion of the casing is flared outwardly and fluted, as at 2. The upper end of the body of the casing is also made somewhat flaring and provided at its upper edge with an outwardly-projecting annular flange 3, on which a stout ring 4 is permanently secured, said ring having depending flanges 5 at its edges, between which the flange 3 is disposed. A hood 6, made of fluted or ribbed sheet-copper, is mounted on the ring 4, said hood being provided with a peripheral flange 7, which rests upon the ring 4 and is secured thereto by means of screws 8. The hood 6 serves to inclose and also to support an induction resistance 9, which is secured thereto by means of screws 10. A portion of the body of the casing is hinged to form a door to permit access to the working parts of the mechanism, but it is sometimes desirable and often necessary to render the casing more accessible than the provision of a door can afford. By mounting the hood removably on the fixed ring 4 it can be readily removed without disturbing the regulating and controlling mechanism of the lamp, and thus access to the upper parts of said mechanism and also to the resistance secured within the hood can be had for purposes of inspection, cleaning, repair, or renewal of parts.

The floor 12 consists of a plate or sheet of aluminium having a depending peripheral flange 13 and is securely riveted to the flaring lower end of the casing. The spaces 14 (formed by the fluted lower end of the casing) and the flange 13 of the floor 12 serve to admit air for ventilating purposes, but will not, on account of the flaring formation of the bottom of the casing, permit the entrance of water. Insects are prevented from finding their way into the casing through the openings 14 by means of a strip 15 of perforated sheet metal placed in the lower end of the casing. Air entering the spaces or openings 14 will be permitted to circulate about the mechanism within the casing and can escape through

a hole 16 in the hood 6. The hole 16 is covered by means of a cap 17, (having recesses 18 to permit the passage of air,) rigidly secured to the head, and this cap is provided with lugs 19, between which an insulator is secured for the attachment of any suitable means for suspending the lamp.

As previously stated, the floor 12 is made of aluminium, and it serves also as a cover for the outer globe 19, the aluminium being bright, serving as a reflector to eliminate shadows in the lower portion of the globe.

In constructing the holder for the large or outer globe 19 I employ a band 20, of sheet-copper, which is bent to form beads 21 to add strength thereto and having a larger intermediate bead 22 to be disposed under the flange 23 of the globe. The band 20 is also made with a number of fingers 24, adapted to embrace the lower portion of the globe. The ends of the band are made to overlap, and one end is provided with a finger 24^a, having a series of screw-threaded holes. A plate 25 is secured to the band near its other end and made with a hole (or holes) for the passage of screw 26, which enters one of the holes in the finger 24^a, and thus secure the ends of the band together and the band on the globe. By thus constructing the band 20 it can be readily adapted to globes of different sizes, and being made of sheet-copper it will possess sufficient flexibility to avoid the breaking of the globe on account of varying degrees of temperature. The band 20 is provided at one point with a rigid hook or tooth 27 to enter a loop 28, depending from the lamp-casing. At a diametrically opposite point on the band a toothed arm 29 is secured thereto and is adapted to be engaged by an arm or loop 30, pivotally attached to the casing. The loop 30 is elongated laterally in both directions from its pivotal support, so that it can be swung laterally to permit the ready detachment of the toothed arm therefrom. A chain 31 is secured at one end to the band in close proximity to the hook or tooth 27 and at the other end to the casing, said chain serving to suspend the globe when the lamp is being trimmed.

Two arms or hangers 32 depend from the floor 12 and at their lower ends support a cover 33 for the inner arc-inclosing globe 34. The inner globe 34 is maintained with a yielding pressure against its seat by means of a conical convolute spring 35, made, preferably, of flat spring metal, which bears at its larger end against the bottom of the globe. The apex of the conical spring is secured to a yoke 36, to the respective ends of which wires 37 are attached. The other ends of said wires are loosely connected with lugs 38, projecting from the cover 33 of the arc-inclosing globe. By thus supporting the globe 34 it can be readily removed when the lamp is to be trimmed, and when in use does not produce objectionable shadows.

A rod 38 is secured to and depends from

the inner globe-cover 33 and is provided at its lower end with a lower-carbon holder 40, the lower-carbon holder and its support being thus disposed within the arc-inclosing globe.

One of the arms or hangers 32 is electrically connected with the cover 33, (which latter is electrically connected with the lower-carbon holder,) and said arm or hanger is connected by means of a conductor 41 with one terminal of the regulator-magnet or solenoid 42. The other terminal of the solenoid is connected with one terminal of the resistance 9, the other terminal of the resistance being connected with the minus terminal of the lamp, as hereinafter more fully explained. The magnet or solenoid 42 is disposed between two plates 43 44, which are secured to the sheet-metal body of the lamp-casing, (preferably by means of screws,) and said plates are connected by rods or bolts 45, which serve to clamp the magnet or solenoid in place between the plates, and between the magnet or solenoid and clamping-plates felt or asbestos is placed for taking up vibrations. The upper plate 43 is provided with an upwardly-projecting arm 46, provided at its free end with a boss, in which a walking-beam 47 is mounted. One arm of the walking-beam is connected with the core 48 of the solenoid through the medium of a spring 49, and to the other arm of the walking-beam a rod 50 is pivotally attached. The lower end of the rod 50 is secured to a bar or lifter 51, which passes freely through a hole in the floor of the casing and is provided at its lower end with a hook 52, adapted to grasp the flanged periphery of a clutch-ring 53. The clutch-ring is disposed above a tubular extension 54 on the inner globe-cover 33, and into said tubular extension a porcelain or lava bushing 55 is screwed. When the lamp is not burning, the clutch-ring rests on the bushing, and the upper carbon 56 of the lamp passes loosely through it. The upper carbon is guided within the casing A in a tube 57, the upper end of which is supported in a proper upright position by an insulating-disk 58, located at the lower end of a rod 59, secured to and depending from the cap on top of the hood of the casing. The lower end of the tube 57 is removably secured by means of a screw 60 to a plate 61, secured in the bottom of the casing. Thus it will be seen that by removing the hood and cap from the casing and withdrawing the screw 60 the carbon-guiding tube can be readily removed. With lamps employing guiding-tubes for the upper carbon it has heretofore been customary to employ a sliding contact for the upper carbon. This is objectionable in a lamp operating with an alternating current, as it is important to reduce the number of movable devices to a minimum on account of the violent vibrations incident to lamps employing alternating currents. I propose, therefore, to connect the flexible conductor 62 directly to the holder 63 of the upper carbon, and this holder being disposed within the tube the latter is provided with a slot 64 for the accommodation of the connection between said conductor and holder. It has heretofore been proposed to construct a carbon-holder of a section of tubing and making a series of two or more longitudinal slots in the lower end thereof, whereby to form spring-jaws to receive the end of the carbon-rod. With such construction the grain of the metal does not run in a direction to insure the best results, and hence the spring-jaws have not as much strength or grasping qualities as they would have if the grain of the metal were made to run in a direction parallel with the longitudinal axis of the jaw, and hence the spring-jaws when formed by slotting the lower end of a tube are liable to become strained and weakened when subjected to the violent vibrations of an alternating-current arc-lamp. In constructing my improved carbon-holder I employ spring metal and so arrange the same that the grain of the metal will run parallel with the axis of the jaws. A strip of spring metal is bent in approximately circular form (with the ends slightly separated, as at 63^a) for the reception of the end of the carbon-rod. One edge of the strip is cut to form two fingers 64^a, which are bent one upon another to form a socket for the reception of a small projection 65 on a cylindrical block 66, to which the holder is secured by means of a screw 67. The block 66 is adapted to slide within the tube 57 and is preferably covered by a packing-ring 68, of non-sonorous material. The upper end of the cylindrical block is provided with a lug 69, to which the conductor 62 is electrically connected. The other end of the flexible conductor 62 is electrically connected with an insulated shoe 68, carried by a switch-arm 69, the latter being mounted in the upper portion of the lamp-casing and provided (exteriorly of the casing) with a crank-arm 70. The shoe of the switch-arm is adapted to engage contact-arms 71, attached to a bracket 72, secured to the core of the inductive resistance 9. The bracket 72 serves as a binding-post for the plus leading-in wire. The minus leading-in wire is connected with a similar bracket or binding-post 73, also secured to the core of the resistance, and the binding-post 73 is connected by a suitable conductor 74 with a terminal of the inductive resistance. The upper portion of the lamp-casing is provided with porcelain sleeves for the passage of the leading-in wires.

The connections of the lamps may be readily traced from the plus bracket or connector 72 to the upper-carbon holder 63 by the switch and the conductor 62, through the carbons and lower-carbon holder to the cover of the arc-inclosing globe, thence to one of the arms or hangers 32, and then by conductor 41 to one terminal of the helix of the solenoid, and from the other terminal of the solenoid to the

one terminal of the resistance, and from the other terminal of the resistance to the minus binding-post 73.

As has been previously stated, electric-arc lamps when operated with alternating currents are subjected to violent vibrations of the parts, and for this reason much difficulty and annoyance have been experienced by the upper carbon "shaking through" the clutch. Attempts have been made to overcome this defect by the use of springs; but as springs are quite susceptible themselves to receive and transmit vibrations, and hence their use has not resulted in successfully preventing the carbon from shaking through the clutch, I overcome this defect by offering to the clutch-ring when it grasps the carbon a dead resistance. The dead resistance or weight may be applied to the clutch in various ways; but I prefer to utilize for the purpose stated the plunger of the air-pot without detracting in the slightest degree from the efficiency of the air-pot in the performance of its functions of steadying the operation of the regulating and controlling mechanism of the lamp. For the accomplishment of the purpose of my invention it is a matter of considerable importance that the air in the air-pot be partially compressed before the clutch becomes active to raise the carbon, so that when the carbons separate to establish the arc the vibrations of the clutch will be effectually resisted by a substantial cushion of compressed air in the air-pot. The bar or lifter 51, secured to the lower end of rod 50, as hereinbefore described, is made with a hole in which a short rod 75 is disposed and guided, said rod normally resting on the clutch-ring. The bar 51 being connected with the ring-clutch, it is apparent that any weight which is brought to bear on the rod 75 will be transmitted directly to said clutch-ring and serve to prevent the same from vibrating, and thus prevent the carbon from shaking through it during the operation of the lamp. The upper end of the short rod 75 is pivotally attached between the ends of a lever 76. One end of the lever 76 is pivotally supported by an arm 77, projecting upwardly from the plate 61 in the bottom of the lamp-casing. The other end of the lever 76 is attached to the plunger-rod 78 of an air-pot 79, and the latter is suspended from an arm 80, secured to the tube 57. From this construction and arrangement of parts it will be seen that the air-pot will perform its usual functions of steadying the regulating and controlling mechanism, and the plunger will offer a resistance, and thus apply a weight to the clutch-ring and serve effectually to prevent the vibration of the latter.

When current enters the lamp, the solenoid will draw its core down, lift the clutch-rod, and cause the clutch-ring to be tipped and made to clutch the carbon and lift it to establish the arc. It may be here stated that in lamps using an alternating current one of the carbons is usually cored, and when the

lamp has just been trimmed the core is apt to produce a flaming arc, and thus renders it necessary that the arc be abnormally long to prevent the rise of current to a point that would cause the heat to break the inner globe. With my construction the mechanism is capable of drawing an arc approximately double the ordinary length, thus effecting a great saving of inner globes that would otherwise be cracked from excessive heating when the lamp is started with new carbons. As the carbons consume, the resistance of the arc increases, current decreases, the solenoid loses strength, and the weight of the clutch and carbon, with attached parts, overcome the pull of the solenoid and descend slowly until a time is reached when the clutch rests upon its trip—viz., the lava or porcelain bushing screwed into the cover of the inner globe. A further descent of the clutch and rod releases the clutch from the carbon by permitting the clutch to assume a horizontal position, when the carbon will feed through it. This diminishes the resistance of the arc, the current increases in strength, enabling the solenoid to again draw down its core with greater force, and the carbons will be again drawn apart.

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 with a clutch-ring, a lifter connected with said clutch-ring at one side of the carbon, a pivoted lever, a rod connected with said lever at a point between the ends of the latter and resting on the clutch-ring at the same side of the carbon as the connection of the lifter with said clutch-ring and an air-pot having its plunger connected with the free end of said pivoted lever whereby when the lifter is actuated air will be compressed in the air-pot before the clutch raises the carbon.

2. In an electric-arc lamp, the combination with the clutch and lifter, of a weight applied to the clutch at the same side thereof as the attachment of the lifter thereto and operating independently of the lifter.

3. In an electric-arc lamp, the combination with a carbon-rod, a ring-clutch and a lifter, of a weight applied to said ring-clutch independently of the lifter and at the same side of the clutch as the attachment thereto of the lifter.

4. In an electric-arc lamp, the combination with the upper carbon, a clutch and regulating mechanism connected with the clutch, of means for applying dead resistance to said clutch at the side thereof to which the regulating mechanism is attached and independently of said regulating mechanism, to prevent the carbon from shaking through said clutch.

5. In an electric-arc lamp, the combination with the upper carbon, a clutch and regulating mechanism connected with the clutch, of weight, and means for applying said weight to the clutch at the side thereof to which the

regulating mechanism is attached, when the clutch is raised by said regulating mechanism.

6. In an electric-arc lamp, the combination with the upper carbon, a clutch, a magnet and a lifter connected with the clutch and magnet, of an air-pot and a connection between the plunger of the air-pot and the clutch, said connection bearing against the clutch at the side thereof to which the lifter is connected and independently of said lifter.

7. In an electric-arc lamp, the combination with the clutch, an electromagnet, intermediate connections between the clutch and magnet, of an air-pot having its plunger connected with said intermediate connections, and a connection between said plunger and clutch and bearing against the latter at the side thereof to which said first-mentioned connections are attached and independently of said first-mentioned connections.

8. In an electric-arc lamp, the combination with the clutch and the regulator-magnet, of an air-pot having its plunger connected with said regulator to steady the movement thereof, said plunger also having an independently-operating connection with the clutch to apply a dead resistance or weight thereto, substantially as set forth.

9. In an electric-arc lamp, the combination with the clutch and the regulator-magnet, of a clutch-rod connected with the armature of said magnet, a clutch-bar secured to said rod and connected with the clutch, a pivoted lever, a rod attached to said lever and guided in a socket in said clutch-bar and an air-pot having its plunger connected with said pivoted lever, substantially as set forth.

10. In an alternating-current electric-arc lamp, the combination with the clutch and the regulator-magnet, of a walking-beam, a spring connecting one arm of the walking-beam with the armature of the magnet, a clutch-lifter connected with the other arm of the walking-beam and connected with the clutch, and an air-pot, a rod connected with the plunger of the air-pot, said rod guided by the lifter and connected independently with the clutch so as to apply dead resistance therein.

11. In an electric-arc lamp a casing comprising a body of ribbed sheet metal having an outwardly-projecting flange at its top, a stout ring secured upon said flange, and a sheet-metal ribbed or corrugated hood removably secured upon said ring.

12. In an electric-arc lamp, the combination with a vertically-disposed casing, regulating mechanism therein, and a depending lamp-arm provided with a lower-carbon holder, of a guide-tube disposed vertically within the casing provided with a longitudinal slot, an upper-carbon holder movable within said tube, and a flexible conductor connected at one end with a terminal of the lamp and connected at its other end to the upper-carbon holder through the slot in the guide-tube, substantially as set forth.

13. The combination with a casing having a removable cover or hood, of a carbon-guiding tube removably secured at its lower end to the bottom of the casing, a rod depending within the removable hood and entering the carbon-tube and a head on the lower end of said rod, substantially as set forth.

14. The combination with a lamp-casing and a globe adapted to seat against the bottom of the casing, of an adjustable band encircling the upper end of the globe, a hook and a toothed arm projecting from said band, a fixed loop on the casing to receive said hook and a loop pivoted to the casing and made elongated laterally from its pivotal support and adapted to engage said toothed arm.

15. The combination with a lamp-casing and a globe, of a sheet-metal corrugated band encircling the upper end of the globe, means for adjustably securing the ends of the band together and means for adjustably and removably securing the band to the lamp-casing to support the globe, substantially as set forth.

16. The combination with a lamp-casing and a globe, of a sheet-metal corrugated band adapted to encircle the upper end of the globe and having overlapping ends adjustably secured together, hooks projecting from said band and detachably connected with the casing, a chain connecting said band with the casing, a toothed arm projecting from the band and a loop pivoted to the casing and adapted to engage said toothed arm, substantially as set forth.

17. A carbon-holder consisting of sheet metal bent across the grain of the metal to circular form with the free ends of said circular strip separate from each other, whereby the clutch will consist of two integral members having the metal running longitudinally thereof in a horizontal direction.

18. A carbon-holder consisting of a strip of spring metal bent to embrace the carbon and having fingers bent to form a socket, and a block having a portion secured within said socket.

19. In an electric-arc lamp, the combination with a carbon-guiding tube, of a metal block having a non-sonorous covering within said tube, and a carbon-holder secured to said block, said carbon-holder consisting of a strip of spring metal bent to embrace the carbon and having fingers bent to form a socket to receive a portion of said block, substantially as set forth.

20. A sheet-metal electric-lamp casing having a fluted lower end and a bottom secured within said fluted end so as to form a series of air-inlets and a perforated strip covering said inlets, substantially as set forth.

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

THOMAS EDGAR ADAMS.

Witnesses:

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JOHN D. ERTEL.