J. H. HALLBERG.

ELECTRIC ARC LAMP.

APPLICATION FILED MAR. 9, 1907.

994,833.

Patented June 13, 1911.

5 SHEETS—SHEET 1.

Fig. 10.

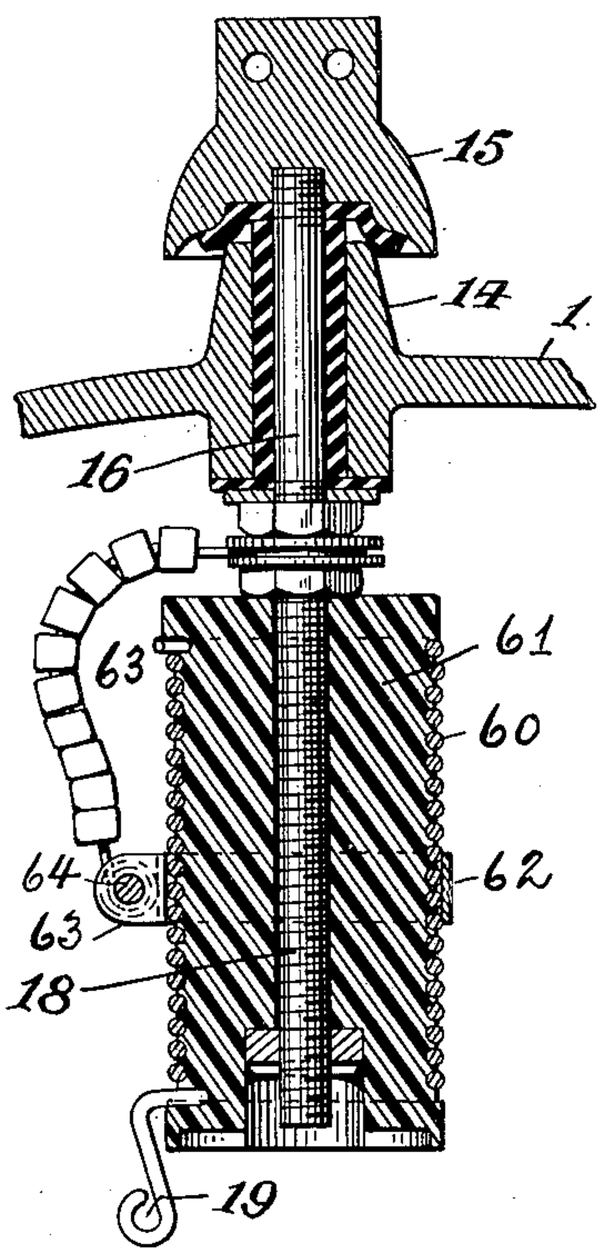


Fig. 1.

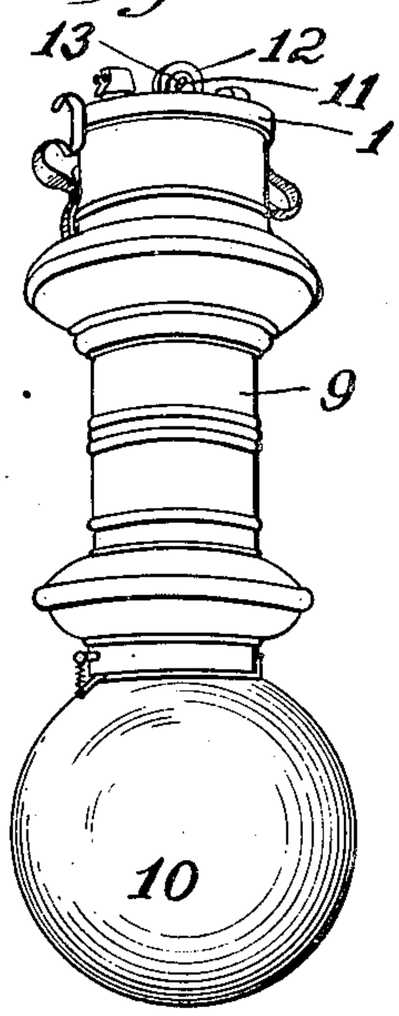


Fig. 12.

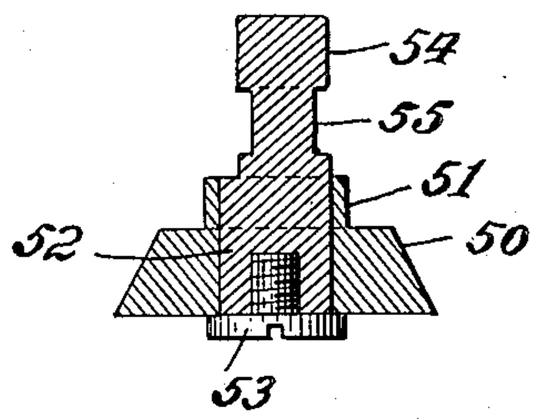
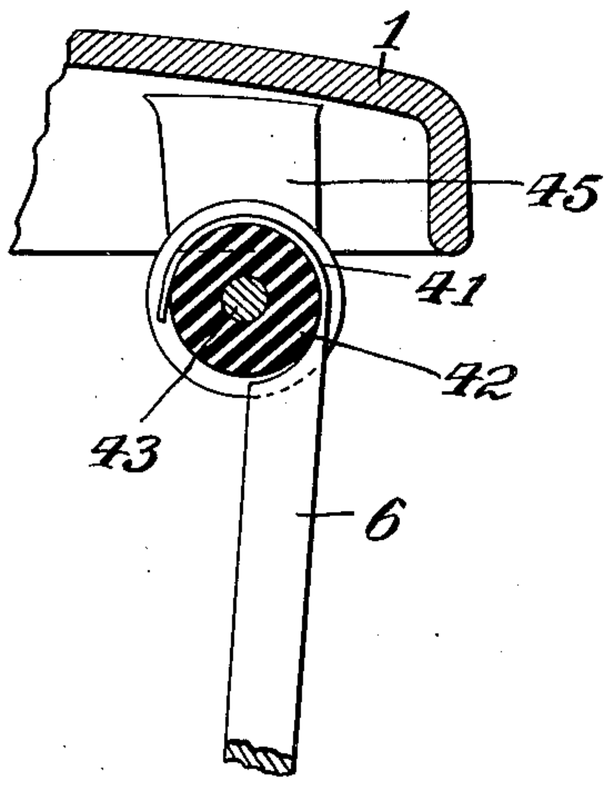


Fig. 11.



Attest:

May Hughes

Chas. McDonnell.

Josef H. Hallberg Inventor:

by William R. Baird

his Atty.

J. H. HALLBERG.

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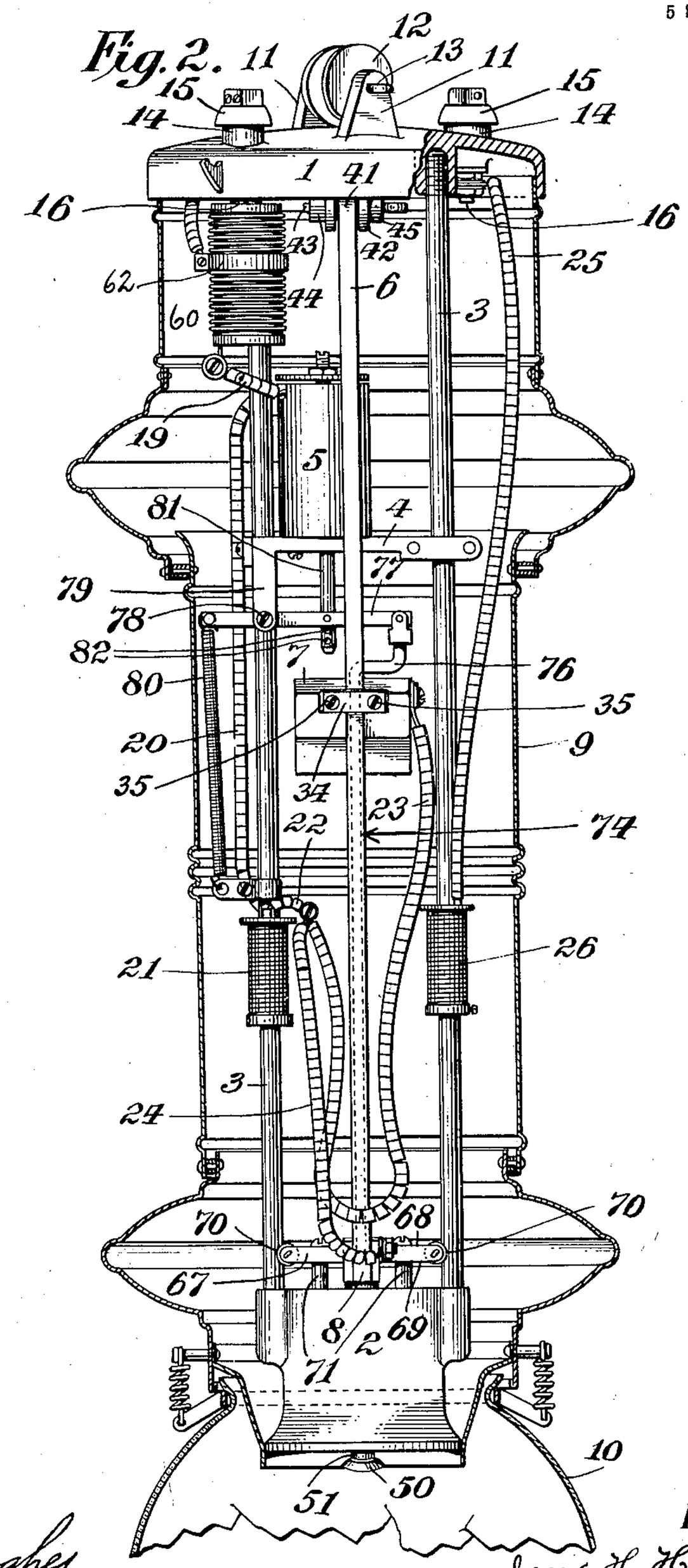
5 SHEETS—SHEET 2.

Fig. 2.



Attest:

Mary Hughes

Reaw McDonnell.

Inventor:

Josef H. Hallberg

by

William R. Baird Atty.

J. H. HALLBERG.

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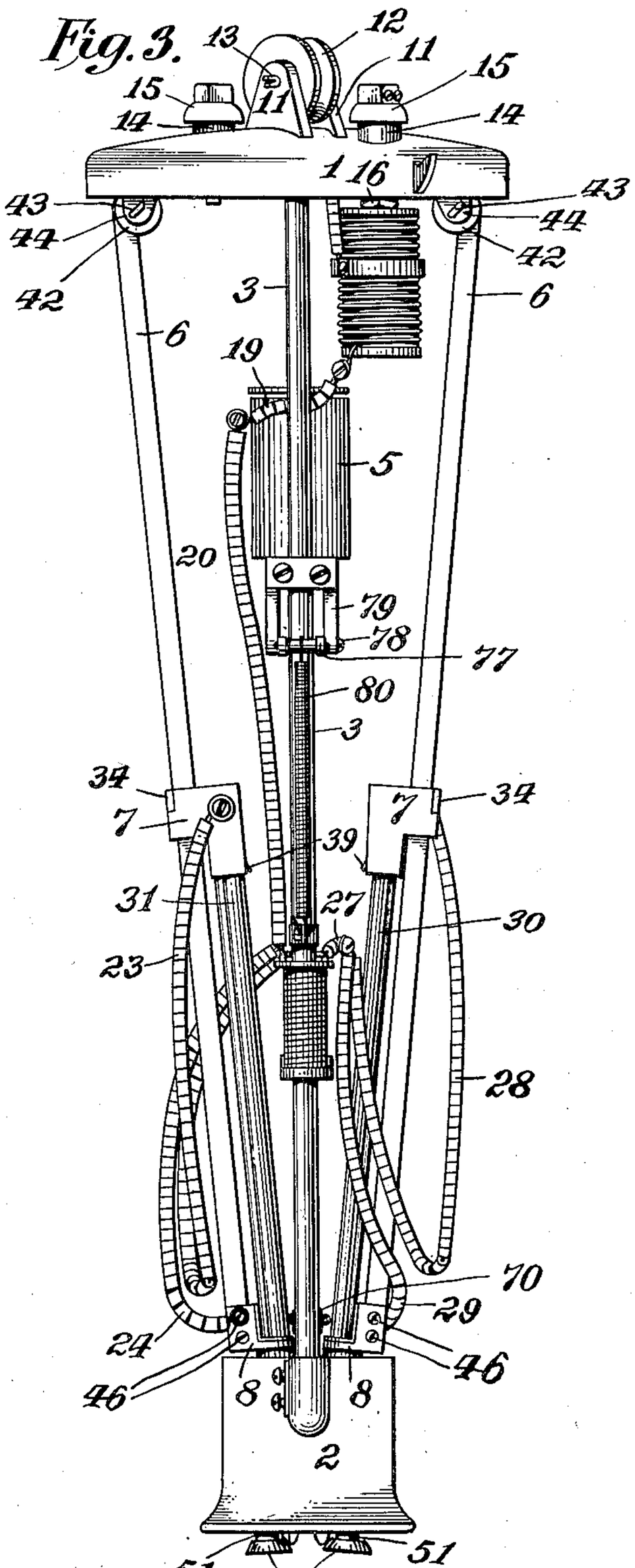
5 SHEETS—SHEET 3.

Fig. 3.



Attest:

May Hughes

Alan McDonnell.

Jouf. H. Hallberg Inventor:

by William R. Baird

his Atty.

J. H. HALLBERG.

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5 SHEETS—SHEET 4.

Fig. 4.

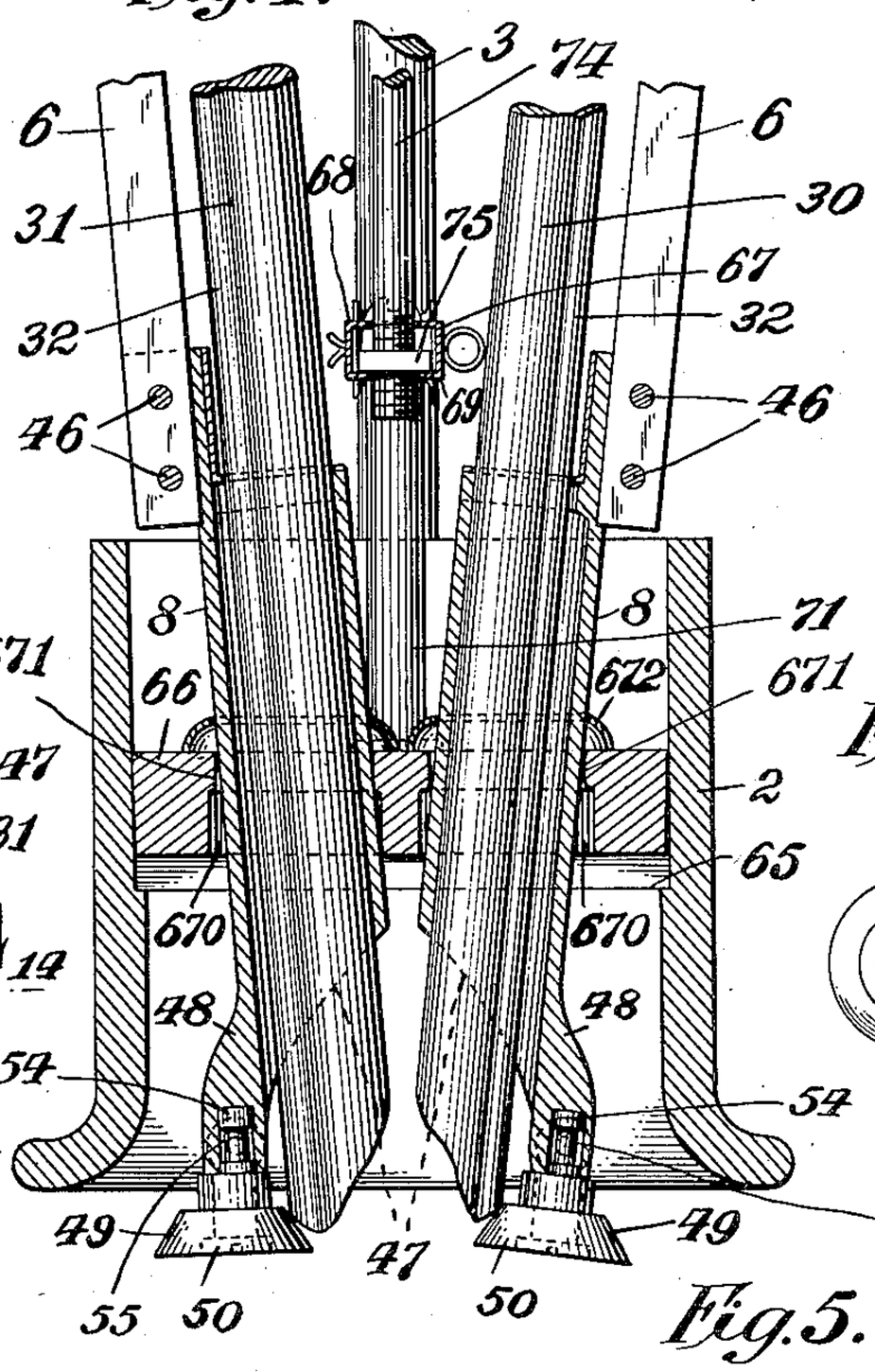


Fig. 13.

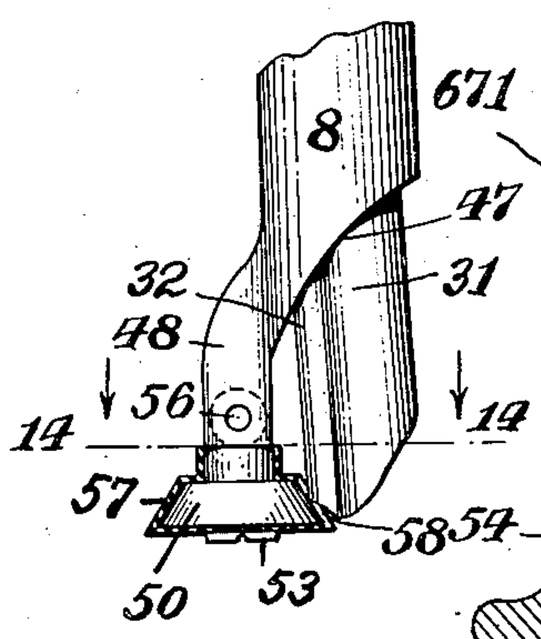


Fig. 14.

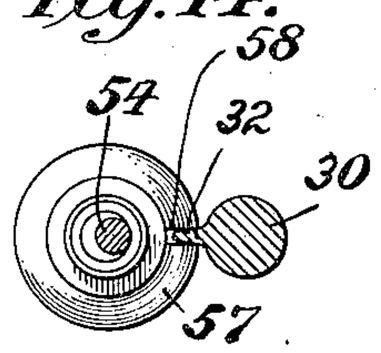


Fig. 6.

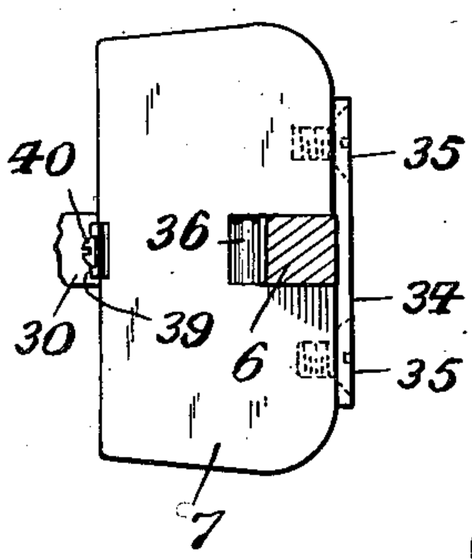


Fig. 7.

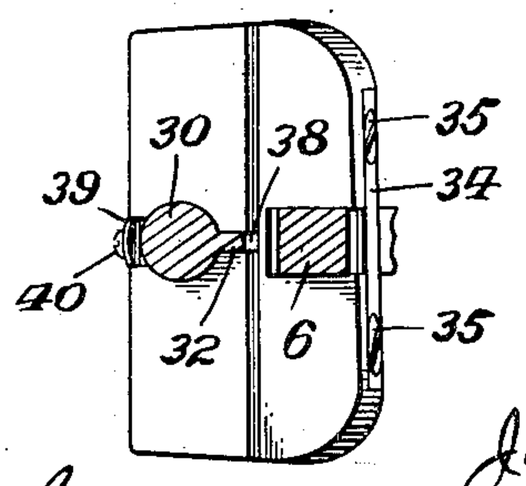
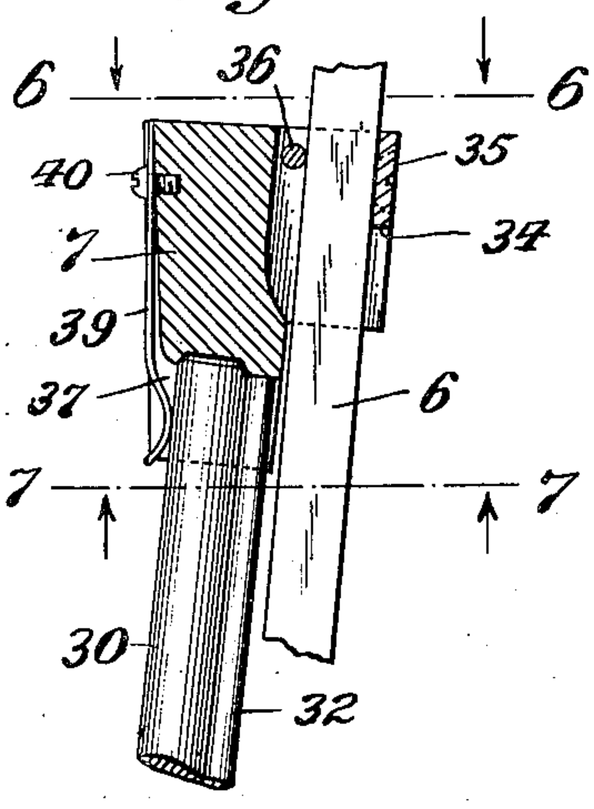


Fig. 5.



Attest:

May Hughes

Edw. McDonnell.

Josef H. Hallberg Inventor:

by William R. Baird

his Atty.

J. H. HALLBERG.

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Patented June 13, 1911.

5 SHEETS—SHEET 5.

Fig. 8.

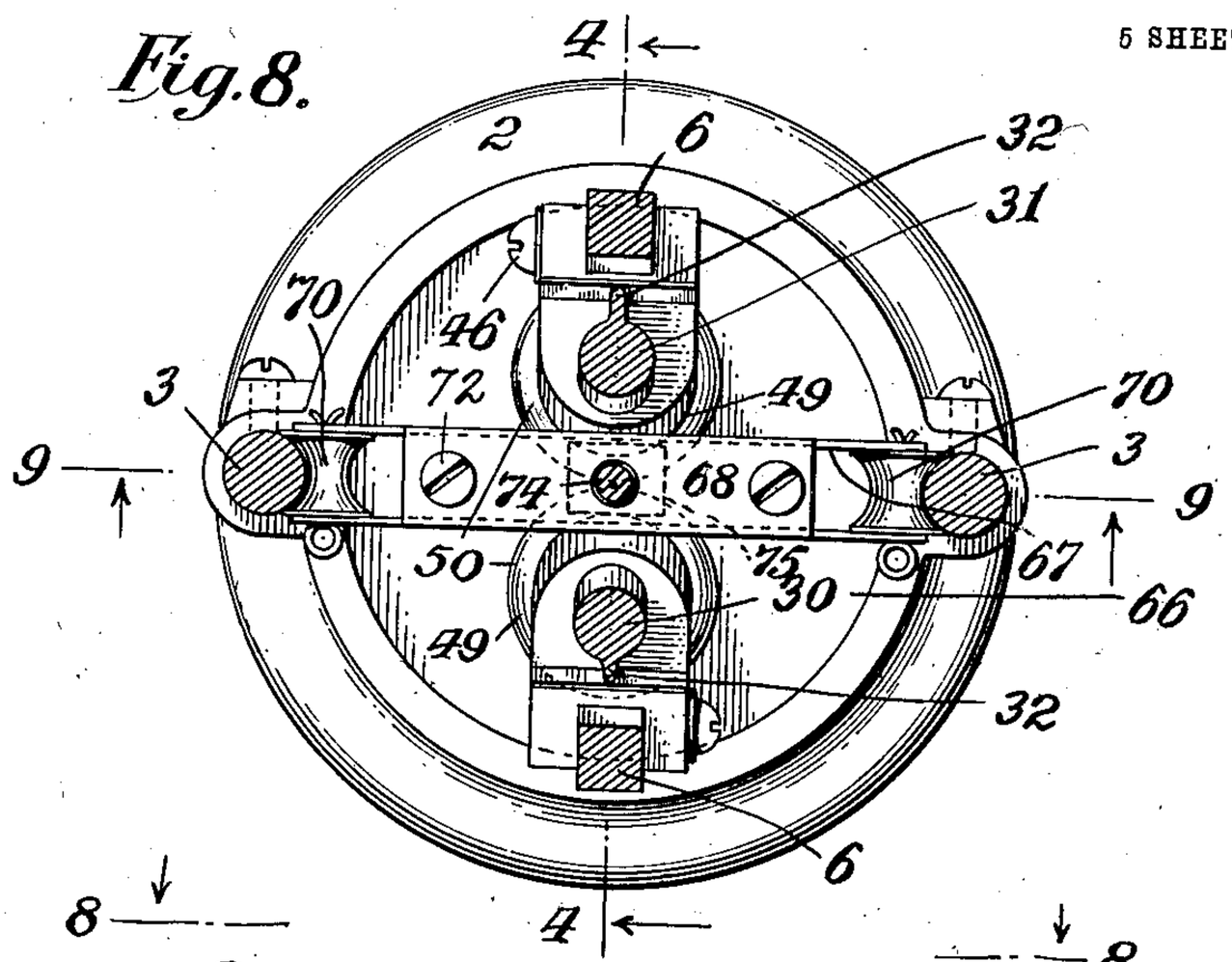
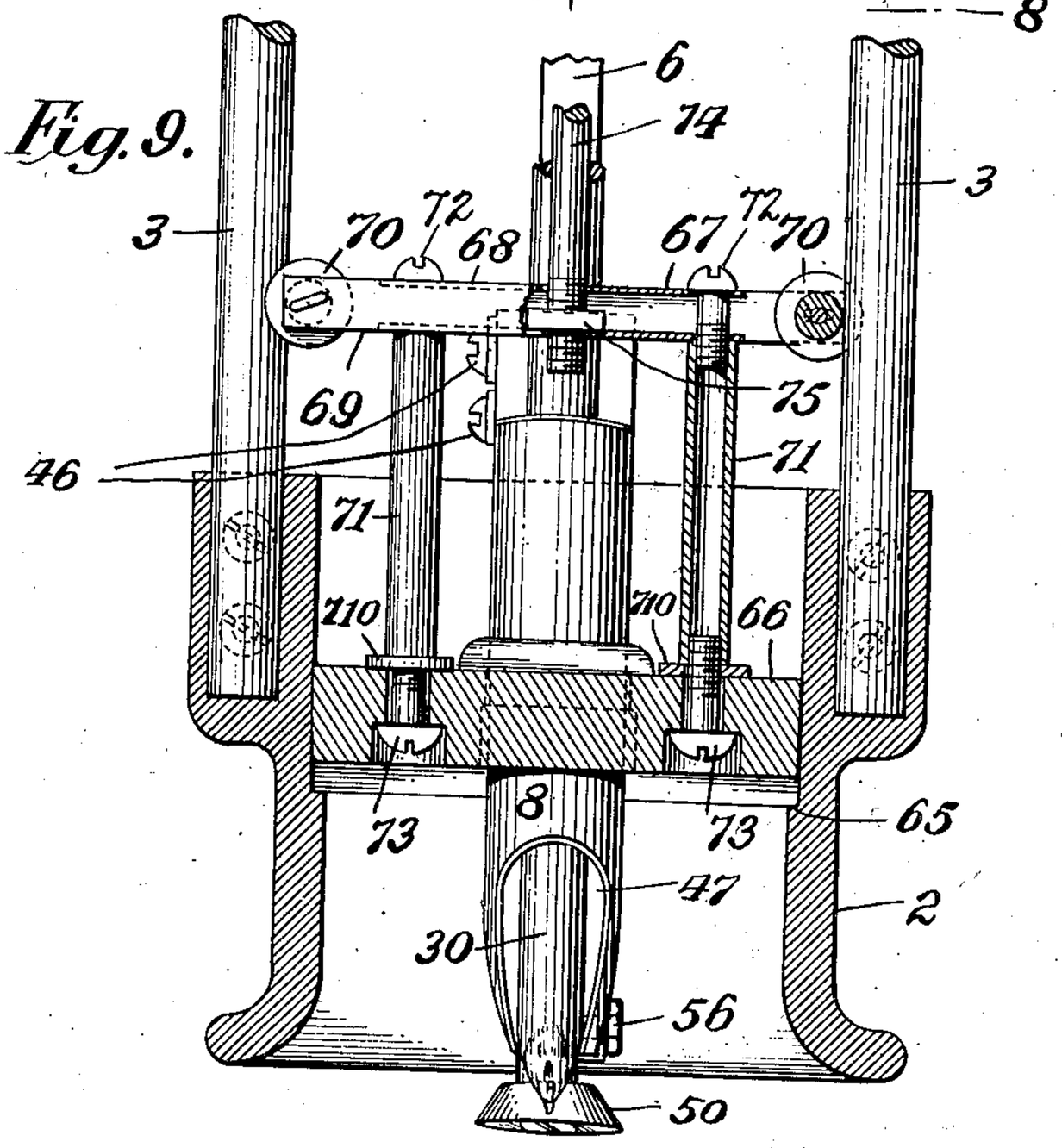


Fig. 9.



Attest:

May Hughes

Edw. McDonnell.

Josef H. Hallberg Inventor:

by William R. Baird

his Atty.

UNITED STATES PATENT OFFICE.

JOSEF H. HALLBERG, OF NEW YORK, N. Y., ASSIGNOR TO THE BECK FLAMING LAMP COMPANY, OF CANTON, NEW YORK, A CORPORATION OF NEW YORK.

ELECTRIC-ARC LAMP.

994,833. Specification of Letters Patent. Patented June 13, 1911.

Application filed March 9, 1907. Serial No. 361,465.

To all whom it may concern:

Be it known that I, JOSEF H. HALLBERG, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to what are known as flaming arc lamps, and its novelty consists in the construction and adaptation of the parts as will be more fully hereinafter pointed out.

The object of the present invention is to produce a most efficient lamp of the type set forth, and in pursuance thereof to provide a lamp of simple, economical and inexpensive construction which will be most effective in operation.

In the drawings, Figure 1 is a miniature representation of the lamp inclosed in its casing and provided with a dependent globe; Fig. 2 is a central vertical section partly in elevation of the casing and operative parts of the lamp; Fig. 3 is a side elevation of the operative parts shown in Fig. 2; Fig. 4 is an enlarged central section on the plane of the line 4—4 in Fig. 8 and a partial elevation of the base of the lamp and the connected parts; Fig. 5 is a detail of the upper electrode holder; Fig. 6 is a plan view of the same below the plane of the line 6—6 in Fig. 5; Fig. 7 is a horizontal section on the plane of the line 7—7 in Fig. 5; Fig. 8 is a top plan view of the parts shown in Fig. 9 beneath the plane of the line 8—8 in that figure; Fig. 9 is a central vertical section on the plane of the line 9—9 in Fig. 8; Fig. 10 is a central vertical section of the resistance coil and connected parts; Fig. 11 is a detail of the electrode hanger; Fig. 12 is a detailed section of the electrode support; Fig. 13 is a detailed side elevation, partly in section, of a modified form of the electrode support, and Fig. 14 is a horizontal section on the plane of the line 14—14 in Fig. 13.

In the drawings, 1 is the upper plate of the lamp frame and 2 is its base, these being connected together by vertically arranged posts 3 secured in position in any suitable manner. Intermediate the upper plate and the base at any convenient place there is arranged a cross piece 4 on which is mounted a solenoid 5. Hinged to the upper plate are two hangers 6, on each of which is slidably mounted an electrode holder 7, and at the lower end of which is arranged a sleeved guide 8 for the electrode, the hangers and consequently the electrodes being arranged in a slanting position. These parts in general comprise the operative mechanism of the lamp, and are inclosed by a casing 9 of light flexible metal from which depends a globe 10 preferably of transparent or translucent glass.

The upper frame 1 is provided with means whereby the lamp is suspended comprising two centrally arranged ears 11, 11, between which is mounted a grooved insulator 12 of usual form secured in place by a spring pin 13. It is also provided with means for conducting the current into the lamp consisting of two upwardly projecting tubular posts 14, each provided with caps 15 to which are attached the conductors (not shown) leading to a suitable source of electrical energy. Each post is provided with a centrally arranged rod 16 threaded at its upper extremity to engage with a threaded aperture in the post 14, and which rod passes down through the upper frame, the resistance being placed on an extension 18 of one of these rods. From this extension a conductor 19 leads into the solenoid 5 and a conductor 20 leads therefrom to a coil 21 mounted on one of the posts 3, from this there is a conductor 22 which is split into two parts, a main wire 23 which leads to one of the electrode holders 7 and a branch wire 24 which leads to the corresponding electrode sleeve 8. From the other central rod 16 a conductor 25 leads to a coil 26 mounted on the other post 3 and from this there is a conductor 27 which is split into two parts, a main wire 28 which leads to the other electrode holder 7 and a branch wire 29 which leads to the corresponding electrode sleeve 8.

30 and 31 are electrodes of suitable form and composition and each preferably provided with a rearwardly extending rib 32 and composed partly of inflammable salts of the alkaline metals, in a manner well known in the art.

Each electrode 7 has its upper extremity secured to a holder 7, which is free to move downward with the electrode, as the electrode is consumed. It is desirable that this downward movement be automatically produced by gravity and that the holders 7 be confined or guided against lateral displace-

ment and prevented from rotating during their downward movement. These desirable ends are accomplished by the construction of holders 7 now to be described which construction, moreover, is simple, inexpensive and effective and is capable of being readily applied to and removed from the hangers 6 upon which the holders 7 are mounted.

Each holder 7 has an opening 33 which extends vertically through it and is open at the front. This opening extends into the body of the holder a distance greater than the diameter of the hanger 6, so that its inner wall will be out of contact with the inner surface of the hanger; except at the lower portion 33ª of said holder which is approximately in the plane of the inner surface of the hanger. Extending across the upper portion of the front of the opening is a plate 34 which is removably secured to the holder, as by screws 35. Arranged in the deeper portion of the opening 33 and opposite the plate 34 is a rounded pin 36, which engages the inner surface of the hanger 6. By this pin 36, plate 35 and the lateral walls of the opening 33, the holder 7 is guided and is enabled to move with a minimum of friction. It will of course be apparent that the weight of the holder will be such as to overcome the frictional resistance at the places of contact between it and the hanger, when gravity is utilized as the force for moving the hanger and electrode downward and that by reducing said friction to a minimum, I am enabled to utilize the force of gravity without having to add undue weight to the holder. At the same time the points of contact are such as effectively to guide the holder in its movement. To prevent rotative movement of the holder the hanger 6 and the opening 33 are of angular conformation. The lower end of each holder is provided with a recess 37 adapted to receive the upper part of the electrode 30 or 31 and this recess is narrowed to receive the rib 32 of the electrode. In the front of the holder is arranged a downwardly projecting resilient tongue 39, the lower end of which normally presses against the upper part of the electrode, and which tongue is secured to the holder by a screw 40 or some other suitable means.

At its upper extremity, the hanger 6, which if desired may be made hollow to decrease its weight, is cut away leaving an upwardly projecting strip 41 which is curved over an insulator 42 of common form which in turn is supported on a cross rod 43 passing through apertures in two ears, 44 and 45, depending from the upper plate 1 of the lamp frame. At its lower extremity, the hanger 6 has secured to it by bolts 46, or in any other suitable manner, the upper part of the sleeve of metal 8 in which the electrode is adapted to slide. This sleeve is cut away at 47 so as to expose the lower inner portion of the electrode. At its lower extremity the sleeve is provided with a rearwardly extending bracket 48 to which is secured the electrode support 49. The electrode support is preferably made in two pieces, a conical member 50, provided with an upwardly projecting annular flange 51 (best seen in Fig. 12) and a central member 52 having a screw head 53 and an upwardly projecting tip 54 provided with an annular groove 55. This tip 54 is thrust upwardly into an aperture in the bracket 48 provided to receive it and is held in place by means of a screw 56 projecting through the bracket 48 and the tip of which screw engages the annular groove 55. The tip 54 is eccentric with the center of the member 52, so that by rotating the tip the conical member 50 may be adjusted in position with respect to the bracket 48 so as to bring the electrodes nearer to or farther away from the center of the lamp. It will be observed that removal or replacement of the conical member 50 does not involve any manipulation of the central member 52, further than the removal or replacement of the screw 53. Thus, when the position of the conical member has once been determined by the adjustment of the central member or tip, said conical member may be removed and replaced without affecting such adjustment. It is desirable to engage the rib of each electrode in a guiding groove in its support and particularly in a groove having side walls of insulatory material. A desirable construction involving this idea is shown in Figs. 13 and 14 upon reference to which it will be seen that the support 50 is inclosed in a covering 57 which is interrupted at 58 to form the groove for the reception of the rib of the electrode. This covering is made of any suitable insulating material, adapted to resist the heat to which it is subjected in use. Among such alberne stone may be mentioned as one which I have found to give satisfactory results. Among others which may be used lava, porcelain and the like may be mentioned.

The resistance comprises a coil 60 insulated by suitable material 61 from the extension rod 18 and provided with an annulus 62 made of suitable conducting material and connected by a conductor 63 with the rod 16 and by the conductor 19 to the solenoid 5. The annulus 62 is provided with ears 63 which are brought together by a screw or bolt 64 closely to embrace the coil 60 and this screw or bolt serves also as a connection to the conductor 63.

The base 2 is contracted to form a shoulder 65 serving as a seat for a positioning plate 66 made of suitable refractory material, for instance soap-stone. This plate is provided with apertures 670 to permit of the passage of the sleeves 8 which pass obliquely through these apertures, the

hangers 6 being arranged in a slanting position for that purpose. It is obvious, therefore, that the movement of this plate 66 upwardly will tend to bring the sleeves 8 and the electrodes encircled thereby together and that its reverse movement downward will tend to separate the sleeves and the electrodes.

The positioning plate 66 is supported by a carrier comprising a cross piece 67 made of two members with a space between them, an upper member 68 and a lower member 69, the cross piece being provided at each end with grooved rollers 70 adapted to engage in rolling contact with the rods 3. The cross piece is also provided with depending pieces 71 which are secured to it by any suitable means, as the screws 72, and which depending pieces are secured to the positioning plate 66 by other suitable means, as the screws 73, the depending pieces 71 being made hollow for the purpose of receiving the threaded ends of the screws and being provided with flanges 710 to limit and define their position.

Secured to the cross piece 67 is a central rod 74 threaded at its lower extremity and provided with a nut 75 secured thereto, which nut is between the two members 68 and 69 of the cross piece, so that the rod 74 may be moved between these members, but its motion is strictly limited by the position of the nut. The rod 74 (shown in full vertical length in dotted outline in Fig. 2) is curved at 76 and hinged at its upper extremity to one end of a lever 77 pivoted at 78 to a bracket 79 depending from the cross piece 4. The other end of the lever 77 is secured to a spring 80 which in turn is secured to a fixed part of the frame. The lever 77 is also pivoted to a rod 81 depending from the solenoid 5 and which rod is provided with means, as the apertures 82, whereby an adjustment may be secured between it and the lever. By such construction the lever 77 and the rod 74 are normally held by the spring 80, so that the nut 75 is in contact with the lower surface of the upper member 68 of the cross piece 67 and the positioning plate is so placed thereby that the sleeves 8 are brought together and the electrodes are practically in contact. As soon, however, as the current is turned on the rod 81 of the solenoid 5 moves downward against the force of the spring 80 and acquires a certain momentum before the nut 75 comes in contact with the upper side of the lower member 69 of the cross piece 67 by reason of the space between the members 68 and 69 of this cross piece. Therefore, the nut 75 strikes the member 69 a sharp blow and moves the positioning plate 66 quickly downward, by this impact disengaging the tips of the electrodes from each other should they have shown any tendency to stick together. The positioning plate and its connected parts have also another function. One of the problems to be solved in connection with the operation of lamps of this character is to prevent the products of combustion arising from the burning electrodes from coming into contact with the operative metal parts of the lamp which they injuriously affect. The positioning plate 66 acts as a seal partially to prevent the passage upward of some of these gases, but a small portion thereof will nevertheless escape through the apertures 670, through which the sleeves pass. More effectually to seal these apertures, I restrict them at their upper portions 671 and I provide above the plate and surrounding the sleeves 8 semicircular sealing rings 672 which closely embrace the sleeves and have their widest rim downward, forming in effect an inverted cup which retains practically all of the gases which may escape through the restricted opening 671. In the actual operation of the lamp I find that the leakage upward of these gases is so small as practically to be negligible.

When the lamp is not energized, the rod 81 of the solenoid 5 is in its uppermost position and the positioning plate is consequently in its uppermost position and the sleeves 8 are drawn together so that the electrodes resting upon the supports 49 are in contact. The resistance ring having been set at the proper position, the current is turned on and the result is, as above stated, that the movement of the rod 81 of the solenoid moves downward the positioning plate, separates the electrodes and an arc forms between the latter. The quick downward movement of the positioning plate compresses the air inside of the base 2 beneath it and tends to expel it from the lower end of the base. This has the effect of pushing the arc immediately outward, so that it is crescent-shaped with the horns upward.

One of the important purposes which I have in view, in the present invention, is to insure that the portion of the electrode which is farthest from the arc and by which it is supported shall be consumed at a ratio equal to the consumption of the main portion of the electrode, in which the crater is formed. It has been found in practice with lamps of this type hitherto proposed, that the rib is more slowly consumed than is the body part of the electrode, so that the arc is maintained above the support and the lower part of the rib. I propose to overcome this liability and assure a substantially uniform downward feed of the electrode, by including in the lamp means whereby the rib and the body part of the electrode are substantially equally consumed and the crater on the body part of the electrode can be kept in a predetermined position with respect to the shoe

or support. This result is secured in the present embodiment of my invention by forming an arc between each shoe or support and the electrode supported thereby. As herein shown this arc is formed by including each shoe or support in a shunt circuit, it being observed that the conductor leading to each electrode is split, forming a main line leading to the weighted electrode holder and a branch line leading to the sleeve. This latter line serves to energize the shoe or supports 49 on which the ribs of the electrode rest, so that an arc is formed between the support and the rib, as already suggested. By regulating the resistance in the branch line leading to the electrode support, the consumption of the rib of the electrode in contact with that support may be increased or decreased, whereby the speed of the downward feed of the electrode may be variably controlled or regulated. A further result of this construction is that the electrodes burn in each instance as if they were of a constant length equal to the length of the sleeve 8, and a uniform illumination and consumption is the consequence. This is an important practical advantage of my invention, and one which heretofore, to my knowledge, has not been utilized in electric arc lamps. The weighted holders create a constant downward pressure upon the electrodes which serve further to increase the steadiness and uniformity of their consumption and the consequent uniformity of illumination.

What I claim as new is:—

1. In an electric arc lamp of the type embodying a ribbed electrode and a second electrode, means for causing the consumption of the rib to be approximately equal to that of the bodies of the electrodes, comprising a supporting means having a conducting element engaged with the rib of the ribbed electrode, and circuit-forming means including said electrodes and conducting element.

2. In an electric arc lamp, a pair of electrodes having ribs, and means for causing the consumption of the ribs to be approximately equal to that of the bodies of the electrodes, comprising supporting means for the electrodes, engaging the ribs, and circuit-forming means, including the supporting means and electrodes.

3. In an electric arc lamp, a pair of electrodes having ribs, supporting means for the electrodes, engaging said ribs, and means forming a circuit which includes said supporting means and the electrodes, the circuit including a resistance element.

4. In an electric arc lamp, a pair of electrodes arranged points downward, each having a rib, a circuit including the electrodes, a lateral support for each electrode, arranged in contact with the rib of the latter, and means for supplying the supports with electric energy from the same source from which the arc is supplied, acting through the supports to cause the consumption of the ribs to be approximately equal to that of the bodies of the electrodes.

5. An electrode and a second electrode provided with a conducting support at its end, means for conveying current through the electrode and means for supplying current to the conducting support, so as to form an arc between the support and the electrode.

6. An electrode and a second electrode, a main circuit including the same, and a support for the second electrode arranged in a shunt circuit, the relative resistances of the two currents being such that an arc is formed between the support and the electrode.

7. In an electric arc lamp, an electrode, a second electrode arranged point downward and having a rib, and means for causing the consumption of the rib to be approximately equal to that of the bodies of the electrodes, comprising a guide sleeve in which the second electrode is mounted to move downward, a shoe carried by the sleeve and engaging the rib of the second electrode and circuit-forming means including the electrodes and shoe.

8. In an electric arc, a pair of electrodes, arranged points downward and each provided with a rib, and means for causing the consumption of the ribs to be approximately equal to that of the bodies of the electrodes, comprising sleeves through which the electrodes are movable downward respectively, each sleeve provided with a support for the lower end of the rib of its electrode, and means forming circuits which include the electrodes and supports.

9. In an electric arc lamp, electrodes having ribs, conducting supporting means engaging the ribs, having walls of insulatory material.

10. In an electric arc lamp, electrodes having ribs, conducting supporting means engaging the ribs, having walls of insulatory material, and said support being of conducting material and having means for conducting current thereto.

11. In an electric arc lamp, an electrode and a support therefor provided with an insulating cover interrupted to form a guiding groove for the electrode.

12. In an electric arc lamp, an electrode having a rib, and a support for the electrode, provided with an insulated cover which is interrupted to form a groove which receives said rib.

13. In an electric arc lamp, an electrode arranged point downward, a guide therefor, in which the electrode is adapted to move downward, said guide provided at its lower extremity with a support for the electrode, an insulated covering for the support interrupted to form a guiding groove for the

electrode and means for supplying electric energy to said support.

14. In an electric arc lamp, means for supporting an electrode, comprising a conoidal member to engage the electrode, a pivotally mounted adjusting element extending into the conoidal member, and means engaging said member for holding the same upon the adjusting element, said means being mounted for adjustment away from the conoidal member, for the purpose specified.

15. In an electric arc lamp, means for supporting an electrode comprising an eccentrically pivoted adjusting element, a conoidal member removably mounted thereon, for engaging the electrode, and means engaging the conoidal member for holding the same upon said adjusting element, said means being adjustable to free it from the conoidal member and permit the latter to be removed from the adjusting element.

16. In an electric arc lamp, means for supporting an electrode comprising an adjusting element having an eccentrically disposed pivot, a conoidal member removably mounted on said element, for engaging the electrode, and a device removably secured to said element for holding the conoidal member thereon.

17. In an electric arc lamp, means for supporting an electrode, comprising an adjusting element which is eccentrically pivoted at one end and has a removable head threaded upon its other end, and a member to engage the electrode, removably mounted on said element in engagement with said head.

18. In an electric arc lamp, an electrode, a guide therefor, and means engaging the end of the electrode for supporting the same, said means comprising an element having an eccentrically disposed tip which is pivotally connected to the guide and a removable member to engage the end of the electrode, mounted upon said element.

19. In an electric arc lamp, an electrode, a guide therefor, and means engaging the end of the electrode for supporting the same, said means comprising an element having an eccentrically disposed tip which is pivotally connected to the guide, a removable member to engage the end of the electrode mounted upon the body of said element, and an element which engages said body and member and is mounted out of the path of the latter to permit removal of the same.

20. In an electric arc lamp, an electrode, a guide therefor, and means for adjustably supporting the electrode, comprising a removable member to engage the end of the electrode, and an adjusting element having a portion which extends into said member, said element having at one end an eccentrically disposed tip pivotally connected to the guide and at its other end an element which engages said member and holds it on said portion, and is movable out of the path of said member.

21. In an electric arc lamp, a guide for the electrode thereof, and means for supporting the end of the electrode, comprising a conoidal member which engages the electrode, a support therefor having a removable head to engage said member and an eccentrically disposed tip at its end remote from said head, and means whereby said tip is pivotally connected to the guide.

22. In an electric arc lamp, a pair of electrodes, a reciprocatory plate connected with the electrodes, means for automatically moving the plate to separate the electrodes when the lamp is energized, and means whereby movement of the positioning plate causes gaseous fluid beneath it to move substantially in the direction of the length of the electrode.

23. In an electric arc lamp, a pair of electrodes, means for separating the electrodes and forcing the gaseous fluid toward the arcing ends thereof when the lamp is energized, and means for confining the fluid in its passage toward said ends, for the purpose specified.

24. In an electric arc lamp, a pair of downwardly extending electrodes, a chamber around the arcing ends of the same, said chamber being open contiguous to said ends, and means movably mounted in said chamber and closing the same above the arcing ends of the electrodes, said means having connection with the electrodes and serving in its movement to move the same relatively to each other and to force gaseous fluid toward the arcing ends thereof.

25. In an electric arc lamp, a pair of electrodes and means for forcing the arc away from the arcing ends thereof comprising a chamber around the electrodes and an element in said chamber movable toward said ends, and substantially impervious to the passage of air or gases through it, said chamber being open at the side remote from said element.

26. In an electric arc lamp, a pair of electrodes, and means for forcing gaseous fluid toward the arcing ends thereof, said means comprising a movable element which is connected with the electrodes and is adapted in its movement to move the same relatively to each other and an inclosure for confining the fluid against lateral flow in its passage to said ends.

27. In an electric arc lamp, a pair of electrodes, and means for forcing gaseous fluid toward the arcing ends thereof, said means comprising a movable element which is connected with the electrodes and is adapted in its movement to move the same relatively to each other and an inclosure for confining the fluid against lateral flow in its passage to said ends, said inclosure being open for the

discharge of the gaseous fluid after it has passed said arcing ends.

28. In an electric arc lamp, a chambered base, a pair of electrodes therein and means controlled by the energization of the lamp for separating the arcing ends of the electrodes and forcing the arc toward the points thereof, said means including a movable element which engages the electrodes and is adapted to move the arcing ends thereof relatively to each other and to coöperate with the walls of the chamber and force the gaseous fluid toward the points of the electrodes when the lamp is energized.

29. In an electric arc lamp, a chambered base, a pair of electrodes therein, a positioning plate reciprocatorily mounted in the chamber of the base and having an area which is approximately equal to the cross section of the chamber, said plate engaging the electrodes and adapted to hold the same together when the lamp is not energized and means for moving the plate to separate the electrodes and force the arc toward their points when the lamp is energized.

30. In an electric arc lamp, a chambered base, a pair of electrodes therein, a positioning plate reciprocatorily mounted in the chamber of the base and provided with apertures for the passage of the electrodes, oblique to the axes of the latter, said plate having an area approximately equal to the cross section of the chamber, a sealing means for said apertures, and means controlled by the energizing of the lamp for moving said plate in the chamber.

31. In an electric arc lamp, an electrode, a holder therefor having an open side, a guide rod, extending into the open side of said holder, a plate crossing the open side of the holder and adapted to engage the contiguous surface of the guide rod, said holder provided with spaced elements to engage another surface of the guide rod.

32. In an electric arc lamp, a guiding rod, and an electrode holder through which the guiding rod extends, said holder having at one side a plurality of separated surfaces to engage the contiguous surface of the rod and at the other side a wall arranged opposite one of said surfaces and an open space opposite the other of said surfaces, said wall engaging the contiguous side of the rod.

33. In an electric arc lamp, a guiding rod, and an electrode holder having an opening through which the guiding rod extends, said holder having at one side of said opening and above and below its center a plurality of surfaces to engage the contiguous surface of the rod, the portion between said surfaces being free from such engagement, and the holder also having at the opposite side of the opening a wall to engage the contiguous side of the electrode, said wall occupying a portion only of the length of the holder, whereby a portion of the last mentioned side of the rod within the holder is free.

34. In an electric arc lamp, an electrode, a guiding rod and a holder to which the electrode is attached, said holder encircling said guiding rod and having at one side a plurality of separated surfaces to engage the contiguous end of the rod, one of said surfaces being rounded, and at the other side a wall arranged opposite one of said surfaces and an open space arranged opposite the other of said surfaces.

35. In an electric arc lamp, a pair of electrodes arranged in relatively inclined position with their arcing ends in contact, and mechanism for separating said ends, comprising an element engaging one of the electrodes and movable to change the inclination thereof, a movable carrier from which said element is suspended and means for delivering a blow to said carrier when the lamp is energized.

36. In an electric arc lamp, a pair of electrodes arranged in relatively inclined position with their arcing ends in contact, a reciprocatory positioning plate engaging the same and adapted to move them relatively to each other, a carrier for said positioning plate, transmitting movement thereto, and an actuating means for said carrier controlled by the energization of the lamp, said actuating means having an element which has an initial movement relatively to the carrier and imparts a sharp blow thereto.

37. In an electric arc lamp, a pair of electrodes arranged in relatively inclined position with their arcing ends in contact, a reciprocatory positioning plate engaging the same and adapted to move them relatively to each other, a carrier for said positioning plate, transmitting movement thereto, said carrier comprising a cross piece having connection with the positioning plate, and a rod controlled by the energization of the lamp for actuating the cross piece, said rod having an element which has initial movement relative to the cross piece and imparts a sharp blow thereto.

38. In an electric arc lamp, a pair of electrodes arranged in relatively inclined position with their arcing ends in contact, posts, a pair of electrodes arranged in relatively inclined position with their arcing ends in contact, a reciprocatory cross piece having a guiding connection with the posts, means connected with the cross piece for separating the arcing ends of the electrodes, when the cross piece is moved and an actuating means for the cross piece, provided with a rod having an element which is adapted to engage the cross piece and has an initial movement relative thereto and means controlled by the energization of the lamp for moving said rod.

39. In an electric arc lamp provided with a positioning plate for the electrodes, a carrier for the plate comprising a hollow cross piece, a connection between the cross piece and the plate, an actuating rod extending inside of the cross piece and provided with a head arranged in the cross piece.

40. In an electric arc lamp provided with a positioning plate for the electrodes, a carrier for the plate comprising a hollow cross piece, a connection between the cross piece and the plate, an actuating rod extending inside of the cross piece and provided with a nut and means for adjusting it to the rod.

41. In an electric arc lamp, electrodes, a reciprocatory positioning plate connected therewith, a solenoid provided with a rod, a cross piece having rollers, said cross piece carried by the rod of the solenoid, connections between the cross piece and the positioning plate, and guiding devices engaged by the rollers of the cross piece.

42. In an electric arc lamp, electrodes, a reciprocatory positioning plate through which the electrodes extend, a rod having connection with said plate, a lever pivotally connected to the rod, a fixed support on which the lever is fulcrumed, an electromagnet, its armature, a connection between the armature and lever, arranged on the same side of the fulcrum of the lever as the connection of the lever with said rod, the weight of the parts being such as to tend to separate the electrodes, and a spring arranged to operate against the weight of the parts to bring the electrodes in contact.

43. In an electric arc lamp, electrodes, a reciprocatory positioning plate through which the electrodes extend, a rod having connection with said plate, an electro-magnet and its arm, a lever arranged approximately at right angles with the rod and fulcrumed at a place intermediate of its ends to a fixed support, one end of said lever being pivoted to the adjacent rod, a connection between the armature and the lever arranged between the fulcrum of the lever and said rod, the weight of the parts being such as to tend to separate the electrodes, and a spring connected to the end of the lever remote from the connection of the latter with said rod, said spring operating on said lever against the weight of the parts and serving to bring the electrodes in contact.

44. In an electric arc lamp, electrodes, a reciprocatory positioning plate engaged with the electrodes, a movable carrier therefrom having elements which are spaced apart, a rod having a head which has movement in the space between said elements and moves the carrier and positioning plate by its engagement with said elements, an electromagnet and its armature, a lever which is pivotally connected with said armature and rod, and is fulcrumed upon a fixed support, and a spring which has connection with the lever and acts in opposition to the magnet.

45. In an electric arc lamp, a pair of electrodes and means for moving the same relatively to each other comprising a solenoid and its core, a spring which acts in opposition to the solenoid, a lever pivotally connected to the spring and solenoid-core, and a relatively fixed support, and operative connections between said lever and the electrodes adapted to move the arcing ends of the latter relatively to each other, said connections comprising a rod pivoted to the lever, a cross piece connected to the rod, means for guiding the cross piece and a positioning plate suspended from the cross piece and engaging the electrodes.

46. In an electric arc lamp, electrodes arranged point downward, supports therefor, a downwardly open chamber around said electrodes, said chamber having a movable positioning plate which closes one of its sides and is provided with openings through which the electrodes extend, and means encircling the electrodes and sealing the space between the same and the walls of said opening.

Witness my hand this eighth day of March 1907, at the city of New York, in the county and State of New York.

JOSEF H. HALLBERG.

Witnesses:
MAY HUGHES,
WILLIAM R. BAIRD.