No. 669,056. Patented Feb. 26, 1901.

M. H. BAKER.

INCLOSED ARC LAMP.

(Application filed Mar. 12, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

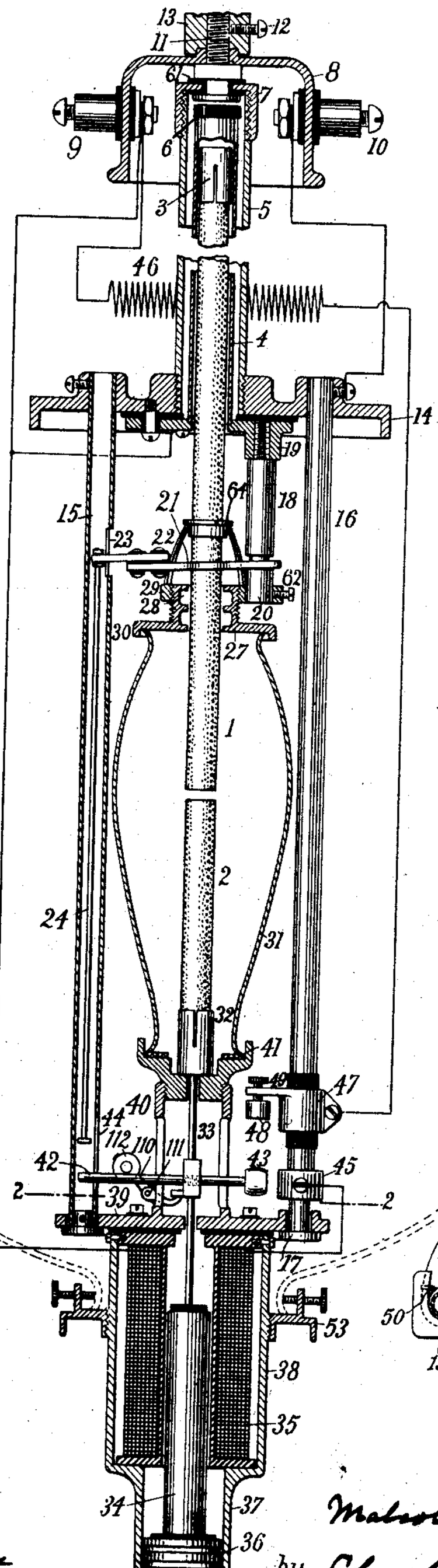

Fig. 3

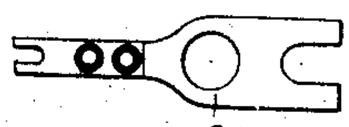

Fig. 2

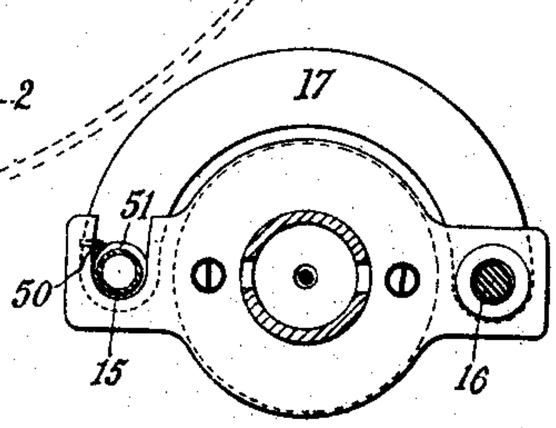

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Fig. 4

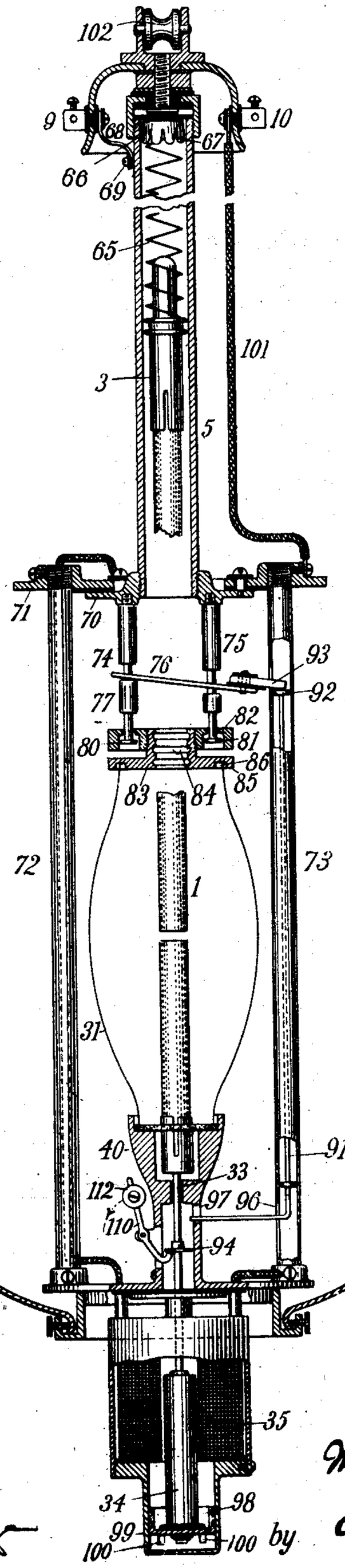


Fig. 5

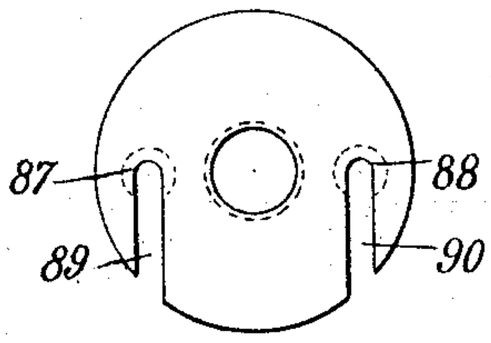
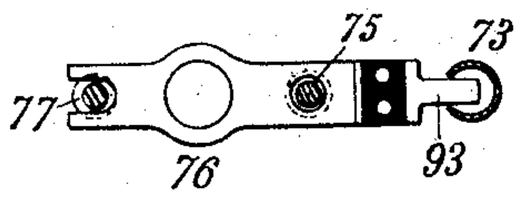


Fig. 6



Witnesses:
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UNITED STATES PATENT OFFICE.

MALCOLM H. BAKER, OF NEW YORK, N. Y., ASSIGNOR TO THE MANHATTAN GENERAL CONSTRUCTION COMPANY, OF SAME PLACE.

INCLOSED-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 669,056, dated February 26, 1901.

Application filed March 12, 1900. Serial No. 8,255. (No model.)

To all whom it may concern:

Be it known that I, MALCOLM H. BAKER, 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 Inclosed-Arc Lamps, of which the following is a specification.

My invention relates to improvements in the construction of electric-arc lamps, its object being to provide a simple, compact, reliable, and economical form of lamp.

In carrying out my invention I have made several improvements in the organization of arc-lamps and in the details of their construction. One of the novel features on which I rely for accomplishing the purposes of my lamp is that of mounting the lower carbon upon the core or armature of the usual shunt-magnet and of causing the movement of the said core or armature to operate also the clutch for the upper carbon. To this end the shunt-magnet core or armature is provided with an extension or trip so placed as to cooperate either directly or indirectly with a tailpiece on the clutch, whereby the attraction of the core or armature will release the clutch, as already described. When this arrangement is followed, the arc is established by the dropping of the lower carbon under the influence of gravity. In other words, the structure is so organized that the operation of the shunt-magnet will act first to raise the lower carbon toward the upper carbon and afterward release the upper carbon, so as to bring the points of the carbons together, after which the shunt-magnet will be partially deënergized, thus allowing the lower carbon to drop by gravity and establish the arc. A dash-pot is usually employed for preventing too sudden movements of the lower carbon. I may employ for the purpose of assisting the shunt-magnet and of rendering the action thereof uniform a pivoted lever or other equivalent device tending to raise the lower carbon slightly (on the initial closure of the circuit through the shunt-magnet) and to exert a constantly-increasing lift upon the lower carbon as the action of the shunt-magnet becomes gradually less effective. The compensating lever just described is usually arranged at a critical angle, whereby its increasing efficiency shall correspond precisely to the decreasing upward pull of the magnet. These and other features of my lamp will be fully explained in the specification which follows and will be more particularly pointed out in the claims.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of a complete lamp structure, including also a diagram of the electric circuits. Fig. 2 is a section along the line 2 2 of Fig. 1. Fig. 3 is a detail of the lamp-clutch. Fig. 4 is an elevation of a modified form of my lamp, and Figs. 5 and 6 are detail views.

Referring to Figs. 1 and 2, the characters 1 and 2 represent, respectively, the upper and lower carbons of my lamp. The upper carbon is provided with any suitable style of carbon-holder, as 3, and the carbon and holder are adapted to reciprocate within a metallic tube 4, the upper end of which carries an insulating cap or washer 6. The lower end of the tube 4 is set into a groove in an insulated plate 19, forming a part of the rigid structure of the lamp. Surrounding the tube 4 is a metallic tube or pipe 5, provided with a cap 7, on which is mounted a larger cap 8, carrying the insulated binding-posts 9 and 10. The junction between the cap 7 and the larger cap 8 is made through the medium of an insulating-washer 61. Through an opening in the upper end of the cap 8 extends a screw-threaded rod 11, to which is secured by a screw 12 the usual hook for supporting the lamp structure as a whole. The lower part of this hook is shown at 13, the upper part being broken away.

To the lower end of the tube or pipe 5 is screwed a circular plate or disk 14, to which the upper ends of the side rods 15 and 16 of the lamp are secured. The lower ends of these side rods are connected to a semicircular plate 17, forming, with the side rods 15 and 16 and with the plate or disk 14, the main elements of the lamp-frame.

From the disk or plate 14 depends a post 18, secured to the plate 19, which is directly connected to the plate 14 with interposed insulation. Near its lower end the post 18 is re-

duced in size, and below the reduced portion is an enlargement 20, which constitutes what I call the "stationary" portion of my lamp-clutch. The movable portion of the said clutch is shown at 21; and it consists, essentially, of a bar having a central opening through which the upper carbon passes. One end of the movable portion of the clutch is forked and surrounds the reduced portion of the rod 18. To the opposite end of the clutch 21 is secured a tailpiece 22, which is insulated from the part 21, as shown. The tailpiece enters an opening 23 in the side rod 15, (which is hollow,) where it is connected to a small rod 24, capable of longitudinal movement within the side rod. When the tailpiece 22 is allowed to drop down, the clutch 21 engages with the upper carbon in the usual manner. When, however, the tailpiece is pushed upward until the clutch 21 becomes horizontal, the carbon is free to pass downward through the clutch. The manner in which the clutch is operated through the medium of the rod 24 will be described farther on.

Below the clutch 21 is a cylinder 27, provided with a gas-check 28. Said cylinder is screw-threaded on its periphery, by which means it is brought into engagement with an internally-screw-threaded ring 29, secured by a set-screw 62 to the enlargement 20 on the lower end of the rod 18. The cylinder 27 is provided with a circular flange 30 at its lower end, the flange being cupped to receive the upper end of a small glass globe 31, which surrounds the end portions of the carbons. Owing to the mode of connection between the ring 29 and the cylinder 27, the latter may be adjusted up and down, whereby the flange 30 may be caused to press down against the upper end of the globe 31 or can be moved away from it at will.

The ring 29 supports a smaller ring 64, which surrounds the upper carbon, leaving space enough for the said carbon to pass through, but not the carbon rod or holder 3. Should the upper carbon be consumed almost completely, so that the bottom of the carbon-rod should be brought into engagement with the ring 64, the said ring would not permit the rod to pass through and the carbon would be retained in place.

The lower carbon is carried in a holder 32, which is supported on the upper end of a rod 33. The said rod is itself carried by the movable core 34 of the shunt-magnet 35. The lower end of the core 34 is surrounded by an insulated grooved plunger or piston 36, located within a closed cylinder 37. The structure thus described constitutes a dash-pot, serving to prevent too quick or sudden motions on the part of the core 34.

The cylinder 37 constitutes an extension of the inclosing case 38 of the magnet 35. The upper end of the case 38 supports a plate 39, on which is mounted a standard 40, constituting the bottom support for the glass globe 31. I provide a ring 41, of felt, rubber, or other cushioning material, at the top of the standard 40, the said top being suitably shaped to hold the ring 41 and the bottom of the globe 31 in place.

The rod 33, besides supporting the lower-carbon carrier 32, also supports a cross piece or lever 42, one end of which carries a contact-piece 43, while the other end enters a slot 44 in the side rod 15 and extends under the lower end of the rod 24. When the core 34 is drawn upward by the action of a current traversing the magnet 35, the cross lever or trip 42 engages the lower end of the rod 24 and through the medium of the said rod pushes the tailpiece 22 upward and trips the clutch for the upper carbon, allowing the carbon to fall.

The circuit connections of the lamp are illustrated diagrammatically in Fig. 1. One circuit passes from the binding-post 9 to the coil 35 and thence to a ring 45 on the side post 16. From the upper end of the said post a wire leads to the binding-post 10, which binding-post is accordingly in connection with the main lamp-frame. Another circuit passes from the binding-post 9, through a resistance 46, to an insulated ring 47 on the side post 16, while a derivation from the magnet-circuit runs to the ring 19, which is electrically connected with the upper carbon through the tube 4 and the carbon-carrier 3. A study of the circuit connections as above set forth shows that when the current of the lamp is first turned on its path is through the coil 35, causing the core 34 to be drawn upward in the manner already described and intermediately causing the upper carbon to fall into contact with the lower. When this happens, the electromagnet is in a measure short-circuited, and consequently exercises less pull upon its core, which falls in response to gravity, thus drawing an arc between the upper and lower carbons. The regulation of the arc will then be effected by the variations in the current traversing the coil 35, all sudden movements being prevented by the dash-pot arrangement connected with the core 34.

Coöperating with the magnet, so as to assist in its lifting effect upon the lower carbon and to resist the effect of gravity, is a lever 110, pivoted at 111 and so connected to the rod 33 as to act upon it through a critical angle, whereby the effect of the adjustable weight 112 at the outer end of the lever shall gradually increase with the ascent of the lower carbon and the magnet-core in a degree corresponding to the decreasing lifting effect of the magnet as the core approaches equilibrium within the same.

I provide a cut-out for removing the lamp from the circuit when the carbons are broken or become inoperative for any other reason. This cut-out consists of the contact-piece 43 on the rod or lever 42, acting in conjunction with an adjustable contact 48, depending from a bracket 49, connected with the contact-ring

47. Should the carbons become broken, thus permitting the entire current of the lamp to pass through the coil 35, the core 34 will be drawn to its extreme upward position, moving the contacts 43 and 48 together. In this way a new path for the current is created, passing through the resistance 46, the contact-ring 47, contact-pieces 48 and 43, rod or bar 42, and the lamp-frame to the binding-post 10.

It will be observed that the plate 39 practically supports the magnet 35 and the parts connected therewith and also that it supports the lower carbon and the lower end of the globe 31. Accordingly all the parts mentioned move with the plate 39, which is pivoted to the side rod 16 and slotted at its other end, so as to slide around the lower end of the side rod 15. Using the side rod 16 as a pivot, the entire structure connected with plate 39 can be swung outward, provided the lamp-globe 31 is free to move and also provided that the catch or detent for holding the opposite end of the plate 39 to the rod 15 is released. In the present instance this catch consists of a pin 50, engaging with a washer 51 on the side rod 15. In order to release the globe 31, it is only necessary to screw the cylinder 27 upward within its ring 29, whereupon the globe can be removed at the will of the operator.

The arrangement described in the foregoing paragraph permits of trimming the lamp without inconvenience, as will be readily understood.

The resistance 46 may, if desired, be disposed around the upper portion of the lamp.

A large inclosing globe 52 may surround the entire lamp mechanism and be supported in any convenient manner. For example, the upper end of the globe may press against the under portion of the plate 14, and the lower end of the globe may be received by the ring 53, surrounding the casing 38.

The lamp illustrated in Figs. 4 and 5 differs from that already described mainly in respect to certain details of construction. In this lamp the plate which supports the shunt-magnet and the standard into which the lower carbon passes is rigidly connected with the side posts of the lamp-frame instead of being pivoted to one of these posts. Moreover, the cylinder which contains the gas-check is secured to a support which is itself detachable from the lamp-frame, thus permitting the lamp to be trimmed by the pushing upward of the upper carbon and the removal of the gas-check cylinder, as will be explained farther on. In the present instance the upper carbon 1, together with its rod or carrier 3, is adapted to reciprocate inside the main lamp-tube 5, and within said tube is located a coiled wire 65, which is connected at one end to the carrier 3 and at the other to a slitted contact-piece 66, having spreading-arms 67 67, which press against the inner walls of the tube 5 and make good contact therewith. The binding-post 9 is joined directly to the tube 5 by a wire 68, being coupled thereto by a binding-screw 69. The tube 5 is screwed into a plate 70, from which the plate 71 is insulated, as shown, the plate 71 being the upper plate of the lamp-frame and having secured to it the upper ends of side rods 72 and 73 of such frame. From the plate 70 depend two posts 74 and 75, one of which corresponds to the post 18 in Fig. 1 and constitutes the rear support of the lamp-clutch 76, the said post 74 being provided, like the post 18, with an enlargement or stop, which in the present instance is designated by the character 77. The clutch in the present instance is not only provided with a yoke, which surrounds the narrowed portion of the rod 74, but it is also provided with an opening surrounding a narrowed portion of the rod 75, so as to allow free motion up and down of the outer end of the clutch. This structure is illustrated in the detail view Fig. 6. The lower ends of the rods 74 and 75 are extended downward and provided with buttons 80 and 81, which support a metallic ring 82, into which a cylinder 83, containing the gas-check 84, is adapted to be screwed. At the lower end of the cylinder a flange 85 is formed, and the same is cupped or provided with an annular groove 86 to receive the upper end of the glass globe 31, surrounding the end portions of the carbons. Depressions 87 and 88 are made in the under side of the ring 82, and from these depressions slots 89 90 are extended to the edge of the ring, which slots permit the ring 82 to be slipped over the narrowed lower portions of the rods 74 and 75 and to be slipped off again at will. It being presupposed that the gas-check cylinder 83 has been screwed into the ring 82, so as practically to constitute the ring and the cylinder a single unitary structure, it is evident that the entire structure can be mounted on the rods 74 and 75 or dismounted therefrom at the will of the operator. For the purpose of trimming the lamp the structure last described will usually be lifted slightly, so that the flange 85 will pass out of the range of the globe 31, and the structure will then be slipped off, allowing the rods 74 and 75 to pass through the slots 89 and 90, whereby it will be made possible to remove the globe itself and trim the lamp. Before removing the gas-check structure the upper carbon will be pushed upward inside the tube 5 far enough to allow the cylinder to be removed. In this structure of lamp the trip for the lamp-clutch is located within the side rod 73, being in the form of a bent rod 91, the upper end of which is provided with a button 92, which rests just under the tailpiece 93 on the clutch 76. The lower end of the bent rod 91 extends into proximity with the vertical rod 33, on which is mounted a button 94, in range with said lower end of the bent rod 91. When the core 34 of the shunt-magnet 35 is raised, carrying with it the rod

33 and the button 94, the latter will be brought into contact with the lower end of the bent rod 91, thus raising the said rod and ultimately lifting the tailpiece of the lamp-clutch and tripping the said clutch. To permit the reciprocating motions of the bent rod 91, a slot 96 is made in the wall of the side posts 73, and a slot 97 is also made in the wall of the standard 40. The piston or plunger in this form of lamp may be a brass cup 98, insulated from the core 34 and adapted to move within a brass cylinder 99. To prevent a possible ground through this part of the apparatus, I provide insulating-stops 100 100 at the bottom of the piston. The lever 110, with its weight 112, acts in the present instance directly upon the button 94, and they do their work in precisely the same manner as indicated in the description of Fig. 1. The circuit of the lamp enters at binding-post 9, passes through the tube 5, the contact-piece 66, wire 63, upper and lower carbons, and thence through the lamp and a wire 101 to the binding-post 10 and the external circuit. At the top of the lamp structure is mounted a grooved roller 102, usually of porcelain, by means of which the lamp can be supported upon a suitable hook.

The invention claimed is—

1. The combination of the upper-carbon rod and its clamp, the lower-carbon rod, a shunt-electromagnet and its movable core or armature for regulating the position of the lower carbon, substantially as described.

2. The combination of the upper and lower carbons of an arc-lamp, a clutch for the upper carbon, a shunt-electromagnet for controlling the motions of the lower carbon, and means operated by said electromagnetic device for releasing the clutch of the upper carbon.

3. In an electric-arc lamp, the combination of the upper and lower carbons, a clutch normally holding the upper carbon, a regulating shunt-magnet for the lower carbon, and a movable core therefor with which the carbon is connected, side rods holding the upper-carbon mechanism and the lower-carbon mechanism in their proper relative positions, a movable rod extending through one of the side bars between the clutch of the upper carbon and the mechanism of the lower carbon, and means for releasing the clutch by a movement of said rod in response to the movement of the core of the lower-carbon-regulating mechanism.

4. In an electric-arc lamp, the combination of the lower carbon, a shunt-solenoid in the same axial line as the carbon, a core for the solenoid controlling the vertical position of the carbon operated in one direction by the action of the solenoid and in the opposite direction by gravity, substantially as described.

5. In an electric-arc lamp, an upper carbon fed downward by gravity alone, a shunt-solenoid, and a lower carbon moving upward in response to current traversing the solenoid and downward by the action of gravity.

6. In an electric-arc lamp, the combination of an upper carbon and a retaining-clutch therefor, a lower carbon, its holder, an electromagnet in shunt to the arc for moving the lower carbon upward in opposition to gravity, an arm moving with the lower carbon, and a rod located between the said arm and the clutch for the upper carbon operated by said arm to release said clutch when the lower carbon has risen beyond a predetermined position.

7. In an electric-arc lamp, the combination of the upper carbon, an insulated tube for receiving the same, a surrounding protecting-pipe, a plate carried thereby, the side rods extending downward from said plate, the lower-carbon-regulating mechanism carried by said side rods, said regulating mechanism being located beneath the lower carbon and in shunt to the arc.

8. In an electric-arc lamp, the combination with the lower carbon, of an electromagnet in a shunt to the arc, the said magnet having a core or armature on which the lower carbon is mounted.

9. In an electric-arc lamp, the combination with the carbons, of a regulating shunt-magnet provided with means for positively moving the lower carbon and for releasing the upper carbon.

10. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on the lower carbon against gravity, and acting on the upper-carbon clutch to release the upper carbon.

11. In an electric-arc lamp, the combination with the carbons, of a regulating-magnet in a shunt across the arc, a clutch for the upper carbon, a trip for the said clutch operated by the magnet, and a gravity device secured to the lower carbon for establishing the arc.

12. In an electric-arc lamp, a longitudinally-movable lower carbon and an upper carbon combined therewith, in combination with a shunt-magnet connected with the lower carbon and a weight attached to the lower carbon.

13. In an electric-arc lamp, a pair of operating-carbons, an electromagnet in a shunt to the arc, a core for the said magnet in line with the lower carbon and connected thereto, the said core being adapted to fall by gravity below the middle of the said magnet when the latter is not energized, and being adapted to be drawn upward when the magnet is energized, as set forth.

14. In an electric-arc lamp, the combination with the main lamp-frame carrying the upper carbon, of a lower lamp-frame carrying the lower carbon, and also carrying the regulating shunt-magnet, the two frames being relatively adjustable in a lateral direction.

15. In an electric-arc lamp, a hollow side rod and a trip adapted to reciprocate therein,

the said trip being in operative connection with the core or armature of the usual shunt-magnet, in combination with a lamp-clutch adapted to be operated by the said trip.

16. In an electric-arc lamp, a hollow side rod constituting a part of the lamp-frame, a trip adapted to reciprocate within the side rod, and controlled by the shunt-magnet, in combination with a lamp-clutch having an insulated tailpiece extending into the said side rod in line with the said trip.

17. In an inclosed-arc lamp, a cylinder containing a gas-check, the said cylinder being externally screw-threaded and engaging with an internally-screw-threaded ring on the stationary portion of the lamp.

18. In an inclosed-arc lamp, a cylinder containing the gas-check, combined with a detachable ring supported on the lamp-frame.

19. In an inclosed-arc lamp, a cylinder containing a gas-check combined with a slotted ring so as to form a unitary structure therewith, in combination with depending posts over which the slotted ring is adapted to be slipped.

20. In an incloesd-arc lamp, a cylinder containing a gas-check combined with a slotted ring so as to form a unitary structure therefor, in combination with posts depending from the lamp-frame, the said posts being provided with terminal buttons for supporting the said slotted ring when the same has been slipped over the said posts, whereby the gas-check cylinder may be easily put in place and removed.

21. In an inclosed-arc lamp, a cylinder containing a gas-check and a slotted ring combined therewith, the said cylinder and said ring being mutually adjustable in the direction of the length of the cylinder, in combination with depending posts supporting the said ring, and a glass globe against which the lower end of the cylinder is adapted to be pressed.

22. In an electric-arc lamp, the combination with the carbons, of a shunt-magnet having a core connected to the lower carbon by a vertical rod, the clutch for the upper carbon, and a trip connected between the said clutch and the said vertical rod, the said trip being adapted to be acted upon by the said rod to trip the said clutch.

23. In an electric-arc lamp, the combination with the lower carbon, of a shunt-magnet having a core connected to the said lower carbon by a vertical rod, a clutch for the upper carbon, a trip for the said clutch, and a collar on said vertical rod, a portion of the said trip being in the path of movement of the said collar, whereby the lamp-clutch will be operated by the movements of the said rod.

24. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on the lower carbon against gravity, and a mechanical device coöperating with the said magnet in its action on the lower carbon.

25. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on the lower carbon against gravity, and a pivoted lever coöperating with the shunt-magnet in its action on the lower carbon.

26. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on the lower carbon against gravity, and a pivoted lever carrying an adjustable counterweight coöperating with the said magnet in its action on the lower carbon.

27. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet connected to the lower carbon by a vertical rod, and a pivoted lever coöperating with the said magnet in its action on the lower carbon, said pivoted lever being arranged at a critical angle whereby its lifting effect upon the lower carbon will increase in proportion as the effect of the shunt-magnet decreases.

28. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on the lower carbon against gravity, and a mechanical force coöperating with the shunt-magnet in its action on the lower carbon, the said mechanical force being adapted to increase its lifting effect in proportion as the corresponding effect of the magnet decreases.

29. In an electric-arc lamp, a longitudinally-movable lower carbon and an upper carbon combined therewith in combination with a shunt-magnet having its core or armature connected with the lower carbon.

30. In an electric-arc lamp, the combination with the usual carbons, of a shunt-magnet acting on one of the carbons and a pivoted weighted lever acting in connection with the said magnet, said pivoted lever being arranged at a critical angle whereby its effect upon the carbon increases in proportion as the effect of the shunt-magnet decreases.

Signed at New York, in the county of New York and State of New York, this 14th day of February, A. D. 1900.

MALCOLM H. BAKER.

Witnesses:
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GEORGE H. STOCKBRIDGE.