No. 655,808. Patented Aug. 14, 1900.

B. A. STOWE.

ELECTRIC ARC LAMP.

(Application filed July 10, 1899.)

(No Model.) 4 Sheets—Sheet 1.

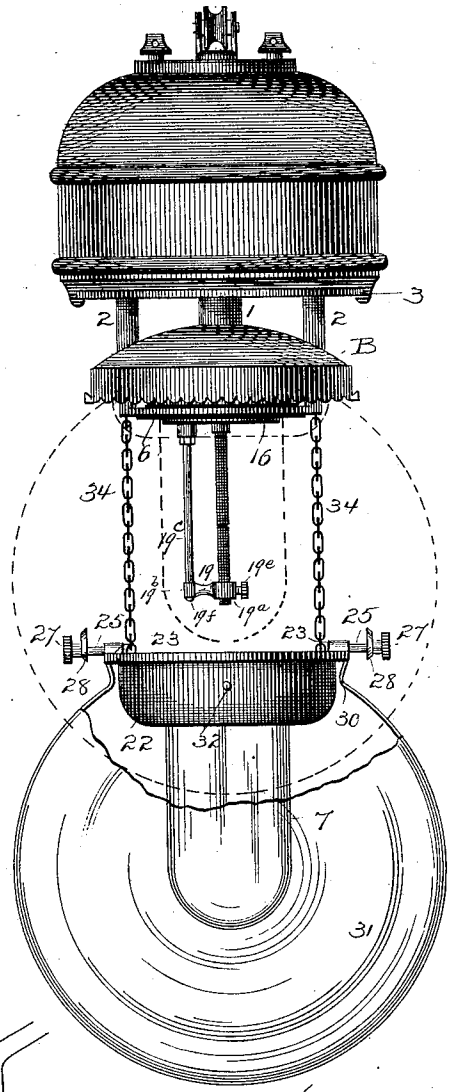


Fig. 1.

Fig. 9.

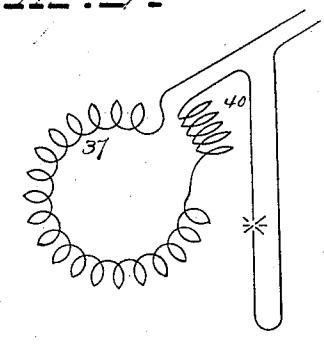
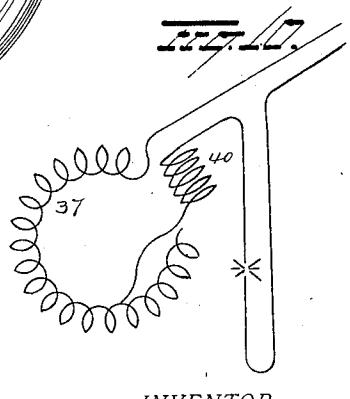


Fig. 10.



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No. 655,808. Patented Aug. 14, 1900.

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ELECTRIC ARC LAMP.

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(No Model.) 4 Sheets—Sheet 2.

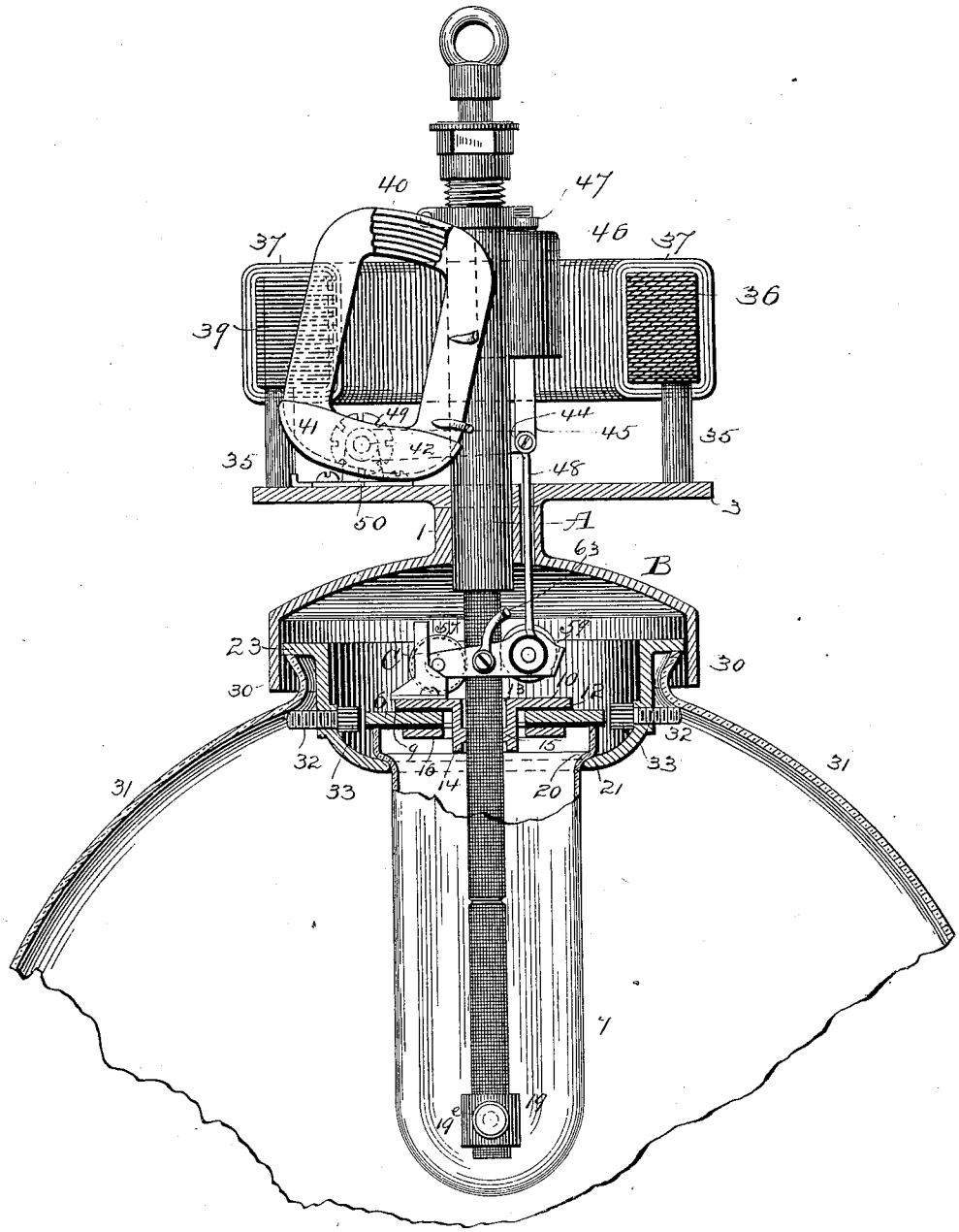

Fig. 2.

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No. 655,808. Patented Aug. 14, 1900.

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ELECTRIC ARC LAMP.

(Application filed July 10, 1899.)

(No Model.) 4 Sheets—Sheet 3.

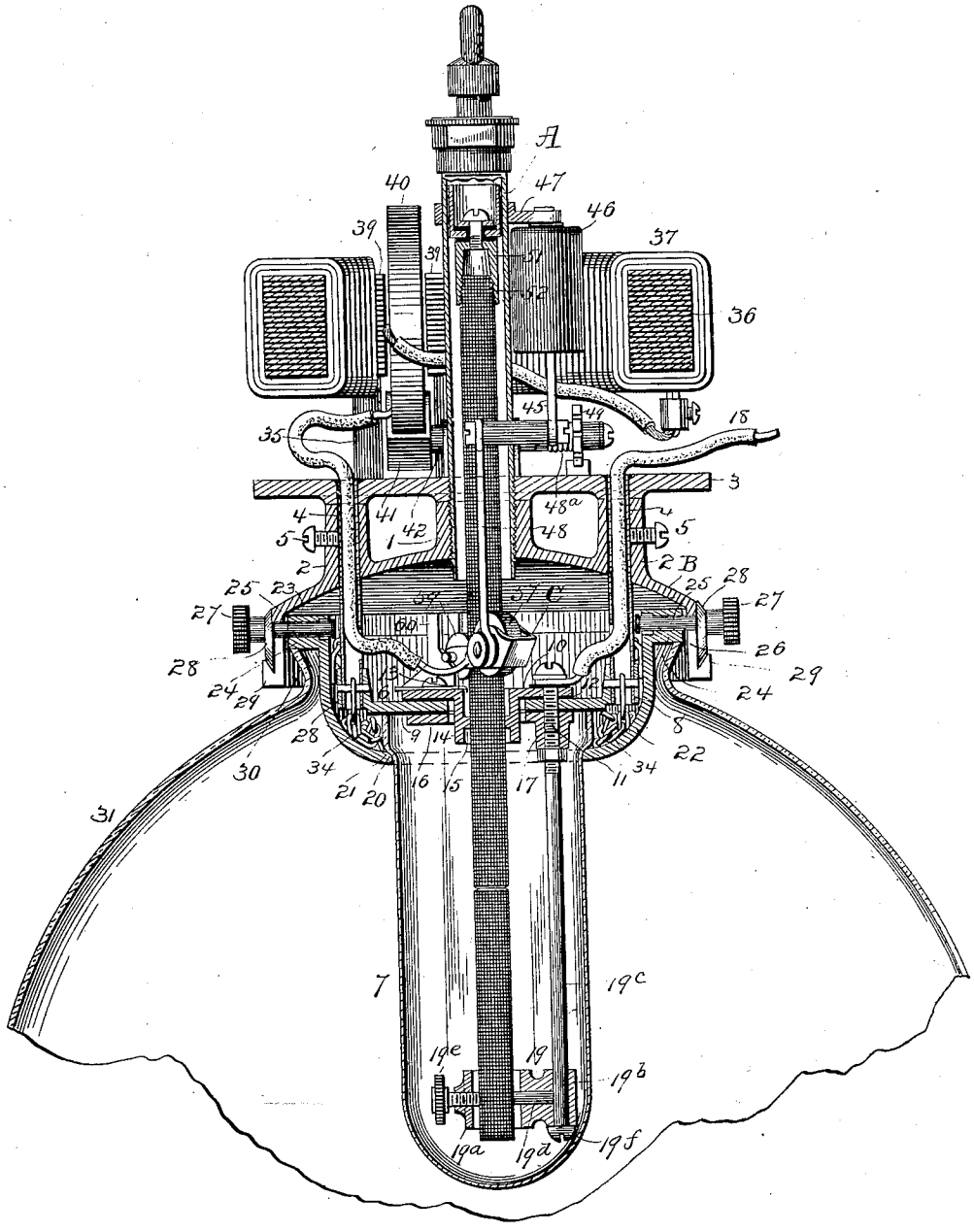

Fig. 3.

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ELECTRIC ARC LAMP.

(Application filed July 10, 1899.)

(No Model.) 4 Sheets—Sheet 4.

FIG. 4.

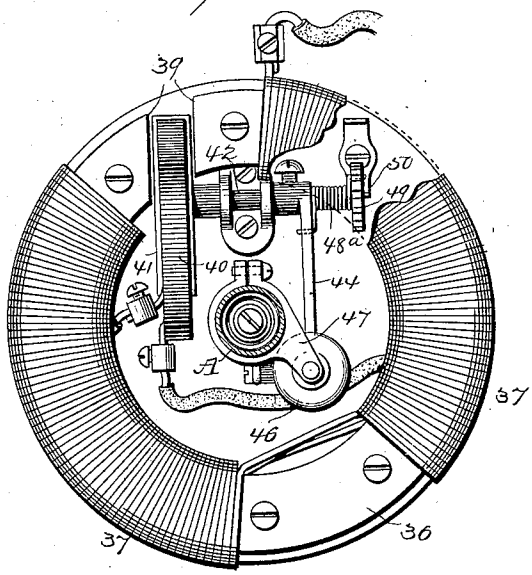


FIG. 5.

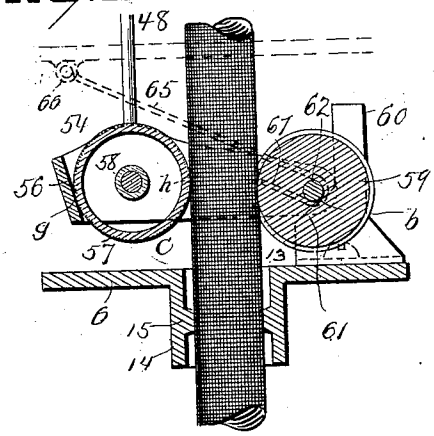


FIG. 6.

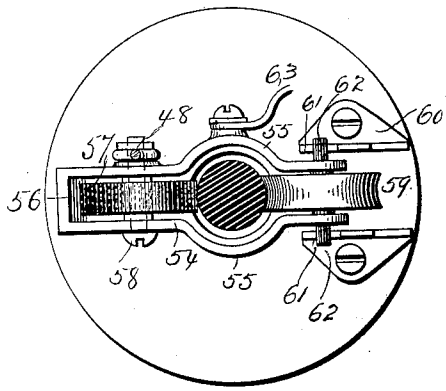
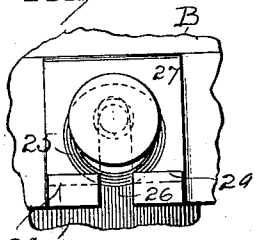


FIG. 8.



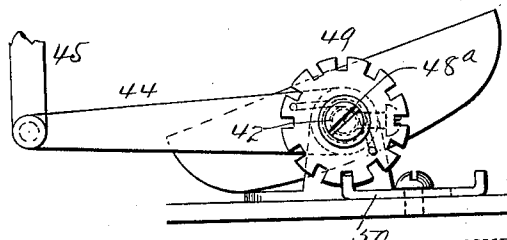


FIG. 7.

WITNESSES

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UNITED STATES PATENT OFFICE.

BERNARD A. STOWE, OF CLEVELAND, OHIO, ASSIGNOR TO THE JANDUS ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 655,808, dated August 14, 1900.

Application filed July 10, 1899. Serial No. 723,401. (No model.)

To all whom it may concern:

Be it known that I, BERNARD A. STOWE, 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 constructed and adapted to operate with alternating or pulsating currents, one object of the invention being to utilize the inductive resistance or choke coil of an alternating or pulsating current arc-lamp for controlling the separation and feed of the carbons.

A further object is to provide means whereby the inductive resistance or choking coil of an alternating or pulsating current arc-lamp can be made to regulate and control the operation of the lamp without the assistance of electromagnets or solenoids and their armatures or cores.

A further object is to provide simple and efficient means for adjusting and adapting the regulating mechanism of an alternating or pulsating current arc-lamp to the conditions of the circuit.

A further object is to reduce to a minimum the number of moving parts in the regulating mechanism of an electric-arc lamp.

A further object is to provide a simple clutch device for an electric-arc lamp.

A further object is to provide an arc-inclosed electric-arc lamp with a single holder for both globes, so that in trimming the lamp both globes can be detached simultaneously.

A further object is to improve and simplify the construction of alternating or pulsating current electric-arc lamps, to insure the accurate operation of the regulating mechanism and the steady burning of the lamp, and to so construct the various details as to render the entire lamp effectual in every respect in the accurate performance of its functions.

With these objects in view the invention consists in the combination, in an alternating-current electric-arc lamp, of a clutch, a stationary inductive resistance comprising a coil and a core having two poles, a movable coil mounted to approach and recede from the maximum density of the field of force between the poles of the inductive resistance, said movable coil having its ends connected to the coil of the inductive resistance, so as to be in circuit therewith, whereby the electromotive force of said movable coil will vary in direct proportion to the variations of the electromotive force in the coil of the inductive resistance, and connections between the movable coil and the clutch.

The invention further consists in the combination, in an electric-arc lamp, of a slotted choking-coil, feeding mechanism for controlling the feed of the movable carbon or electrode, an armature for controlling the feeding mechanism, the said armature consisting of a coreless coil included in circuit with the choking-coil and so located as to enter the slot of the choking-coil and be in operative relation to the pole-pieces thereof bounding the slot.

The invention further consists in the combination, in an alternating-current electric-arc lamp, of an inductive resistance having an air-gap between the poles of its core, a movable conductor of non-magnetic material disposed in said air-gap and included in circuit with the coil of the inductive resistance, a clutch, and connections between the clutch and movable conductor.

My invention further consists in the combination, in an alternating-current electric-arc lamp, of an inductive resistance or choke coil provided with a laminated core having its poles so arranged that a field of force will be generated between them, a working coil of wire having no core movably supported in position to be actuated by the fluctuations of said field of force, said working coil included in series with wire of the inductive resistance or choke coil, and means for utilizing the movements of said working coil to regulate and control the burning of the lamp.

My invention further 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 an elevation of my improved lamp. Fig. 2 is

a sectional view. Fig. 3 is a sectional view taken at right angles to Fig. 2. Fig. 4 is a horizontal sectional view on the line $x\,x$ of Fig. 3. Figs. 5, 6, 7, and 8 are detail views. Figs. 9 and 10 are diagrammatical views.

A represents the central stem or tube of the lamp wherein the upper carbon moves, as hereinafter more fully described, and the lower end of said stem or tube passes through and is secured to a hood B. The hood B is provided centrally with an upwardly-projecting integral neck 1 and at respective sides of said neck with upwardly-projecting integral sleeves 2 2, terminating at their upper ends in the same horizontal plane as the upper end of the neck, said neck and sleeves thus serving as supports for a circular plate 3. Tubular rods 4 pass through the sleeves 2 and plate 3 and preferably have their upper ends flanged or upset. The tubular rods 4 are secured to the sleeves 2 by means of set-screws 5 and depend through the hood B, at respective sides of the center thereof. The cover 6 for the inner or arc-inclosing globe 7 is supported by the lower ends of the tubes 4, for which purpose the cover is provided at diametrically-opposite points with hollow bosses 8, in which said tubes are secured. A disk 9, of cushioning material, is secured to the under face of the cover 6 to form a seat for the upper end of the arc-inclosing globe, and to the upper face of said cover a gas-check cap 10 is secured by screws 11, but insulated therefrom by means of a suitable gasket 12. The cap 10 is provided centrally with a hole 13 and a depending sleeve 14, communicating therewith, for the passage of the upper carbon, said sleeve having an internal diameter appreciably larger than that of the carbon and provided internally, at a point between its ends, with an annular flange or rib 15 to guide the upper carbon. A ring 16 is secured to the under side of the cover 6 by means of the screws 11, which latter are insulated from the cover 6 and gas-cap 10 by means of suitable collars of insulating material. The ring 16 is made on its under face with a perforated boss 17, with which one of the screws 11 is in electrical connection, and to said screw the conductor 18, constituting one terminal of the lamp, is connected, said conductor being passed upwardly through one of the tubular rods 4. The perforated boss 17 serves to receive and support the lower-carbon holder 19, which is disposed within the arc-inclosing globe 7. The lower-carbon holder comprises a collar 19^a, having a perforated boss 19^b for the reception of the lower end of the rod or arm 19^c, by which the carbon holder or collar, *per se*, is supported. The boss 19^b is made with a transverse hole communicating at one end with the hole in said boss, into which the rod or arm 19^c projects, and at its other end with the collar 19^a, and in said transverse hole a small longitudinally-movable pin 19^d is disposed. At the opposite side of the collar 19^a a set-screw 19^e passes through the wall thereof and adapted to engage the carbon. From this construction and arrangement of parts it will be seen that when the carbon is secured in the collar or holder 19^a the pin 19^d will be pressed against the arm or rod 19^c to securely hold the carbon holder or collar in place. When the set-screw is loosened, pressure against the pin 19^d will the relieved, and the carbon holder or collar can be turned on the rod to bring it in convenient position for removing the old carbon and replacing it by a new one, the collar being prevented from dropping by a head 19^f on the lower end of the arm or rod 19^c. By means of the same devices I am enabled to accurately adjust the lower carbon in proper alinement with the upper carbon. The upper end of the globe 7 is somewhat enlarged to form an annular shoulder 20, by which the globe is supported upon the inwardly-projecting flange 21 of a dish-shaped holder 22. The holder 22 is provided with an outwardly-projecting peripheral flange 23, at diametrically-opposite points on which perforated bosses 24 are cast for the reception of longitudinally-movable pins 25, adapted to enter open slots 26, located at diametrically-opposite points in the depending peripheral portion of the hood B. Each pin is provided with a knob or head 27, by means of which to manipulate it, and with a cam 28 to engage lugs 29 at respective sides of the slots 26. In applying the holder the pins will be first pulled outwardly and then passed up through the slots 26, with the peripheral flange of the holder disposed within the depending peripheral portion of the hood B. The pins will then be pressed inwardly until the cams 28 bear against the outer face of the hood. The pins will now be turned by the lamp-trimmer to cause the cams to engage the lugs 29, and in this way the holder can be drawn up and insure the firm bearing of the open end of the arc-inclosing globe against the cover 6. The flange 30 at the open end of the large outer globe 31 (or of a reflector, if such be used instead of an outer globe) is made to bear against a peripheral flange 23 of the holder and will be held in such position by means of screws 32 passing through the wall of said holder. The heads 33 of the screws 32 are disposed within the holder, and the outer globe will be connected with the holder before the latter is connected with the hood B. Chains 34 are attached at one end to the holder 22 and at the other end to the rods or tubes 4 and serve to suspend the holder from the lamp-frame when detached from the hood B.

By the construction and arrangement of parts above described it will be seen that I provide a single holder for the two globes, that both globes can be removed simultaneously and suspended from the lamp-frame to permit ready access for the purpose of trimming, and that the fastening devices for connecting the holder with the hood B serve also

to insure contact of the inner globe against its seat with the proper degree of pressure.

Having described the frame of the lamp and the manner of connecting the globes therewith, I will now proceed to explain the construction and operation of the appliances for regulating and controlling the operation of the lamp.

A series of posts 35, of non-magnetic material, are located upon the plate 3 and have secured to their upper ends the annular laminated core 36 of a horizontally-disposed inductive resistance or choke coil 37. The adjacent ends of the core 36, between which the air-gap is formed, are preferably cut tangentially, said adjacent ends of the core constituting poles 39, between which a field of force will exist when the core is energized by the current passing through the coil 37. It is this field of force generated between the poles forming the air-gap of the inductive resistance or choke coil that I propose to utilize for regulating the separation and feed of the carbons. To this end I employ a coil of wire 40 (without a core) and so mount said coil that it shall be moved by the inductive action of the field of force between the poles 39, the movement of the coil thus effected being transmitted to the clutch for the upper carbon for the purpose of first separating the latter from the lower carbon to establish the arc and subsequently manipulating said clutch during the variations of the lamp-circuit to effect the accurate feed of the upper carbon. The coil 40 is preferably included in series with the coil 37, as shown in Fig. 9, or with a portion thereof, as shown in Fig. 10, and is so connected that a current will flow through it in the same direction as that of current flowing through the coil 37, so that the magnetic field of force will act to draw the coil toward the maximum density of said field. By reversing the connections of either working coil or inductive resistance-coil and modifying the translating device equally-good operation may be secured. In such case a repulsion takes place, tending to move the working coil to a flux of decreasing density, which movement by suitable means can be made to draw and maintain the arc.

The coil 40 will preferably be wound with suitable insulating-tape and may be conveniently supported by a cup or holder 41, secured to one end of a shaft 42, mounted in suitable bearings on the plate 3. The cup or holder and the shaft to which it is secured are so disposed that one leg of the working coil 40 will be normally disposed to one side of the center of air-space between the poles 39, so that when current is made to flow through the coil 37 and a field of force is thus generated between said poles the said leg of the coil will be drawn toward the point of maximum density of the lines of force in line with the axes of said poles, thus causing the shaft 42 to turn in its bearings and transmit motion to the clutch mechanism. A long arm 44 is secured at one end to the shaft 42, and the free end of said arm is pivotally connected with the plunger-rod 45 of an air-pot 46, supported by a suitable arm or bracket 47, secured to the central stem or tube of the lamp. The arm 44 is also pivotally connected at its free or inner end with the upper end of a rod 48, which depends freely through holes in the plate 3 and hood B, and attached at its lower end to a clutch C, disposed within the hood B, said clutch preferably being of a construction presently to be explained in detail. A spring 48^a is coiled on the shaft 42 and secured at one end to the arm 44. The other end of the spring 48^a is secured to a notched wheel 49, mounted on the shaft 42 and adapted to be engaged by a dog 50, attached to the plate 3.

When no current is flowing through the lamp, the leg of the working coil nearest the poles 39 should be so disposed as to be just within the space marked by the longest lines of force between said poles when the latter are energized, so that when current first enters the lamp the working coil will be moved toward the point of maximum density of the field a distance sufficient to effect the full or normal separation of the carbons. The width of the field of force, or, in other words, the positions of the longest and least dense lines of force, will depend on the number of ampere-turns of the inductive resistance-coil 37, and the number of ampere-turns given the coil in a particular lamp will depend on the frequency of the current on the line in which the lamp is to be used, and the density of the field of force between the poles of the core 38 will depend upon the same considerations. It is important, therefore, to provide means for adjusting the normal position of the working coil to such position relatively to the longest lines of force and also to adjust the resistance offered to the movement of the working coil to the strength or density of the field of force according to the prevailing conditions under which the particular lamp is to be operated. The adjustment of the normal position of the coil relatively to the edge or longest lines of the field of force can be readily accomplished by turning the arm 44 on the shaft 42 more or less in one direction or the other until the outer leg of the working coil assumes the proper position and then securing said arm rigidly to the shaft by means of the set-screw. The working coil can be easily adjusted relatively to the strength or density of the field of force between the poles 39 by means of the spring 48^a, the tension of which will be increased or diminished by turning the notched wheel 49 more or less in one direction or the other. The spring 48^a really has a double function, that of compensating for the vertical component of force due to the weight of the working coil operating at the end of a horizontal lever (imaginary) of variable length, depending upon the angle of inclination of the coil with the

horizontal, and of assisting or resisting the action of the field of force, depending upon the relative position of the working coil with respect to the maximum intensity of the field of force set up by the inductive resistance. Whether the spring assists or resists the action of the field of force does not destroy its availability as a means for adjustment of the current consumption of the lamp.

The upper carbon of the lamp is, as before stated, disposed within the central stem or tube A of the lamp, and within said stem or tube a holder 51 for upper carbon is located. The holder 51 consists of a metal socket-piece having the socket therein made slightly tapering or conical and having its wall serrated or roughened, as at 52. The carbon-rod will be passed upwardly into the tubular stem A until it engages the holder, and it will then be pressed up quickly, causing the holder to strike the cap on the stem and the carbon to be thus forced or wedged into the tapering roughened socket, where it will remain until forcibly extracted. The carbon can be thus quickly and effectually secured to the holder and the latter will follow the carbon to the clutch C, at which time only a small section of carbon will be unconsumed. The gas-check cap acts as a guide for the carbon below the clutch.

The clutch and contact devices which I employ are important features of the lamp, and their construction and operation will now be described in detail.

The frame 54 of the clutch and contact devices for the upper carbon is rectangular in general form, its parallel members being made with outwardly-projecting curved portions 55 to form an enlarged opening for the free passage of the carbon, and said parallel members are connected at one end by one inclined cross-bar or end wall 56, against which a serrated clutch-ring 57, disposed in the frame, is adapted to bear, said ring being made of metal or of other material—such as porcelain, marble, ivory, &c.—as may be desired. The clutch-ring 57 is not provided with a hub and is loosely disposed in the frame 54, normally resting on the plate or cap when no current is flowing through the lamp. A screw 58 passes through the members of the frame 54 and through the clutch-ring 57 and serves to prevent possibility of escape of said ring, said screw also serving as means for attachment of the rod 48 of the regulating mechanism to the clutch-frame 54. A contact-wheel 59, of good conducting material, such as will not easily corrode, is mounted between the free ends of the frame 54 and is provided with a grooved periphery, so that it will readily conform to the carbon-rod. The contact-wheel 59 projects beyond the end of the frame 54 and is guided between uprights or chairs 60, secured to the cap or plate 6, said uprights being provided with beveled or inclined seats 61 for the reception of the projecting ends of the shaft 62, on which the contact-wheel is mounted. At rest the clutch-ring 57 will bear upon the cap 6, which acts as the releasing-plate, and the frame 54 will have dropped away from the clutch-ring and also rests upon said plate or cap, said frame swinging, in moving to such position, on a center, (indicated at *b*.) In this position the clutch-ring 57 will not impinge against the inclined end wall 56 of the frame 54 and the carbon simultaneously, and consequently the upper carbon will rest freely upon the lower carbon. The contact-wheel 59 is also at a position of rest when no current is flowing through the lamp, the shaft of said wheel bearing upon the inclined seats of the chairs or uprights 60. The inclined seats 61 of the chairs or uprights 60 cause the contact-wheel 59 to bear against the carbon-rod with a certain horizontal component of force, depending upon its weight and the inclination of said seats. This component of force serves to insure contact of the wheel 59 against the carbon-rod, but not with such pressure as to prevent the rotation of the wheel on its shaft or the proper feeding of the carbon-rod. In this position of rest the electrical connection between the frame 54 and the carbon-rod is effectually maintained. Current is conveyed to the frame 54 by means of a conductor 63, passing up through one of the tubes 4 and connected through the regulating mechanism with the one terminal of the lamp.

In starting the lamp the rod 48 will be actuated or pulled upwardly by the regulating mechanism, and thus first cause the frame 54 to be raised or turned on the point *b* as a center until the clutch-ring 57 impinges against the wall 56 at *g* and the carbon rod at *h*. The upward movement of the clutch-rod 48 will now cause the clutch-ring to grip the upper carbon and raise both clutch and carbon until the regulating mechanism has reached a position of equilibrium, in which position a normal arc obtains. The entire clutch then hangs from the rod 48, and being pivotally supported the weight of the contact-wheel 59 will cause the frame 54 to become disposed at an angle with respect to the horizontal, depending upon the size of the carbon and the relative position of the clutch-ring, thus insuring a uniform contact-pressure of the rings 57 and 59 upon the carbon rod. As the clutch lowers, due to the regulation of the actuating mechanism of the lamp, the projecting ends of the shaft or stud 62 eventually come to rest upon the inclined seats 61 of the chairs 60, the angle of which seats determines the contact-pressure of the contact-ring 59 against the carbon rod. Further descent of the clutch-rod causes the frame 54 to move in the arc of a circle, of which the point *b* is the center, causing a further descent of the carbon rod in the process of feeding until the clutch-ring 57 comes to rest on the cap or plate. As the rod 48 continues to descend the clutch-ring remains stationary and the frame 54 swings downwardly and away from said ring, thus releasing the latter and permitting the

carbon to drop, and thereby restoring, in conjunction with the regulating mechanism, a normal flow of current. During the feeding of the upper carbon the contact-wheel 59 maintains a constant pressure upon the carbon rod.

Instead of the chairs or uprights above described a lever 65, pivoted at 66, might be employed, said lever having a slot or hook 67 at its lower end for the reception of the shaft or stud of the contact-wheel. The functions of the lever 65 will be exactly the same as that of the inclined bearing edges of the chairs or uprights and the contact-pressure of the wheel 59 against the carbon rod made dependent upon the weight of contact-wheel and the inclination of the lever. The slot or hook of the lever engaging the shaft or stud on which the wheel 59 is mounted permits the vertical movement of said wheel and its unbroken contact with the carbon rod.

The lamp-circuit can be conveniently traced from the line to one end of the inductive resistance-coil, through said coil or a portion thereof to one end of the working coil, from the other end of said working coil by the conductor to the clutch from 54, thence to the upper carbon, then to the lower carbon, and then to the line by the lower-carbon holder and the conductor.

Numerous changes might be made in the details of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details herein set forth.

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 and a magnet, of a movable coreless coil disposed within the field of force of the magnet so as to be actuated by the fluctuations thereof, and connected with the clutch, said movable coreless coil included in circuit with the coil of the magnet.

2. In an alternating-current electric-arc lamp, the combination with a clutch and a stationary inductive resistance comprising a coil and a core having two poles, of a movable coil mounted to approach and recede from the maximum density of the field of force between the poles of the inductive resistance, said movable coil having its ends connected with the coil of the inductive resistance so as to be in circuit therewith, whereby the electromotive force of said movable coil will vary in direct proportion to the variations of the electromotive force in the coil of the inductive resistance, and connections between said movable coil and the clutch.

3. In an arc-lamp, the combination of a slotted choking-coil, feeding mechanism for controlling the feed of a movable carbon or electrode and an armature for controlling the feeding mechanism, the said armature consisting of a coreless coil included in circuit with the choking-coil and so located as to enter the slot of the choking-coil and be in operative relation to the pole-pieces thereof bounding the slot.

4. In an alternating-current electric-arc lamp, the combination with an inductive resistance having an air-gap between the poles of its core, of a non-magnetic movable conductor disposed in said air-gap and included in circuit with the coil of the inductive resistance, a clutch and connections between said clutch and movable conductor.

5. In an electric-arc lamp, the combination with a coil included in the lamp-circuit and a core within said coil, the poles of said core disposed opposite each other, of a conductor of non-magnetic material movably mounted so as to enter the field of force between said poles and included in circuit with said coil and means connected with said movable conductor for regulating the burning of the lamp.

6. The combination in an alternating or pulsating current electric-arc lamp, of a stationary inductive resistance and a conductor included in circuit with said inductive resistance and disposed in the field of force between the poles thereof to regulate and control the separation and feed of the carbons.

7. The combination in an electric-arc lamp, of a stationary inductive resistance, a movable coreless coil included in circuit with said inductive resistance and adapted to be actuated by the field of force between the poles thereof, and means for utilizing the movements of said coil to regulate and control the burning of the lamp.

8. The combination in an electric-arc lamp, of an inductive resistance, a clutch and a movable coreless coil included in circuit with said resistance and connected with said clutch said movable coil arranged to be actuated by said inductive resistance.

9. The combination in an alternating or pulsating current electric-arc lamp, of a fixed choke-coil having a laminated core, the poles of which are so disposed that a field of force will be generated between them, a movable coreless coil included in circuit with choke-coil and arranged to be actuated by the fluctuations of said field of force and means for utilizing the movements of said movable coil to control the separation and feed of the carbons.

10. The combination in an alternating or pulsating current electric-arc lamp, of an inductive resistance or choke-coil provided with a laminated core having its poles so arranged that a field of force will be generated between them, a working coil having no core, normally supported in position to be actuated by the fluctuations of said field of force, said working coil included in series with the inductive resistance or choke-coil and means for utilizing the movements of said working coil to regulate and control the burning of the lamp.

11. In an alternating or pulsating current electric-arc lamp, the combination with a coil having the poles of its core arranged so that a field of force will be generated between them, a movable coil included in circuit with the first-mentioned coil and adapted to be actuated by the fluctuations of said field of force, devices connected with said movable coil for controlling the burning of the lamp and means for adjusting the normal position of said movable coil to the width and density of said field of force.

12. In an alternating or pulsating current electric-arc lamp, the combination with a coil provided with a core having its poles so disposed that a field of force will be generated between them, an oscillatory shaft, a working coreless coil secured to said shaft and adapted to be actuated by the fluctuations of said field of force, said working coil included in circuit with said first-mentioned coil, a carbon-clutch and connections between said clutch and shaft.

13. The combination in an alternating or pulsating current electric-arc lamp, of a coil provided with a core having its poles so arranged that a field of force will be generated between them, a pivoted coil so disposed as to be actuated by the fluctuations of said field of force, an arm projecting from the pivoted coil, means for adjusting said arm relatively to the said coil, a carbon-clutch and a connection between said arm and clutch.

14. The combination in an alternating or pulsating current electric-arc lamp, of a coil provided with a core having its poles so arranged that a field of force will be generated between them, an oscillatory shaft, a working coil attached to said shaft and so disposed as to be actuated by the fluctuations of said field of force, a carbon-clutch connected with said working coil, a spring connected with the coil and means for adjusting said spring relatively to the size and density of said field of force, and to compensate for the variations in the tangent of the angle which that axis of the working coil which passes through the pivot of the same makes with the horizontal.

15. The combination in an alternating or pulsating current electric-arc lamp, of an inductive resistance provided with a core having its poles so arranged that a field of force will be generated between them, an oscillatory shaft, a cup or holder secured to said shaft, a working coil supported by said cup or holder and adapted to be actuated by the fluctuations of said field of force to oscillate said shaft, an arm projecting from said shaft, a carbon-clutch connected with said arm, a spring on the shaft and secured at one end to said arm and an adjusting device to which the other end of said spring is secured.

16. The combination in an electric-arc lamp, of an inductive resistance provided with a core having its poles so arranged that a field of force will be generated between them, a pivoted working coil included in circuit with the inductive resistance and adapted to enter said field of force and be actuated by the fluctuations thereof, an arm projecting from said pivoted working coil, a carbon-clutch, a rod connecting said arm and clutch, an air-pot and a connection between the plunger of said air-pot and said arm.

17. In an electric-arc lamp, the combination with a frame, of a concave or dish-shaped holder having a hole therein for the accommodation of an arc-inclosing globe, a peripheral flange on said holder against which the upper edge of an outer globe or reflector bears and set-screws passing outwardly through the wall of the holder below said peripheral flange, for supporting said outer globe or reflector and coöperating with said peripheral flange to hold the outer globe rigid.

18. In an electric-arc lamp, the combination with a frame and arc-inclosing globe-cover secured to said frame, of a holder for the arc-inclosing globe, and cams carried by said holder and adapted to engage the lamp-frame and simultaneously draw the upper end of the globe up against said cover.

19. In an electric-arc lamp, the combination with a hood and means for supporting the same, said hood having open slots in its vertical wall and lugs or shoulders at respective sides of each slot, of a holder constructed and adapted to support an inner or arc-inclosing globe, outwardly-projecting pins mounted in said holder to have longitudinal and revoluble movements, said pins adapted to enter the open slots in the hood, and cams on said pins to engage the lugs or shoulders on the hood.

20. In an electric-arc lamp, the combination with a frame, of an arc-inclosing globe-cover secured thereto, a gas-cap secured upon and insulated from said cover, a collar depending from said cap and through the cover for the passage of the upper carbon, said collar having an internal annular rib to guide the carbon, a ring secured to and insulated from the under face of said cover and a lower-carbon holder secured to said ring.

21. In an electric-arc lamp the combination with the regulating mechanism of a clutch-frame suspended therefrom, one or more clutching members mounted on said frame, one or more contacting members, also mounted thereon, adapted to conduct the current to the upper carbon, and means for movably supporting a portion of said frame to maintain the contact member or members in constant engagement with the carbon.

22. In an electric-arc lamp, the combination with the regulating mechanism, of a clutch-frame suspended therefrom, a clutch member mounted in said frame, a contact member also mounted in said suspended frame and means operating automatically to maintain the contact member constantly against the carbon.

23. In an electric-arc lamp, the combination with regulating mechanism, of a clutch-frame

suspended therefrom and means for movably supporting each end of said frame and a clutch member and a contact member for the carbon, mounted in said suspended movably-supported frame, one of the supports for the frame being constructed and adapted to normally maintain the contact member against the carbon.

24. In an electric-arc lamp, the combination with the regulating mechanism, of a frame suspended therefrom and adapted to permit the passage of the upper carbon through it, a clutch-ring mounted freely within one end of said frame so as to be at one side of the carbon, means for causing said clutch-ring to bind against the carbon, a contact-wheel for the carbon mounted in the other end of said frame and means for movably supporting said last-mentioned end of the frame to maintain the contact-wheel in constant engagement with the carbon.

25. In an electric-arc lamp, the combination with the regulating mechanism, of a frame suspended from said regulating mechanism and adapted to permit the passage of the upper carbon through it, a clutch-ring mounted in one end of said frame, a contact-wheel mounted in the other end of the frame, and stops for the respective ends of the frame, the stop for the end of the frame carrying the contact-wheel being disposed in a plane above that of the stop for the other end of the frame and constructed to press the contact-wheel against the carbon.

26. In an electric-arc lamp, the combination with the regulating mechanism, of a frame suspended from said regulating mechanism and adapted to permit the passage of the upper-carbon rod, a plate below said suspended frame, a clutch-wheel mounted loosely in one end of said frame and adapted to normally rest on said plate, a contact-wheel for the carbon rod mounted in the other end of said suspended frame and an upright or chair on said plate and having an inwardly-beveled portion to be engaged by the end of the frame carrying the contact-wheel.

27. In an electric-arc lamp, the combination with the regulating mechanism and a frame suspended from said regulating mechanism and adapted to permit the free passage of the upper-carbon rod through it, one end of said frame having a beveled cross-bar or end wall, of a clutch-ring mounted loosely in said frame and adapted to engage said beveled cross-bar or end wall, a plate under the frame to receive the clutch-ring and the end of frame in which it is mounted, a contact-wheel mounted in the other end of the frame, studs projecting laterally from the end of the frame in which the contact-wheel is mounted, and two standards mounted on the plate under the suspended frame and embracing the contact-wheel so as to form a guide therefor, said standards having inwardly-beveled shoulders to be engaged by said studs to maintain the contact-wheel in constant engagement with the carbon rod.

28. In an electric-arc lamp the combination with an arm or rod, of a carbon-holding collar having a perforated boss for the reception of said rod, a pin disposed between the collar and boss and adapted to project into the bore of both and a set-screw passing through the wall of said carbon-holding collar at the opposite side thereof from said pin.

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

BERNARD A. STOWE.

Witnesses:
JOTHAM POTTER,
D. W. ROCKWELL.