

(No Model.)

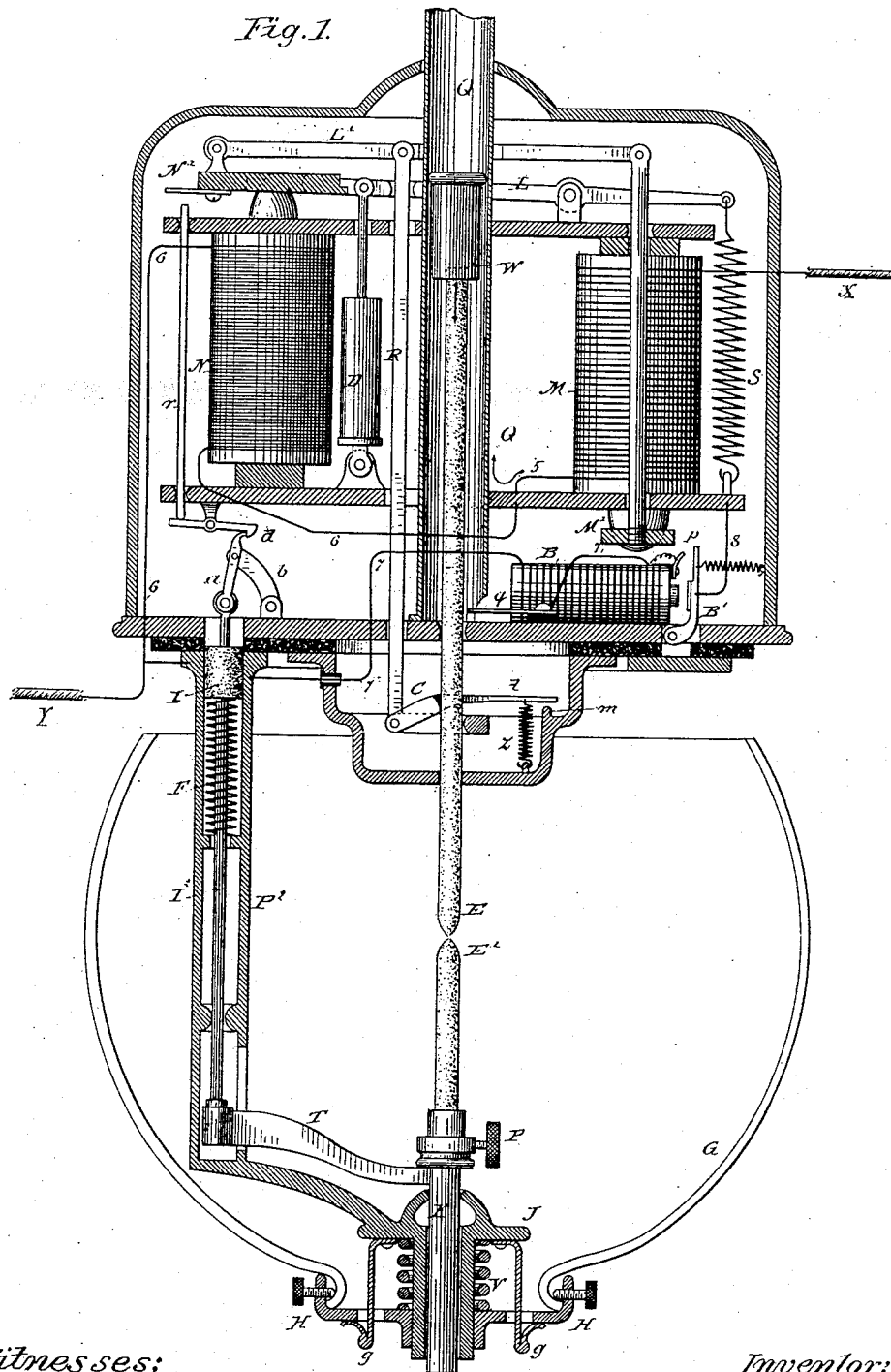
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E. THOMSON.
ELECTRIC ARC LAMP.

No. 302,962.

Patented Aug. 5, 1884.

Fig. 1.



Witnesses;

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Inventor;

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By his Attorney W. L. Townsend.

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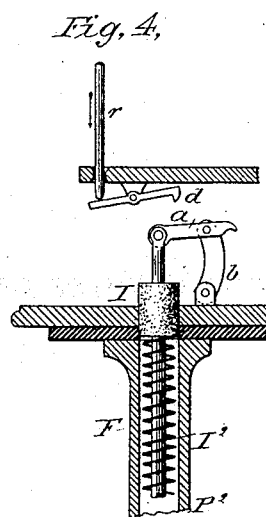
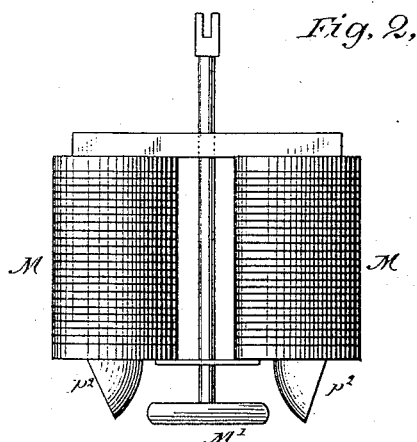
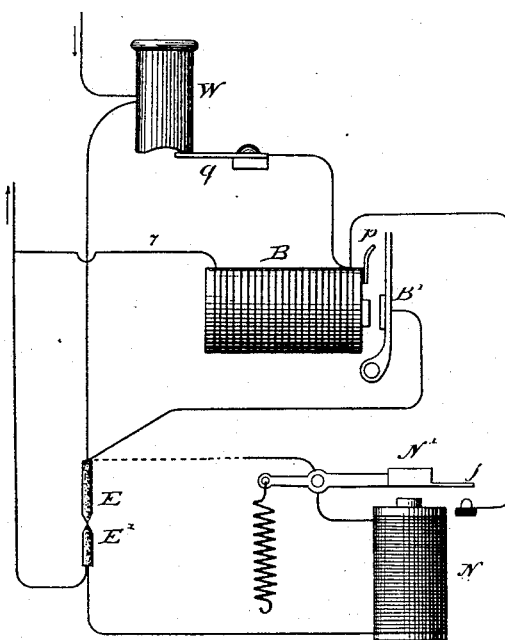


Fig. 3,



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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 302,962, dated August 5, 1884.

Application filed January 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The object of my invention is, primarily, to provide an electric-arc lamp capable of operating without the employment of rods or holders for the carbon stick or pencil.

My invention consists in a certain novel construction of electric-arc lamps whereby the objects above stated are secured, and whereby, also, in case of an abnormally long arc or failure of the carbons to feed properly, they shall be brought positively into contact, thus providing a path for the current, so as to prevent rupture of the circuit by final extinguishment of the arc.

The novel construction of lamp forming my invention also provides a means whereby the lamp will be automatically switched out of circuit when the carbons are burned as far as desirable, or to a predetermined point, and also embodies other details of construction, hereinafter described and claimed.

The construction of lamp and the general principles and arrangements whereby the objects aimed at are secured will be more fully understood from the following description, taken in connection with the accompanying drawings, which form a part of this specification, and will be more specifically defined in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a vertical section through an electric lamp embodying my invention. Fig. 2 is a side view of the lifting or main-circuit magnet, which in Fig. 1 is shown in edge view. Fig. 3 is a diagram of the circuits of a portion of the lamp. Fig. 4 shows a detail view of the mechanical construction.

In Fig. 1, Q indicates a vertical tube or guide, of conducting material, in which slides a follower or weight, W, of conducting material, that rests upon the end of the carbon stick or pencil E, and serves to force the same posi-

tively downward through suitable guides or bushings formed in or attached to the frame of the lamp, when said carbon is released by the feed-regulating mechanism. The tube Q is supported in the frame of the lamp, and through said frame or by other means is put in connection with the conductors, by which current is conveyed to the lamp and the carbon E.

C indicates a clutch, of any suitable construction, which engages directly with the carbon, and serves to lift the same to form the arc or to release it to allow a feed downward by the action of gravity and the weight W. The clutch here shown is the same in construction as that described in prior patents granted to me, and consists, briefly speaking, of a clamp body or block through which the carbon passes, a clutch or clamping-toe pivoted in the clamp-body and bearing against the carbon, and an elongated extension, *t*, from said clutch, which extension is connected with a spring, *z*, that serves to hold the clamp engaged while the arc is of proper length. A releasing-stop, *m*, in the path of the arm *t* releases the hold of the clutch upon the carbon when the clamp-body is lowered to permit the carbon to feed. The clamp is supported by a rod, R, depending from an armature-lever, L', which latter is at one side of R, supported on a pivotal support by a suitably-guided standard rising from the armature M' of a main-circuit electro-magnet, M, (shown in side view in Fig. 2,) and is at the other side of R connected by a joint with the armature-lever L for a derived-circuit electro-magnet, N. The latter has preferably a conoidal pole, and the armature N' is perforated, as described in a prior patent granted to me, so as to give a uniform pull upon the armature in all positions of the same with the same strength of magnetism in N. The retractor, which acts upon the lever L, is assumed to exert a practically uniform or unvarying retractive force upon the lever in all positions of said lever. Lever L is pivoted in any usual or proper manner upon the lamp-frame, and is provided with a dash-pot, D, of any suitable construction, as usual.

The armature M' is adapted to be lifted by the direct-circuit magnet M on starting the lamp, and to remain so lifted while the lamp is in operation. The armature M' works vertically between the two poles p^2 of the magnet M, as shown in Fig. 2, which poles are sloped off upon their sides presented to one another, and are just far enough apart to admit the armature M' between them without contact. The armature is guided by the standard rising from it, or by other means, so as to move only vertically.

At or near the bottom of the tube Q is fixed an insulated contact spring, stud, or point, g , in the path of the weight W, and at such point that the latter will bear upon and make electrical connection therewith when the upper carbon is nearly consumed, thus closing a safety-shunt or branch circuit around the lamp, which safety or branch circuit includes an electro-magnet, B, placed in any suitable position. The armature-lever of said magnet is connected with the main circuit upon one side of the lamp, and the contact-stop p , with which said armature makes contact when the magnet is energized, is connected with the safety-circuit passing through said magnet, so that the moment that contact is made by W with g the magnet immediately closes and holds closed the safety branch through points independent of W and g . By this means a firm and sure contact or connection is substituted for the light contact of W with g , which latter might eventually be burned and destroyed. The lower carbon, E', is secured in a clamp or holder, P, of any suitable construction, arranged to have a free vertical movement, so as to permit the lower carbon to be forced upward into contact with the upper carbon and there held. In the present instance the holder P is mounted on the stem or spindle K, which is guided in a base-plate, J, projecting from a side rod or arm, P², extending downward from the lamp. A foot or arm, T, engages with the lower holder, and is connected with a suitable actuating device normally held from action, but released by means of the armature-lever L, which acts upon suitable detent devices if the arc becomes too long, or the resistance in the arc branch becomes too great.

A preferred construction of the actuating mechanism and detent devices is as follows:

I² indicates a rod or stem in the hollow pillar or arm P², which rod carries at its lower end the arm or foot T, projecting through a slot in the pillar, and engaging beneath a collar or projection on the lower carbon-holder. An actuating-spring, F, within the pillar engages with a stud or block of insulating material, I, upon rod I², and is held compressed between said block and an annular projection on the interior of the pillar by means of links a b , pivoted to one another, and held in the position shown in Fig. 1 by a catch-lever, d , pivoted on the lamp-frame. One link, a , is

pivoted in the upper end of the rod I², but is insulated from the lower carbon by the block I. The other link, b , is pivoted in a stationary support on the lamp-frame. A rod, r , rests upon one end of catch-lever d , and extends up into the path of feed armature-lever L, so that when the latter is sufficiently attracted, owing to an abnormal arc, the detent or locking devices d b a will be released, and the spring F may thereupon act and lift the lower carbon into contact with the upper. The position taken by the detent or locking mechanism when unlocked is shown in Fig. 4. The holder H for the globe G embraces a downward extension from the plate J, and is held up by spring-catches g g , supported by plate J. A coiled spring, V, interposed between H and J, keeps the parts firmly in place, and prevents in large measure accidental disengagement of the globe-holder. The electro-magnet M, which is the lifting or separating magnet for forming the arc, is, as usual, in the main or principal circuit with the carbons, the connections being made, as indicated, from X, through the coils of M to a connection at 5 with some portion of the frame of the lamp; thence through the frame to the upper carbon, either by way of the clutch, or by the tube Q (which is supported by the frame or is in direct electrical connection therewith, as indicated) and the weight W, sliding in said tube. From the lower carbon connection is made to the continuation of the main conductor at y by means of the insulated pillar P². The magnet N is in a derived circuit, 6, around the arc, formed by connecting the terminals of said magnet to the frame, as indicated at 5, or otherwise, and to the insulated pillar P². The safety or shunt circuit, formed when the weight W makes contact with g , is indicated by the numeral 7. The contact-stop for armature-lever B' is connected with 7, as indicated, while the armature-lever is itself connected by wire 8 or otherwise with the lamp-frame, so that when contact is made by B' with said stop the safety or shunt circuit is closed independently of W and g , and when so closed includes the coils of magnet B.

The general operation is as follows: When the lamp is out of action, the parts are in the position shown in the drawings. When the current passes, the magnet M lifts its armature, thus raising the end of lever L' and lifting the clutch by rod or link R, so as to form the arc. The adjustment is such that the armature M' is held lifted during the operation of the lamp. As the carbons consume and the arc lengthens the magnet N increases in power and lowers the clutch to permit a feed to take place. If the carbons fail to feed, the armature-lever L is drawn down still farther to unlock detent d and cause projection of lower carbon upward. When the carbon E is consumed as far as need be, the weight W descends into contact with g , connected to one terminal of the magnet-coil B, the other ter-

5 minal of which latter is attached to the lower carbon, or negative side of lamp, as described. The weight, being in connection with the positive side, will therefore shunt the lamp; but the fact that the contact will be a light one would eventually cause burning and destruction of *q*. This is avoided by use of the switching-magnet B and contacts, which is energized upon contact of W and *q*, pulls its armature-lever B' over, and makes a firm shunt at *p*. I sometimes, in addition, bring the switching-magnet B into action when a long arc forms by causing a second set of contacts, *f*, Fig. 3, occupying precisely the same electrical relations as W *q*, in fact, being branched therefrom, respectively, to be closed by a movement of the armature N' of the derived-circuit magnet N beyond that position which should feed the carbons.

20 My invention, as is obvious, is not limited to any particular form or construction of electro-magnets, and the mechanical construction of the detents, the actuating devices for the lower carbon-holder, the circuit-closers, &c., may obviously also be varied in many ways without changing the manner of operation.

What I claim as my invention is—

30 1. The combination, in an electric-arc lamp, of an illuminating pencil or electrode, a feed-governing mechanism directly engaging with said electrode, a feed-regulating magnet system for producing a release of the electrode on an increase in the length of arc, and an actuating block or follower pressing on the end of said electrode.

5 2. The combination, in an electric-arc lamp, of an illuminating pencil or electrode, a feed-controlling mechanism engaging with said electrode and governed in its action upon the electrode by variations of resistance at the arc, and a weight of conducting material pressing upon the end of the electrode, and moving in contact with a suitable tube or guide that is a conductor of electricity, and is connected with the conductor by which the lighting-current is supplied to the arc.

3. The combination, with the carbon pencil or electrode, of a feed-clutch engaging directly therewith, a weight, W, resting upon the end of the electrode, and a conducting-tube in contact with which the weight slides.

4. The combination, in an electric-arc lamp, of a carbon pencil or electrode, means for controlling the feed of said electrode engaging directly therewith, a block or follower resting upon the end of the pencil or electrode for moving the same positively toward the opposite electrode, and an electric shunting contact with which said follower makes connection when the electrode has fed to a predetermined point, for the purpose described.

5. The combination, in an electric lamp, of a circuit-closer actuated by a weight moving with the carbon for closing a safety or shunt circuit when the carbon shall have fed to a predetermined point, independently of any in-

crease in the length of arc, an electro-magnet in said shunt-circuit, and extra switch-contacts actuated thereby for keeping said shunt-circuit firmly closed.

6. The combination, in an electric lamp, of a circuit-closer moving with the carbon or electrode for closing a shunt-circuit when said carbon shall have fed to a predetermined point, an electro-magnet in said shunt-circuit, and extra switch-contacts actuated thereby for keeping said shunt-circuit firmly closed.

7. The combination, in an electric-arc lamp, of a lower carbon or electrode, devices for moving the same upward to make contact with the opposite electrode, a catch or detent which normally holds said devices from action, and means for releasing said catch or detent actuated by the feed-regulating armature of the lamp for releasing said actuating devices upon an abnormal resistance in the carbon or electrode branch.

8. The combination, in an electric-arc lamp, of a lower carbon or electrode holder capable of moving freely upward, a spring which, through suitable connections, may act upon said holder, but is normally held from action by a suitable catch or detent, and means connected with the feed-regulating armature of the lamp for releasing said spring upon an abnormal resistance in the arc branch.

9. The combination, in an electric lamp, of a hollow arm depending from the lamp proper, and a spring-actuated rod or support for the lower carbon holder, the spring for which is contained in said hollow arm, as and for the purpose set forth.

10. The combination of the hollow arm, the lower carbon holder, capable of moving up and down in a support or bracket extending from said arm, and a spring-actuated rod working in the hollow arm and engaging or connected with the carbon-holder, said rod being normally held by suitable devices that are released upon the occurrence of an abnormal increase of resistance in the arc branch.

11. The combination of the hollow arm, the spring-actuated rod, the freely-movable lower carbon holder, carried or supported by said rod, the catch or detent, and the derived-circuit armature, as and for the purpose described.

12. The combination, in an electric lamp, of a lower carbon holder, a spring for projecting the same upward, a catch or detent, and means connected with the armature of the feed-regulating magnet for operating the catch or detent upon an abnormal resistance in the arc branch.

13. The combination, in an electric-arc lamp, of the globe-holder, the spring-catches, and the coiled spring acting upon said globe-holder to hold it firmly against the spring-catches.

14. The combination, in an electric lamp, of the lower arm or bar in which the lower carbon holder is mounted, the globe-holder work-

ing upon a downward extension from the same, the spring-catches, and the spring surrounding said downward extension.

15. The combination, in an electric lamp, of
5 the two parallel magnet-poles curved on their sides, presented to one another, and an armature arranged to work between said poles and adapted to nearly fill the space between the poles.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 22d day of January, A. D. 1884.

ELIHU THOMSON. 2

Witnesses:

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