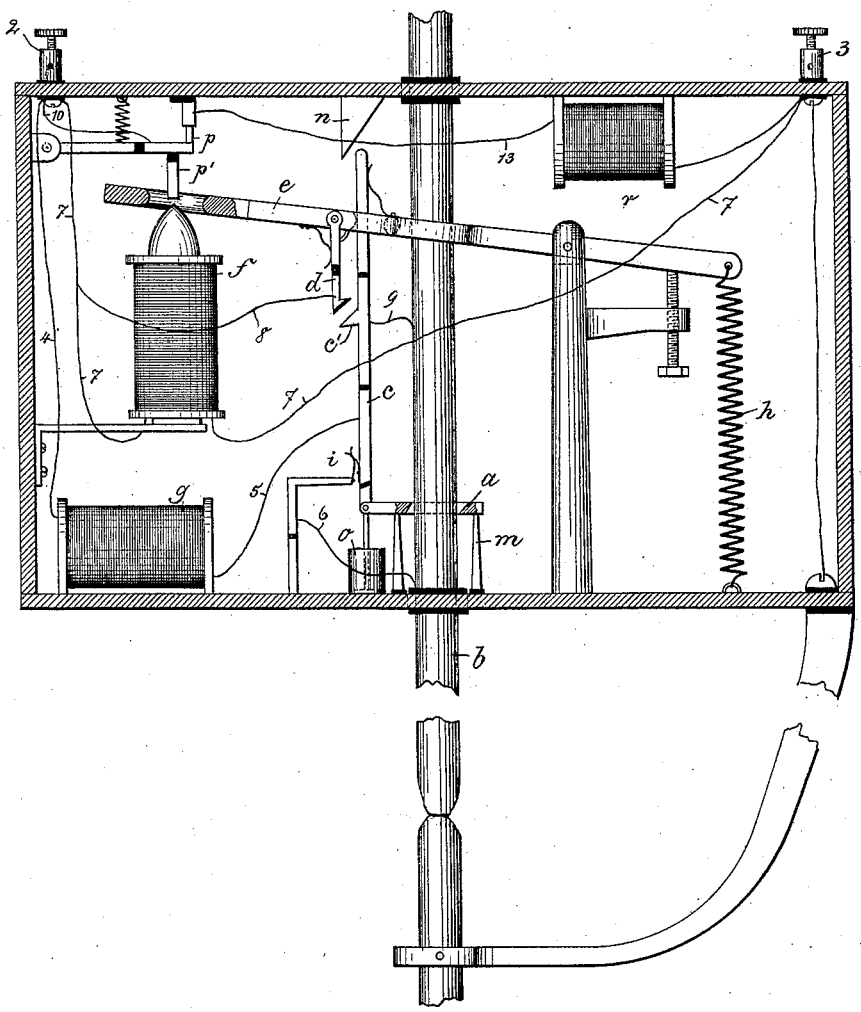
(No Model.)

J. J. SKINNER.

ELECTRIC ARC LAMP.

No. 304,672. Patented Sept. 2, 1884.



Witnesses.
Arthur Lipperdan.
Henry Marsh.

Inventor.
Joseph J. Skinner
by Crosby & Gregory
Attys.

UNITED STATES PATENT OFFICE.

JOSEPH J. SKINNER, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 304,672, dated September 2, 1884.

Application filed January 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. SKINNER, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Electric Lamps, of which the following description, in connection with the accompanying drawing, is a specification.

My invention is embodied in an electric lamp in which a single magnet placed in a shunt or derived circuit controls the feed of the carbon. In order to start the lamp or separate the carbons to establish the arc between them, resistance is included in circuit with the carbons while they are in contact, in order that a sufficient portion of the current may traverse the shunt-magnet to cause it to attract its armature, and thus store power in its retractor sufficient to raise the carbon and establish the arc as soon as the power of the shunt-magnet is weakened. The attraction of the shunt-magnet armature also operates a circuit-closer, which completes a circuit of low resistance to the carbons, and thereby causes a sudden reduction in the strength of the shunt-magnet, so that its retractor immediately operates to withdraw the armature from its poles, in which movement the said armature, by means of suitable devices, raises the carbon, establishing the arc, and thus making the strength of the shunt-magnet dependent on the length of the arc, in the usual manner. The armature-lever of the said shunt-magnet, when thus attracted, becomes operatively connected with the carbon-holding clutch, and is operated by the opposing force of the magnet and its retractor, causing the carbon to feed in proportion as it burns away, lengthens the arc, and thereby increases the strength of the magnet. The armature of the magnet, before starting the lamp, is disconnected from the clutch, and when the current begins to flow and the armature is attracted it is brought into engagement with the clutch, and in the operation of engaging it operates a circuit-closer, by which the resistance is removed from the circuit of the carbons, thus reducing the strength of the magnet and causing its armature to be retracted, in which movement the clutch accompanies it, raising the carbon, and at the same time operating a circuit-breaker, by which the resistance is left in open circuit during the subsequent normal operation of the lamp. A device is employed for short-circuiting the entire lamp in case it fails to operate properly—as, for example, if the circuit of the controlling-magnet should be broken.

The drawing shows in vertical section a lamp constructed in accordance with this invention, the parts being in the position occupied when no current is passing over the circuit.

The clutch or clamp *a*, by which the upper carbon, *b*, is raised to establish the arc, and is subsequently permitted to feed as it burns away, may be of any suitable or usual construction, it being shown in this instance as the well-known ring-clamp, one side of which is connected with a lifting device, *c*, which when raised first tilts the ring, causing its opposite edges to embrace the carbon or a holding-rod therefor with sufficient friction to lift it in the further upward movement of the lifter and ring. The clutch-lifting device *c* is provided with a projection, *c'*, adapted to be engaged by an engaging device, (shown as a hook, *d*,) pivoted on the armature-lever *e* of the lamp-controlling magnet *f*, which is included in a shunt or derived circuit, so that its strength is increased in proportion as the arc is lengthened by the burning away of the carbon, and the increased strength of the said magnet in operating on its armature causes the clutch to release the carbon, permitting it to feed, and thereby shorten the arc, thus compensating for the consumption of the carbons, in the usual manner.

In starting the lamp the carbons have to be in contact, and their resistance is then so small that only a small portion of the current would pass through the magnet *f*, insufficient to cause it to attract its armature far enough to engage the clutch-lifter *c;* and in order to cause it to engage the said lifter, resistance of any suitable kind (shown as a coil, *g*, of fine wire) is included in the main circuit passing through the carbons, it being of sufficient amount to cause enough of the current to pass through the magnet *f* to make the latter attract its armature and engage the clutch-

lifter *c*. After the engagement has taken place it is necessary for the magnet *f* to be weakened so that the retractor *h* of its armature may raise the clutch-lifter, causing the clutch to first engage and then lift the carbon, so as to establish the arc; and in order to provide for such weakening of the magnet the engagement of the armature-lever with the clutch-lifter also closes at *c' d* a short circuit or shunt around the resistance *g*, the device *d* being connected by wire 8 with the line or main circuit at one side of the coil *g*, and the co-operating device *c'* being connected by wire 9 with the upper carbon. The clutch-lifting device *c* also operates a circuit-breaker, *i*, in the normal circuit from the resistance *g* to the carbon, thus breaking the said circuit when the clutch is lifted, and leaving the resistance in open circuit during the subsequent operation of the lamp.

The main line or circuit supplying the electric current to the lamp is shown as connected with the binding-screws 2 3, the former of which is connected by wire 4 with one end of the resistance *g*, the other end of which is connected by wire 5 with one member of the circuit-breaker *i*, the other member of which is connected by wire 6 with a brush or spring in contact with the upper carbon or its supporting-rod, while the lower carbon is connected with the binding-post 3, thus completing the main circuit through the resistance *g* and carbons before the latter are separated. A wire, 7, connects the binding-posts 2 and 3 with the magnet *f*, which thus forms a shunt from the main circuit around the arc, the current being divided between the said magnet and main circuit in accordance with the well-known law, the resistance *g* causing a sufficient portion to pass through the said magnet to enable its attraction to overcome the force of the retractor *h*, as before described. In the movement of the armature thus produced by the magnet *f* the catch *d* is mechanically engaged with the projection *c'* and clutch-lifter, at the same time completing the electrical connection between the wires 8 and 9 from the binding-post 2 to the carbons, so that the main portion of the current no longer has to pass through the resistance *g*, the removal of which produces a corresponding decrease in the strength of the magnet *f*, so that its armature is retracted, lifting the clutch and causing it to engage and then lift the upper carbon, establishing the arc and lengthening it until its resistance is sufficient to cause the attraction of the magnet *f* to balance the force of its retractor, preventing further upward movement of the armature, and thus determining the length of the arc.

The catch *d* is so constructed that it does not complete the electrical connection of the shunt 8 9 until after the mechanical engagement of the said catch with the clutch-lifter. The arc having been thus established, the carbons will begin to burn away, thus lengthening the arc, increasing its resistance, and causing more of the current to pass through the magnet *f*, which thus becomes stronger and draws down the armature and the connected clutch until the side of the latter opposite the lifter comes in contact with the pin *m*, arresting the side of the clutch, so that the further downward movement of the clutch-lifter will tend to relieve its pressure on the carbon, and the latter will slip or feed downward to maintain the operation of the lamp, in the usual manner. The carbon will thus feed before the circuit-breaker *i* is closed in the downward movement of the clutch-lifter.

The clutch has been shown and described as engaging the upper carbon directly; but it is obvious that the usual carbon-holding rod may be employed.

When the current wholly ceases to flow, the magnet *f* will be demagnetized and its armature raised by the strength of the retracting-spring *h* to the position shown in the drawing, and in this movement the upper end of the clutch-lifter will be struck by a disengaging device, *n*, which forces it aside until the projection C' is disengaged from the hook *d*, permitting the clutch-lifter *c* to drop.

The movements of the clutch and carbon are preferably checked by a dash-pot, *o*, preventing sudden changes in position of the carbon.

In case the circuit of the magnet *f* should become broken, or the said magnet should be demagnetized from any cause, the said magnet, as well as the carbons and the remainder of the lamp, will be shunted by a circuit-closer, *p*, operated by an armature, *p'*, for the magnet *f*, the said circuit-closer having one member connected by wire 10 with the binding-post 2, and its other member connected by wire 13 with the binding-post 3. The armature *p'* is very small and easily moved, and when attracted absorbs but little of the magnetism of the magnet *f*. A small amount of resistance, composed of wire *r*, coarse enough to carry the current for a considerable length of time without injury, is included in the shunt-circuit 13, so as to cause the magnet *f* to be slightly magnetized in starting the lamp, its attraction being sufficient to open the circuit-closer *p*, thus breaking the shunt 10 13 of the lamp, and causing the latter to operate, as before described. In case the circuit of the magnet *f* should be broken, the circuit-closer *p* would be closed, thus affording a direct circuit between the binding-screws 2 3, so that other lamps in the same circuit will not be extinguished, and the coil *g* will not be injured by the increased current which might otherwise flow through it.

The lamp may be provided with the usual hand-operated switch for cutting its entire operative parts, including the safety-shunt 10 13, out of circuit, and the said shunt 10 13 may be spoken of as a safety-shunt for the entire lamp, as it, when closed, short-circuits all the parts of the lamp essential for its normal operation.

I claim—

1. In an electric lamp, the following elements in combination, namely: a controlling-magnet in a shunt or derived circuit, an armature and retractor therefor, a clutch disconnected from the said armature when no current is flowing, and resistance in circuit with the carbons before they are separated, whereby the magnet is strongly charged and its armature moved into engagement with the clutch, substantially as described.

2. The controlling-magnet in a shunt or derived circuit, and armature and retractor therefor, combined with a clutch disconnected from the said armature when no current is flowing, an engaging device for the said clutch and armature, and resistance in circuit with the carbons except when said clutch and armature are engaged, substantially as described.

3. The controlling-magnet in a shunt or derived circuit, and the armature and retractor therefor, combined with the clutch disconnected from the said armature before the current begins to flow, resistance in circuit with the carbons, and an engaging device for the said clutch and armature, and a branch circuit controlled by the said engaging device, whereby the said clutch and armature are connected, and the resistance at the same time removed from the circuit of the carbons, substantially as and for the purpose described.

4. The controlling-magnet in a shunt or derived circuit, and its armature and retractor, combined with the clutch, and an engaging device for connecting the said clutch and armature when the latter is attracted by its magnet, and a disengaging device whereby the said clutch is disconnected from the armature when the latter is wholly retracted upon the total demagnetization of its magnet, substantially as described.

5. The controlling-magnet and its armature and retractor, combined with the clutch, and an engaging device for connecting the said clutch and armature when the latter is attracted by its magnet, and a disengaging device whereby the said clutch is disconnected from the armature, and a dash-pot for retarding the movement of the said clutch, substantially as described.

6. The clutch and resistance in circuit with the carbons when in contact, combined with a circuit-breaker in circuit between the said resistance and carbons, operated to open-circuit the said resistance by the movement of the clutch in separating the carbons to establish the arc, substantially as described.

7. In an electric lamp, the controlling-magnet included in a shunt or derived circuit, combined with a safety-shunt for the entire lamp, and a circuit-breaker therein controlled by the said magnet, as described, whereby the said safety-shunt is closed when the said magnet is wholly demagnetized, substantially as set forth.

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

JOSEPH J. SKINNER.

Witnesses:
JOS. P. LIVERMORE,
W. H. SIGSTON.