(No Model.) 3 Sheets—Sheet 1.

W. S. PENDLETON.

ELECTRIC ARC LAMP.

No. 524,116. Patented Aug. 7, 1894.

Fig. 1.

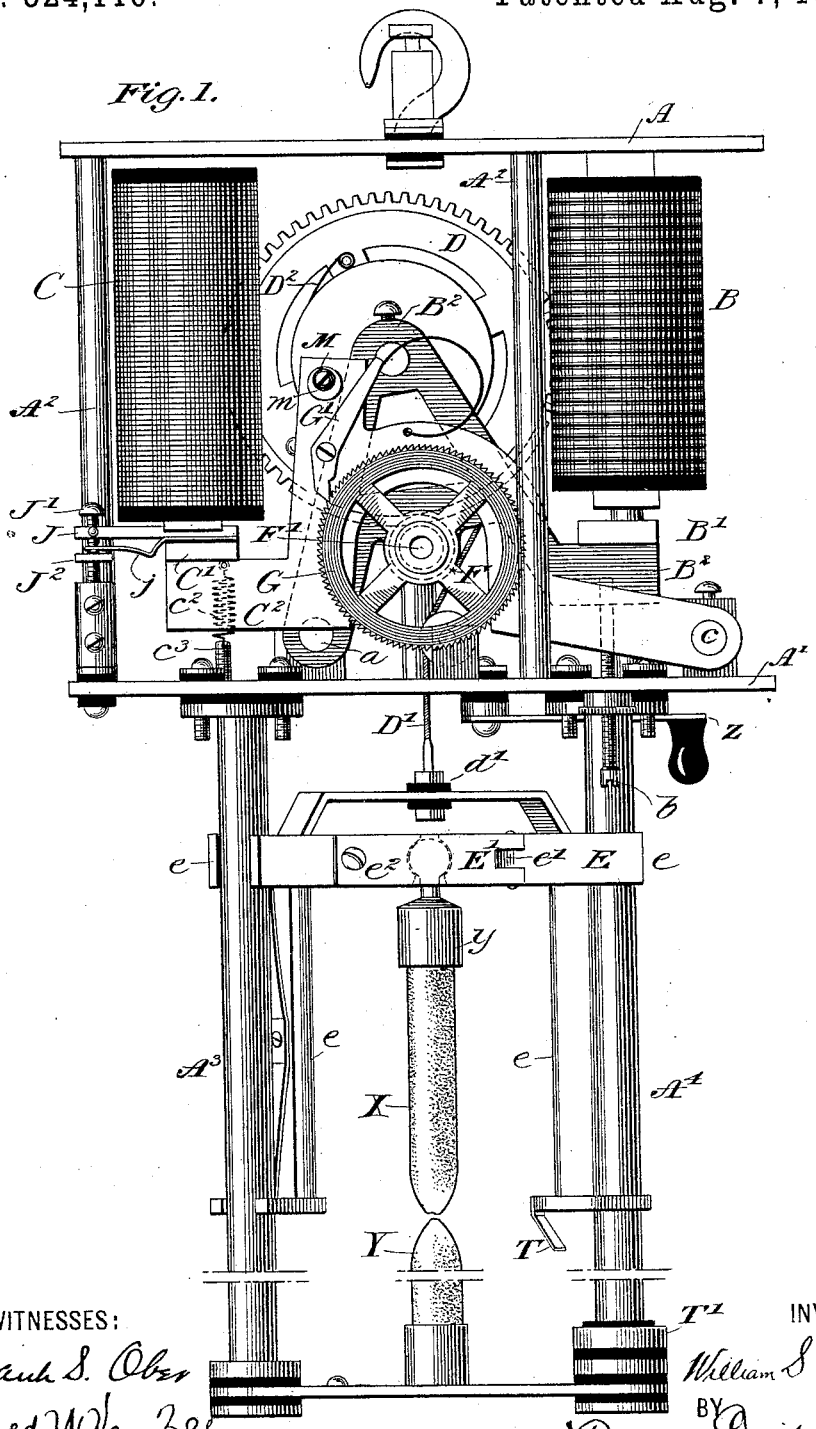

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Fig. 2.

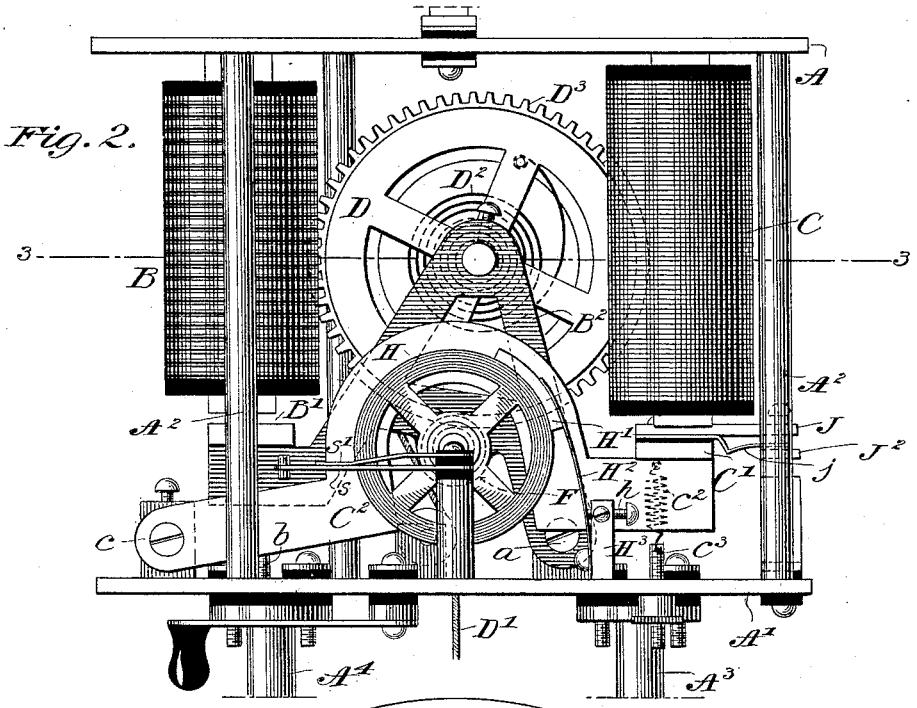
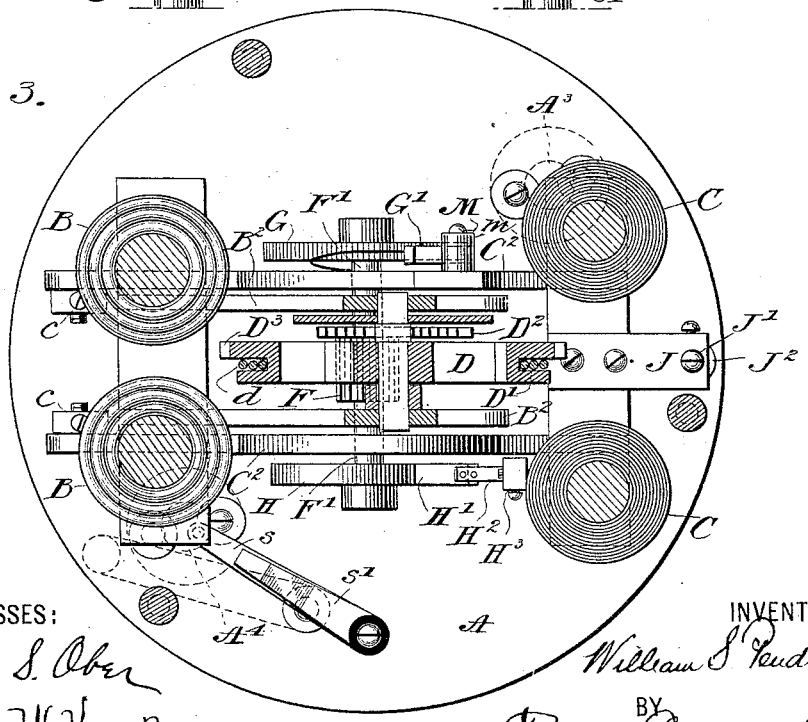


Fig. 3.



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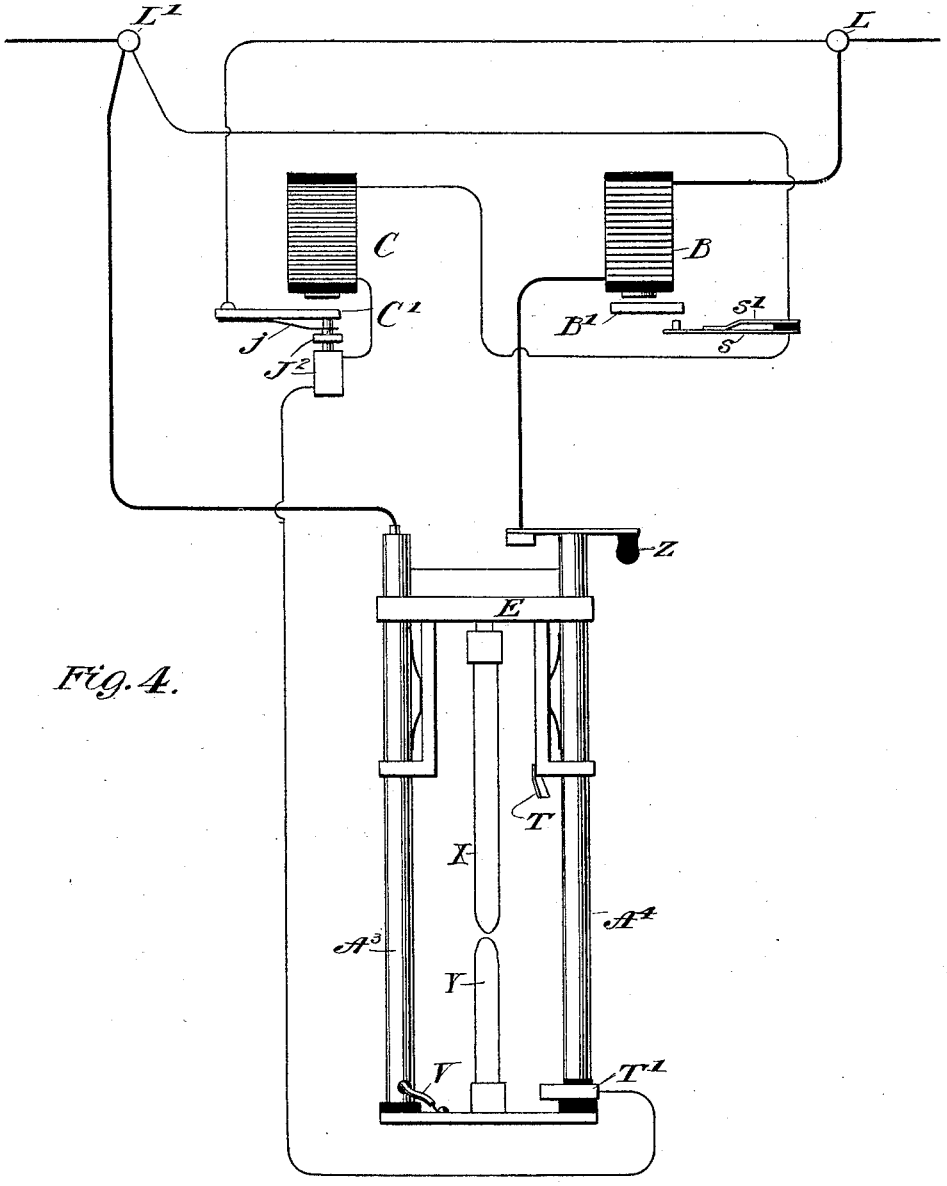

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM S. PENDLETON, OF NEW YORK, ASSIGNOR TO EDMUND D. DAVIDSON, OF HUNTINGTON, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 524,116, dated August 7, 1894.

Application filed March 6, 1894. Serial No. 502,561. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. PENDLETON, a citizen of the United States, residing at New York, county and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The subject matter claimed is hereinafter specified.

In the accompanying drawings, Figure 1 is a side elevation of my improved lamp; Fig. 2, a similar view, from the opposite side, of the upper part of the lamp; Fig. 3, a horizontal section through the upper part of the lamp on the line 3, 3, of Fig. 2; Fig. 4, a diagram illustrating the circuit connections.

The frame is of usual construction, consisting of the top and bottom plates A A′ connected by posts A^2, and the depending rods A^3, A^4, on which the carriage of the upper carbon works. The coarse wire magnet B, for separating the carbons to strike the arc, and the fine wire or high resistance feed magnet C, are suitably mounted upon and pendent from the top plate A.

The armature B′ of the magnet B is attached to a rocking frame B^2 pivoted on the bottom plate A′ at *a*, and the play of the armature and frame is limited by an adjustable screw stop pin *b* passing up through the bottom plate A′. At the top of the arch shaped frame B^2 is mounted a wheel D having a peripheral groove or recess *d* in which is wound the cord or chain D′ (the end of which is of course attached to the wheel) that supports the movable carbon carriage E, traveling on the rods A^3, A^4, and to which the end of the cord is attached by an insulating connection at *d*′. A volute spring D^2 having one end attached to the frame B^2 and the other to the wheel D tends normally to wind up the carbon carriage suspending cord and hold the carriage up. The wheel D has also a peripheral toothed or cogged flange D^3 that gears with a pinion F fast on a shaft F′ having its bearings in the rocking frame B^2 below the wheel D, and carrying at one end a ratchet wheel G, and at the other a brake wheel H. When the magnet B is energized and attracts its armature the carriage rises, rocking on its pivot *a*, the carbon carriage E is raised thus separating the carbon pencils and striking the arc, and the brake wheel H is pressed against the brake shoe H′ carried by a spring H^2 mounted on a post H^3 on the frame plate A′, and having an adjusting screw *h* for regulating the pressure of the shoe. At the same time the ratchet wheel G is by the same movement brought into engagement with a spring pressed pawl G′ pivoted on a rocking frame C^2 to which is attached the armature C′ of the shunt or feed magnet C. The frame C^2 is also arch shaped and passes over the shaft F in the frame B^2 and is pivoted to the lower frame plate A′ at *c*. The armature C′ and frame C^2 are drawn normally away from the magnet C by a spring c^2 connected at one end to the armature and at the other to an adjusting screw c^3 passing upwardly through the plate A′, the play of the frame being limited by a suitable stop. If, then, the current and circuit condition are such that the magnet C attracts its armature the frame C^2 rises and the pawl G′ slips over one or more teeth of the ratchet wheel G, according to the adjustment, and when the circuit through the shunt magnet C is interrupted, as presently described, the armature and frame C^2 are drawn down by the spring c^2 and the pawl G′ drives the ratchet wheel G which in turn, through pinion F drives the wheel D and lowers the carbon carriage to maintain the arc between the carbon pencils.

To provide for the automatic opening of the shunt circuit through the magnet C after it has attracted its armature, I place on the frame C^2 or armature C′ a projection J carrying an adjustable screw J′, and mount on the frame plate A′ a post carrying an adjustable contact J^2, and between these two adjustable parts lies a contact spring finger *j* carried by said armature or frame. The time when during the attraction of the armature C′, the finger *j* leaves the contact J^2 and interrupts the circuit through the magnet C may be adjusted with nicety.

The carbon carriage E is provided with guides *e* of any suitable ordinary character that run on the rods A^3, A^4, and may be of any ordinary construction. In order, however, to provide an adjustment of the upper carbon pencil X to insure its proper adjustment with the

lower pencil Y, in trimming the lamp, I construct the carbon as follows: A spherical socket is formed in the cross-piece of the frame—half in the cross-piece and half in a piece E′ hinged thereto at e' and secured at the other end by a screw bolt e^2. The carbon holder y has a ball formed on the end which fits in the spherical socket. In this way the carbon holder may be properly adjusted and clamped.

Z indicates the controlling switch of the lamp. It may be located, as shown, on the bottom plate A′, or be placed at any point in the circuit. Suitable insulation is provided as required and as shown.

Referring more especially to the diagram Fig. 4, the switch Z being closed, the main circuit is from the binding post L through the low resistance magnet B, thence to the upper carbon, lower carbon, and by insulated wire V, passing up through the hollow rod A^3 to the binding post L′, and thence to line again. The magnet B lifts its armature, the carbons are separated, and the arc established as already described. When by reason of the consumption of the carbons and the consequent lengthening of the arc, the resistance through the arc becomes sufficiently great, the circuit through the sensitive high resistance feed magnet C takes enough current to energize it sufficiently to cause it to attract its armature, and the carbon carriage and carbon X are fed downwardly to establish the normal condition of the arc.

The shunt circuit including the coils of the magnet C is as follows:—From the binding post L, through the contacts $j J^2$, coils of magnet C and separable contacts S S′ to the binding post L′. When the magnet B is de-energized, its armature remains down, as for instance when the switch Z is open, and the contacts S S′ are separated by the armature, pressing S out of contact with S′, and the circuit through the feed magnet is therefore held open. When the carbon carriage in the normal operation of the lamp has descended to its lowest position by reason of the gradual consumption of the carbons, a cut out contact T thereon closes against an insulated contact T′ at the lower end of the lamp frame, which contact is connected as shown permanently through the coils of the magnet C to contacts S S′, to the binding posts L′. In this condition of the lamp the armatures B′ C′ are permanently attracted and the parts of the lamp remain motionless, but with a complete circuit through the lamp, so the current may still pass to one or more lamps that may be in series therewith.

To provide for the adjustment of the pawl G′, to compensate for wear and other conditions, and afford adjustment of the play thereof, I provide an eccentric head m on the rotatable bolt M, mounted in the upper end of the frame C^2. This eccentric limits the movement of the pawl under the tension of its spring.

In my organization the magnets are pendent from the top-plate and are removed to that extent from the heat of the arc. The frame B^2 of the series magnet armature is composed (Fig. 3) of two arch shaped side bars pivoted on one side to lugs on the bottom plate and bound together by the armature B′, and at the top by the shaft on which the combined gear wheel and winding drum is mounted centrally between the two side bars. The ratchet wheel G is carried at one end of the shaft F and the brake wheel at the other. The frame B^2 and all the parts carried thereby are, therefore, balanced and symmetrically disposed with regard to the central plane of movement of the frame, and a corresponding certainty and delicacy of operation results. The frame is similarly constructed, and all the working parts are practically included in the space between the two pendent magnets. The construction is compact and simple and is one that does not call for very great care in the finishing and mounting of the parts. The coiled spring that tends to wind up the wheel D is applied directly to the wheel and serves to steady the feed and prevent too great a length of feed or throw of the positive carbon.

I claim as my invention—

1. The combination, substantially as set forth, of the magnet B, the rocking frame actuated thereby, a wheel mounted in the frame and having a peripheral groove in which is wound the suspending cord of the carbon carriage and a peripheral gear formed thereon, a spring applied to said wheel to wind the cord thereon, a pinion on a shaft mounted in said frame meshing with said peripheral gear, a ratchet wheel at one end of said shaft and a brake wheel at the other end of the shaft, a brake shoe against which the brake wheel is pressed when the carriage is actuated, the magnet C, its rocking frame, the pawl on said frame into engagement with which the ratchet wheel is thrown by the movement of the first mentioned frame, and means for automatically opening the circuit of the magnet C when the rocking frame carrying the pawl has been actuated by it.

2. The combination, substantially as set forth, of the top and bottom plates, the magnets B, C, pendent from the top plate, the arch-shaped frames B^3 pivoted upon the lower plate, and consisting of two side bars connected by the armature of the magnet B, the arch shaped portion of the frame extending up between the magnets, the shaft uniting the upper parts of the two side bars, the peripherally geared or toothed winding wheel mounted centrally on said shaft and supporting the carbon carriage, the shaft F′ mounted in the lower part of the frame, and carrying a pinion F with which the geared wheel meshes, a ratchet wheel on one end of the last named shaft, and a brake wheel upon the other, the arched shaped frame C^2 pivoted on the bottom plate and consisting of two side bars connected with the armature of the mag-

net C, said side bars being arranged on the outer sides of the frame B^3 and arching up over the shaft F', the pawl carried by the frame C^2, and the brake shoe mounted on the bottom plate.

3. The combination, substantially as set forth, of the top and bottom plates, the magnets B, C, pendent from the top plate, the arch-shaped rocking frame B^3 actuated by the magnet B, and extending up between the magnets B, C, the carbon carriage suspending wheel mounted in said frame, a gear moving with the wheel and driving a pinion on a shaft mounted in said frame, a ratchet wheel and brake wheel carried at opposite ends of said shaft, the rocking arch-shaped frame C^2 actuated by the magnet C, and extending up between the two magnets B, C, the pawl on the frame C^2 engaging the ratchet wheel, the brake shoe, and the contacts for automatically opening the circuits of the magnet C when it has caused the movement of its rocking frame.

4. The combination, substantially as set forth, of the magnet B, the rocking frame carried thereby, the carbon carriage suspending wheel mounted in said frame, a coil spring applied thereto and tending normally to raise the carriage, a gear moving with said wheel and driving a pinion on a shaft mounted in the frame, a ratchet wheel and a brake wheel carried at opposite ends of said shaft, the frame C^2 actuated by the magnet C, the pawl on the frame engaging the ratchet wheel, the brake shoe and the contacts for automatically opening the circuit of the magnet C when it has caused the movement of its frame.

5. The combination, substantially as set forth, of the magnet B included in the main circuit with the carbons, the rocking frame controlled by said magnet, and from which is suspended the movable carbon carriage, whereby on the rocking of the carriage the carbons are separated to establish the arc, the magnet C included in a shunt circuit around the magnet B, the separable contacts S S' in said shunt, and opened by the frame of the magnet B when the circuit through said magnet is interrupted, the carbon feeding devices controlled by the magnet C, and means for opening the shunt circuit including said magnet after its armature has been attracted.

6. The combination, substantially as set forth, with the magnet B included with the carbons in the main circuit, means controlled thereby for raising the carbon carriage to separate the carbons to establish the arc, the magnet C included in a shunt circuit, means controlled thereby to feed the carbon to maintain the normal condition of the arc, and a cut-out contact adapted in the lowest position of the carbon carriage to close against a cut-out contact permanently connected through the coils of the magnet C, whereby the armatures of both magnets are held attracted, but with the mechanism of the lamp at rest with a complete circuit through the lamp.

7. The combination, substantially as set forth, of the magnet B included in the main circuit with the carbons, the rocking frame controlled by said magnet and from which is suspended the movable carbon carriage, whereby on the rocking of the carriage the carbons are separated to establish the arc, the magnet C included in the shunt circuit around the magnet B, the separable contacts S S' in said shunt, means for opening such contacts when the magnet B is de-energized, the carbon feeding devices controlled by the magnet C, and means for opening the shunt circuit including said magnet after its armature has been attracted.

In testimony whereof I have hereunto subscribed my name.

WILLIAM S. PENDLETON.

Witnesses:

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ALFRED W. VAN ZEE.