(No Model.) 2 Sheets—Sheet 1.

G. C. PYLE.

ELECTRIC ARC LAMP.

No. 570,053. Patented Oct. 27, 1896.

Fig 1.

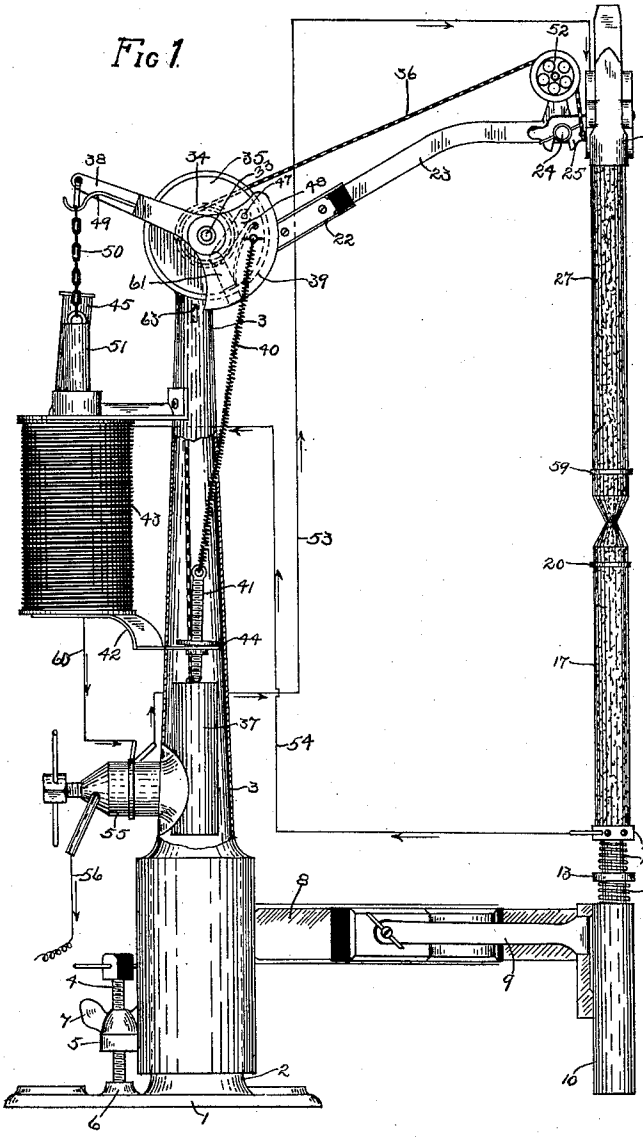
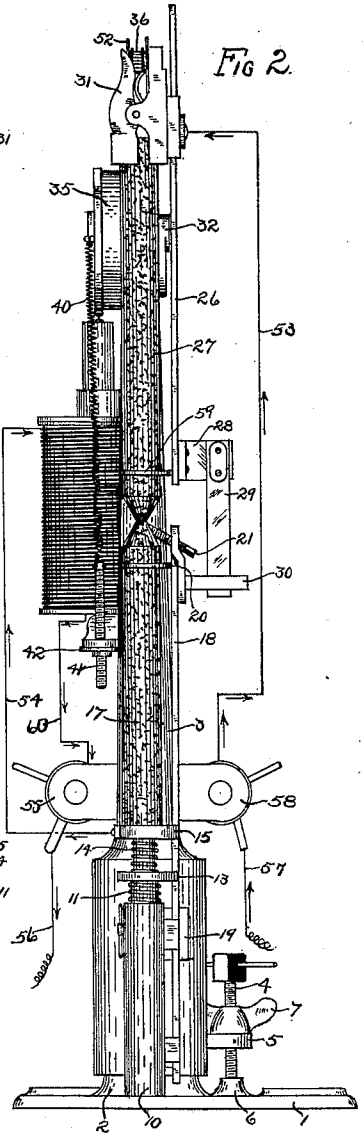


Fig 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig 3.

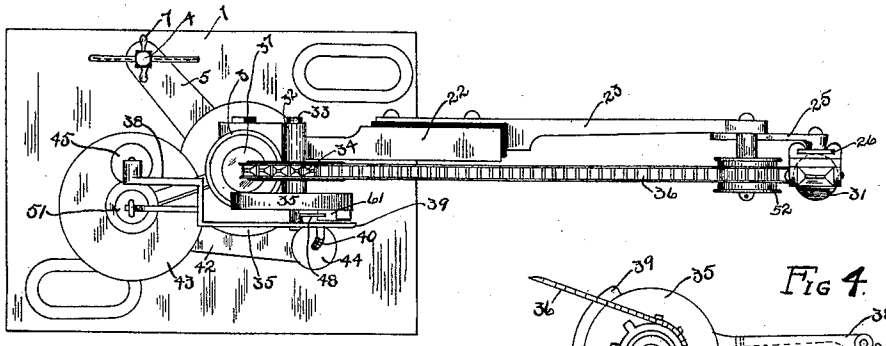

Fig 4.

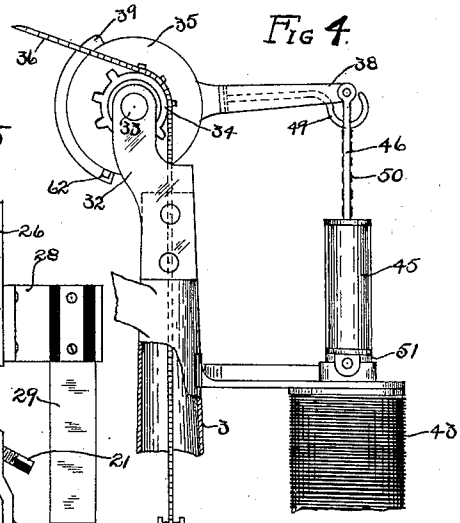

Fig 5

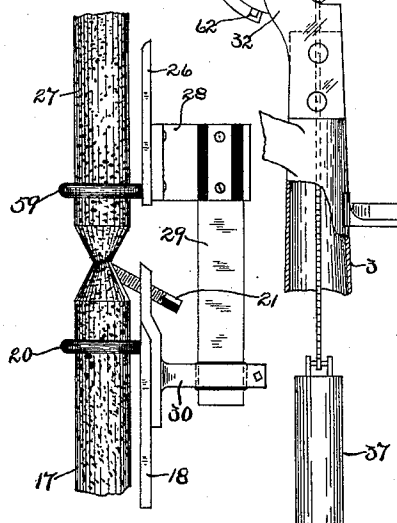

Fig 6

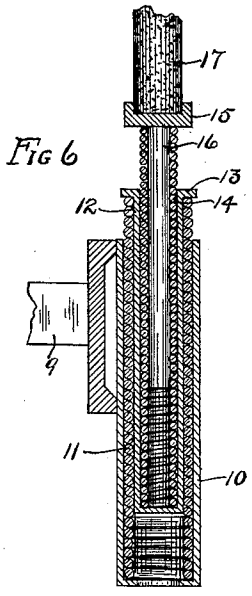

Fig 7

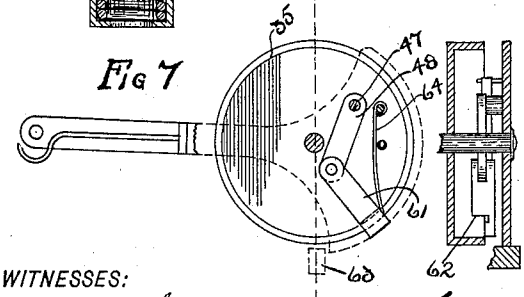

Fig 8

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UNITED STATES PATENT OFFICE.

GEORGE C. PYLE, OF INDIANAPOLIS, INDIANA, ASSIGNOR OF ONE-HALF TO FRANK H. EWERS, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 570,053, dated October 27, 1896.

Application filed January 27, 1896. Serial No. 576,999. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. PYLE, of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Improvement in Arc-Lamps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

My invention relates to improvements in arc-lamps. These improvements are to make the arc-lamps able to do the reliable and constant work in electric headlights for locomotives. The constant shaking of the apparatus when on a running locomotive is a source of some difficulty, because of its tendency to interfere with and even counteract the action of parts of the lamp, and especially the means for regulating the arc. It is clear that any defect in construction whereby the electrodes are not automatically fed as they are consumed, and if the arc is not automatically regulated so as to operate with permanent success the light will at times be extinguished, leaving the track in the dark and rendering the headlight apparatus objectionable, if not wholly impracticable, for the purpose intended. The full nature of my invention will appear from the accompanying drawings and the description and claims following.

In the drawings, Figure 1 is a side elevation of my lamp, a part of the lamp-post being on section. Fig. 2 is what may be called a "front" elevation of it. Fig. 3 is a plan view thereof. Fig. 4 is a detail of the upper portion of the lamp-post and regulating mechanism, parts being broken away and parts in section. Fig. 5 is an enlarged view of the electrodes at their junction and the guiding mechanism. Fig. 6 is a vertical section of the spring-support for the lower electrode. Fig. 7 shows the clutch-wheel mechanism. Fig. 8 is a cross-section on the line X X of Fig. 7.

Upon a suitable base-plate 1, having the base-post 2 extending up from it, is mounted the lamp-post 3. The lamp-post has an enlarged hollow base that fits over the base-post 2, and the entire lamp is vertically adjusted by means of the screw-bolt 4, passing through an interiorly-threaded opening in the arm 5, extending from the lower end of the lamp-post, the lower end of the screw-bolt being rotatably secured at 6 to the base-plate 1. This screw-bolt 4 has on it the thumb-nut 7 to hold the arm 5 in place on the screw-bolt. By this means the lamp is adjusted so that the light will be in that position relative to the reflector which will make the reflection of the light most powerful.

From the lower end of the lamp-post there is extended the horizontal arm 8, being preferably a piece of channeled iron, with its body vertical and with a flange on each edge, whereby it forms a guideway as well as holding apparatus for the arm 9, which is movably mounted and secured in such channeled arm 8. On the outer end of the arm 9 I secure the tube 10, with its lower end partially closed and its upper end open.

Within the tube 10 I place a spiral spring 11, that fits snugly against the wall of the tube and extends normally for some distance above the tube. Within the spiral spring 11 I place a second or inner tube 12, having its lower end closed wholly or partially and its upper end open and provided with an outwardly-extending annular flange 13, that rests upon and is supported by the upper end of the spiral spring 11. Within this second or inner tube 12 I place a second spiral spring 14, fitting snugly against the wall of the tube and extending likewise for some distance above its upper end. Upon this second spiral spring 14 I place the electrode-holder 15, which has a stem or rod 16, that extends down for some distance within the second or inner spiral spring 14.

It is observed that the second or inner tube 13 does not normally extend to the bottom of the outer tube 10 and the rod 16 does not extend to the bottom of the inner tube 13. By this mechanism the lower electrode 17, which is carried upon the electrode-holder 15, is normally forced upward by the spring mechanism, that is very sensitive and capable of permitting the electrode-holder to have great variation in movement, so that it will continue to support and push upward the electrode from the time it is first inserted until it is consumed.

Extending parallel with the lower electrode and its supporting mechanism is a guide-bar 18, carried on the arm 9 at the lower end of the lamp and provided with guiding-rings 20 at its upper end whereby it guides the direction of movement of the lower electrode. In the upper end of this guide-bar is a stop 21, consisting of the inwardly-extending screw that is screwed in until it engages the conical end of the lower electrode and stops it in its upward movement, thus counteracting the action of the spring-support below and holding the upper end of the lower electrode always in the same place. It is obvious that this holding of the lower electrode is effected by the coöperation of the stop 21 and the upper guide-ring 20. One effect of so sensitive a spring-support for the lower electrode is to avoid the tendency of the conical points of the electrode to break and the two electrodes to come together with too great force, whatever may be the cause of such movement on their part.

On the upper end of the lamp-post is a channeled arm 22, like the arm 8 below, excepting that it is smaller, and in it is secured the bent arm 23. In its outer end I place a pin 24, with free ends that support the bracket 25, to which is secured the upper guide-bar 26, that extends parallel with the upper electrode 27. The attachment of the bracket 25 on the pin 24 is such that the former can be readily removed. At the lower end of the guide-bar 26 I provide the guide-ring 59, which surrounds the upper electrode. I connect the lower end of the guide-bar 26 and the upper end of the guide-rod 18 by means of the arm 28, extending from the lower end of the upper guide-bar and having the downwardly-extending arm 29, that extends through a slot or recess in the arm 30 from the upper end of the lower guide-bar 18. This mechanism holds the approaching ends of the two electrodes in line with each other. The upper end of the upper electrode is held in place by the clamp 31, that slides on the upper guide-bar 26.

The difficulty of regulating the arc in a lamp to be used on a locomotive so that the lamp will emit a continuous light is, as I have said, very great, because of the jarring of the locomotive while running. The ordinary means used in lamps I have found is not satisfactory, and I have endeavored to make a regulating mechanism that will meet this difficulty. The lamp-post 3 is hollow, and on its upper end is carried a bracket 32, having mounted in its opposing arms a shaft 33. On this shaft is rigidly mounted a sprocket-wheel 34 and also a clutch-wheel 35. I connect a chain 36 to the clamp 31, which holds the upper electrode, and pass such chain back over the sprocket-wheel 34 and down into the hollow lamp-post 3, where it is attached to the weight 37. Loosely mounted on the shaft 33 is a lever 38. It is bent in substantially the form shown in the plan view, Fig. 3, and one end 39 of it is enlarged and has secured to it the spring 40, that extends down and is attached to the lower end of the screw-bolt 41, which passes through the lower bracket 42, that carries a solenoid 43. The screw-bolt 41 has the thumb-screw 44 on it above the bracket 42 and a nut below, whereby the tension of the spring 40 may be regulated. This connection and means for regulating the spring 40 is exterior to the lamp-post, as seen in Fig. 2, instead of interior, as some might think from inspecting Fig. 1. The other or smaller end of the lever 38 at its extremity is connected up with the dash-pot 45 by the link 46.

The clutch-wheel 35 has a laterally-extending rim about its periphery and adjacent to the lever 38 and especially the portion 39. On the inside of the portion 39 of the lever 38 at 47 I pivot a link 48. To this again I pivot the clutch-link 61, having in its free end a notch or slot, making jaws 62 on each side that envelop or embrace the laterally-extending rim of the clutch-wheel 35. The notch is wider, preferably, than the thickness of the rim, so that the jaws have some play thereon. By the gravity of that clutch 61 it moves downward on the rim of the wheel 35 until its jaws 62 on each side of the notch engage and clamp said rim, and since the link 48 is secured to the lever 38 the relative position of the two is locked. While the lamp is running, the position of these parts is substantially that shown in Fig. 7. When, however, for some reason there is a movement of the parts of the lamp whereby the small end of the lever 38 is drawn upward by the pull of the spring 4 and the weakness of the current through the solenoid, the wheel 35 will be rotated until the clutch 61 contacts with the lug 63, which is integral with the lamp-post, whereby the clutch is pushed back and thereby loses its hold on the rim of the wheel 35. The portion 39 of the wheel 35 will also at times engage the lug 63, and therefore the use of said lug is to limit the movement of the lever 38 as well as the clutch 61. After the hold of the clutch 61 has been released, as above described, the parts are free to resume their normal position when the solenoid and other parts succeed in restoring the arc. In such case the core of the solenoid is drawn down, which causes the clutch mechanism to again assume the position shown in Fig. 7, where the lever 38 and wheel 35 are relatively locked.

In order that the hold of the clutch on the rim of the wheel 35 may be positive and not be jarred loose by the shaking of the lamp when on the locomotive, the spring 64 is added, which coöperates with the action of gravity on said clutch 61 and forces it into a locked position, excepting when the clutch, as has been explained, comes into contact with the lug 63, and the clutch, together with the spring 64, are pushed backward and the hold of the clutch released. I have found this device to be very successful in operation.

Extending from the middle portion of the

lever 38 is an arm 49, with a chain 50 suspended from its outer end, that is attached to the core 51 of the electrode 43.

From this description of the regulating mechanism it is seen that the solenoid, through the chain 50, the arm 49, belt 47, clutch-wheel 35, shaft 33, sprocket-wheel 34, and sprocket-chain 36, which extends over the pulley 52, elevates the upper electrode. When the core 51 is drawn downward by the increased electric force, the upper electrode is elevated. The weight 37 coöperates with the solenoid while the lamp is working, as it also tends to elevate the upper electrode. Practically the weight 37 tends to counterbalance the weight of the upper electrode and clamp 31 and to keep the chain 36 taut in case of jarring of the lamp. While the weight 37 and the solenoid coöperate to produce the same result, the dash-pot 45, as well as the spring 40 and the weight of the upper electrode, tend to counteract the action of the solenoid and weight and render their action slow, deliberate, and regular. Thus it is observed that in my regulating mechanism I have provided several means for compensating any jarring which the lamp may receive from the locomotive.

The electric current is transmitted to the upper electrode through the wire 57, binding-post 59, and wire 53, which is connected with the clamp mechanism 31. The circuit passes down through the lower electrode and out through the wire 54, that leads from the electrode-holder to the solenoid through which the current passes. From the solenoid it passes through the wire 60, binding-post 55, and wire 56 away from the lamp.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an arc-lamp, the combination of a gravity-fed upper electrode, a lower electrode, telescoping springs to support said electrode and feed it upward and a solenoid to regulate the arc.

2. In an arc-lamp, the combination with the lower electrode, and a lower arm to support the same, of a spring-supported tube carried in the lower arm, and a spring-supported electrode-holder carried in such tube.

3. In an arc-lamp, the combination with the lower electrode, and a lower arm to support it, of a vertical tube carried in such lower arm, a spiral spring coiled within the tube, a second tube within the spiral spring having a flanged top to support it on the spring, a second spiral spring within the second tube, and an electrode-holder within the second spiral spring having a cap on it to support it on the spring, substantially as set forth.

4. In an arc-lamp, the combination with a lower electrode, an arm extending from the framework, a spring-support for the lower electrode mounted thereon, a guiding-bar extending parallel with the electrode, a guide-ring secured to such guiding-bar, and a screw or stop secured to the guiding-bar that engages the conical upper end of the electrode whereby the screw and guide-ring will coöperate to limit the upward movement of the spring-supported electrode and hold the upper end thereof in place.

5. In an arc-lamp, a framework, suitable upper and lower electrodes, a guiding-bar extending parallel to the lower electrode with a slotted lateral extension near its upper end, a guide-ring near its upper end, a guiding-bar parallel to the upper electrode, a guide-ring secured to its lower end surrounding the upper electrode, and a downwardly-extending arm from the lower end of the upper guide-bar which extends loosely through the recesses in the laterally-extending bar in the upper end of the lower guide-bar.

6. In an arc-lamp, the clutch-wheel 35 provided with a laterally-extending rim, a lever mounted adjacent to said rim having the enlarged end 39, a core and solenoid connected with said lever, a link 48 pivoted to the lever, the clutch 61 pivoted at one end to the link and at the other end provided with jaws which engage the laterally-extending rim on the clutch-wheel and a stop to engage such clutch and enlarged end of the lever to limit their movement.

7. In an arc-lamp, the combination with a lamp-post, an arm extending from its upper end, a guide-bar held by such arm parallel with the upper electrode, means slidably mounted on the guide-bar for holding the electrode, a pulley mounted on the outer end of the arm from the lamp-post, a sprocket-wheel mounted rigidly on a shaft carried in the upper end of the lamp-post, a chain extending from the upper electrode-holder over the pulley and sprocket-chain to the weight, a lever loosely mounted on the shaft at the upper end of the lamp-post, an adjustable spring connected with one end of the lever, a dash-pot connected up with the other end of such lever, a solenoid also connected up with the other end of such lever, a drum mounted rigidly on the shaft at the upper end of the lamp-post, and a strap connected with such drum at one end and with said lever at the other end, whereby the solenoid and weight will tend to elevate the upper electrode while the dash-pot, spiral spring and gravity of the upper electrode will tend to depress it, substantially as set forth.

In witness whereof I have hereunto set my hand this 17th day of January, 1896.

GEORGE C. PYLE.

Witnesses:
V. H. LOCKWOOD,
ZULA GREEN.