(No Model.)

4 Sheets—Sheet 1.

J. E. GASTON.

ARC LAMP.

No. 385,705. Patented July 10, 1888.

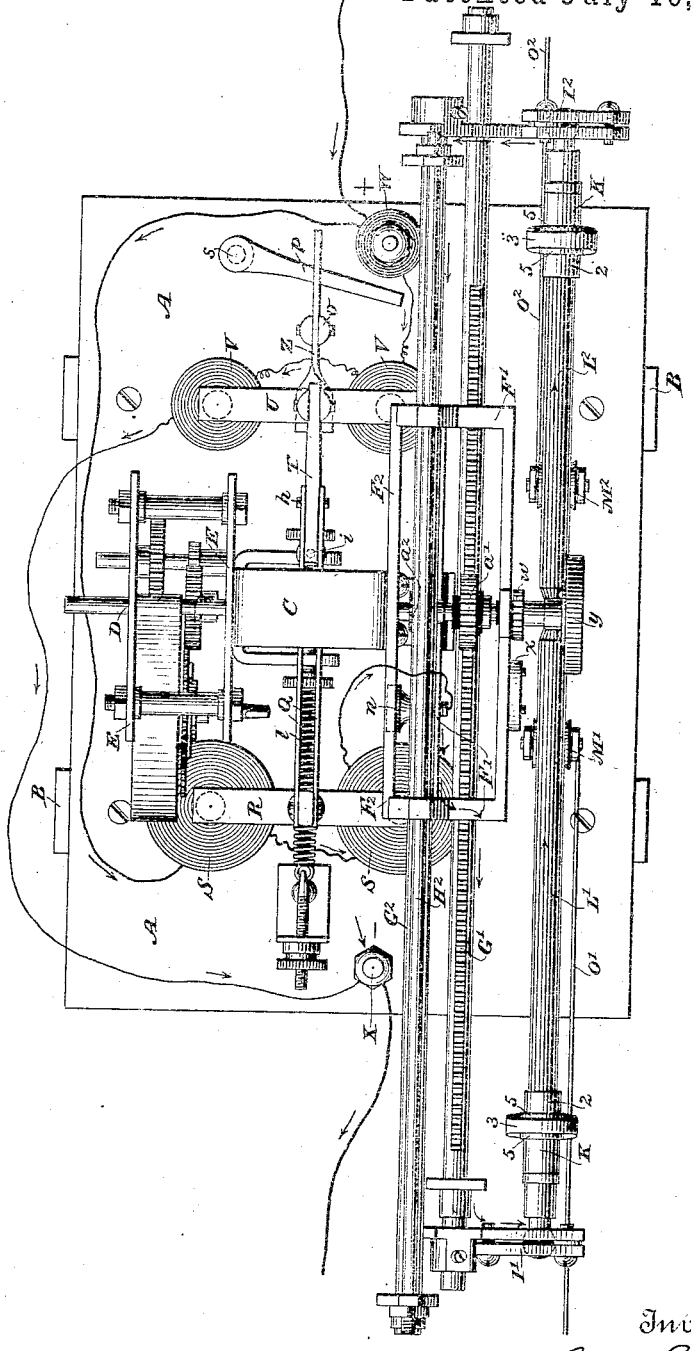

Fig. 1.

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(Model.)

4 Sheets—Sheet 2.

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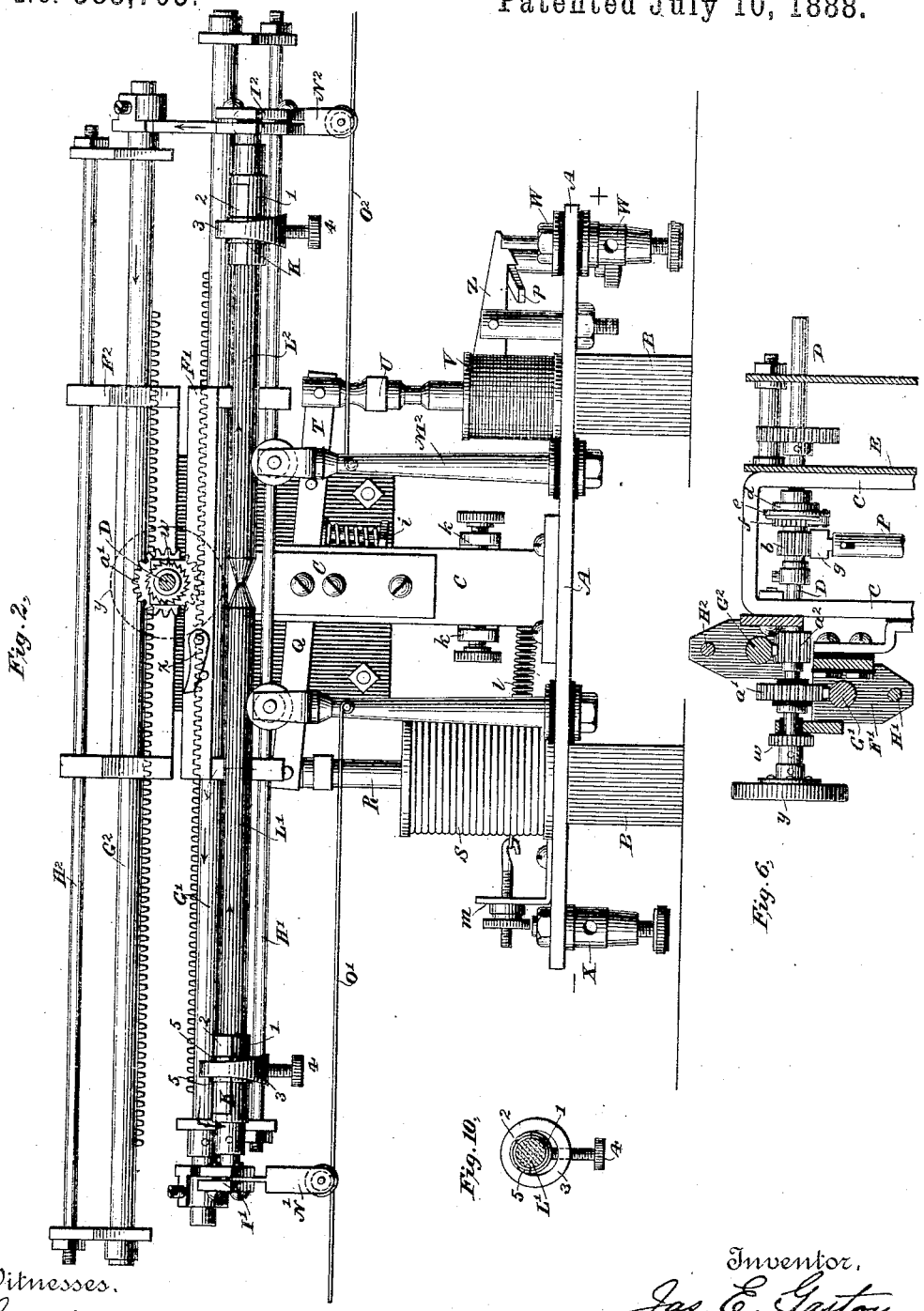

Fig. 2.

Fig. 6.

Fig. 10.

Witnesses.
Geo. W. Breck,
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(No Model.) 4 Sheets—Sheet 3.

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Fig. 4.

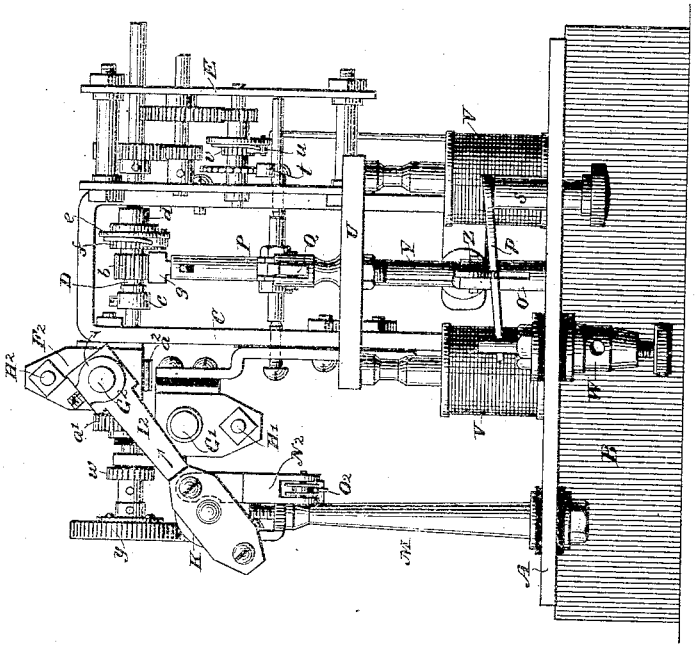
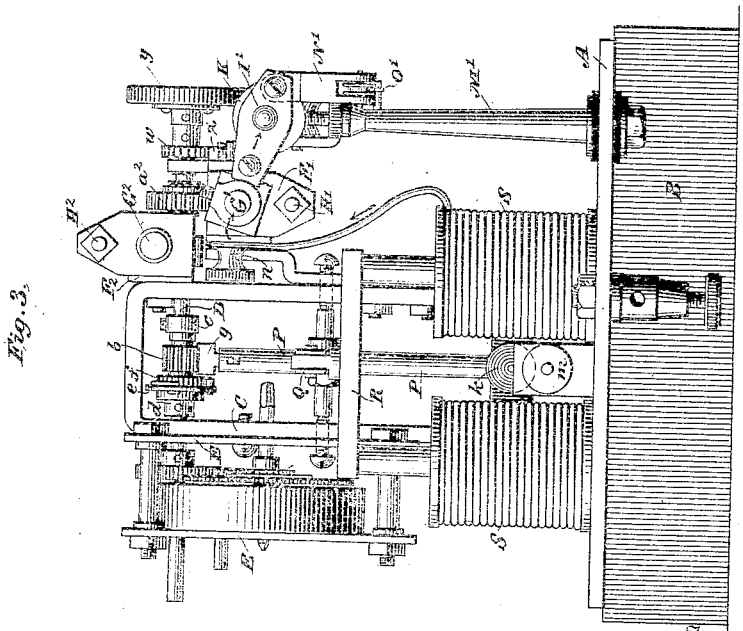


Fig. 3.



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4 Sheets—Sheet 4.

J. E. GASTON.

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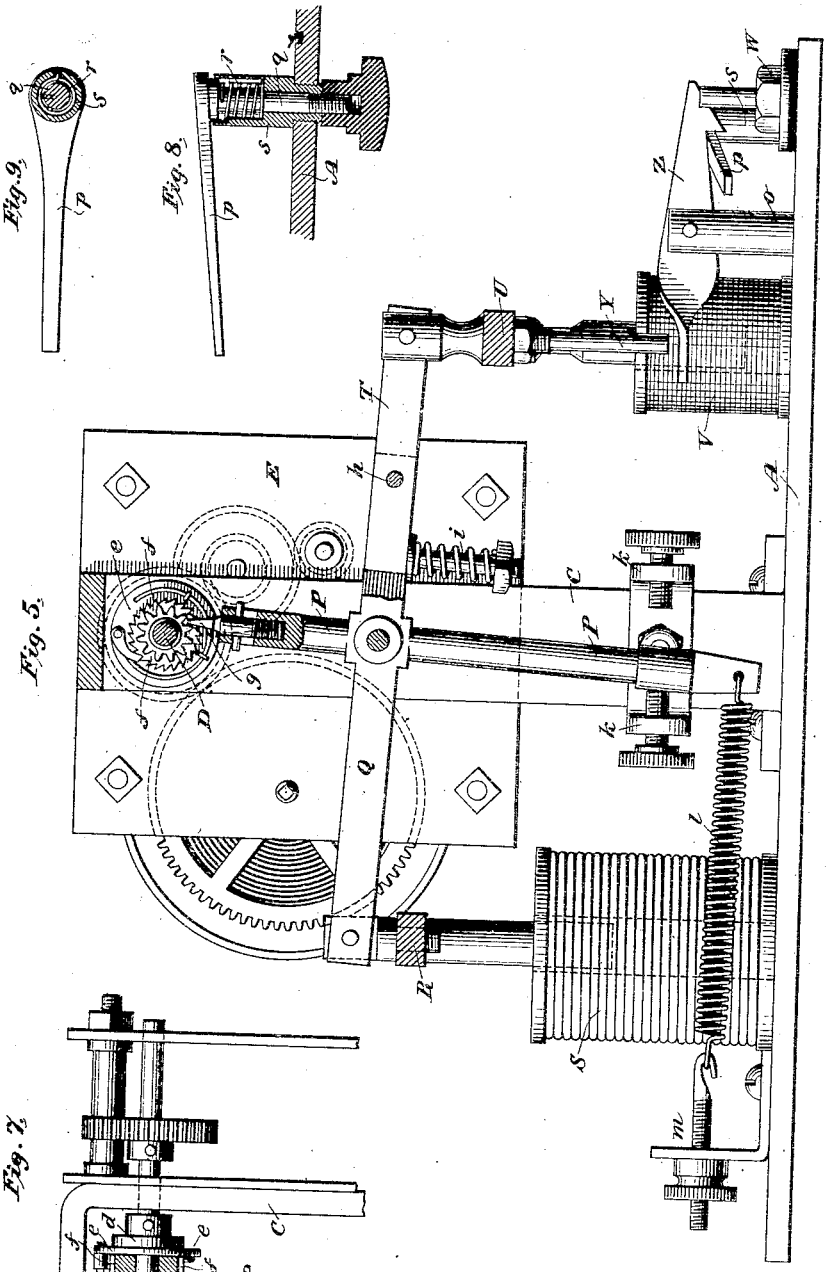

Fig. 9.

Fig. 8.

Fig. 5.

Fig. 7.

Witnesses.
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UNITED STATES PATENT OFFICE.

JAMES E. GASTON, OF FORT WORTH, TEXAS.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 385,705, dated July 10, 1888.

Application filed September 14, 1887. Serial No. 249,619. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. GASTON, a citizen of the United States, residing at Fort Worth, in the county of Tarrant and State of Texas, have invented certain new and useful Improvements in Arc Lamps for Locomotive Head-Lights, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to positive-feeding arc lamps, the same being accomplished by clock-train or other suitable motor.

The object of my invention is to produce an arc lamp that will be uninfluenced by the jar of the locomotive. When an ordinary arc lamp is used for locomotive head-lights, this jar is sufficient to so interfere with its workings as to preclude arc lamps from being used for such purposes.

Arc lamps have been heretofore designed for locomotive head-lights, and accomplish the above result with more or less uncertainty. My lamp possesses features which, I claim, will secure the results desired in a superior manner.

The invention consists of, briefly, two carbon-carriers, preferably arranged horizontally, the feed of both being controlled by a shaft bearing two spur-wheels, the one of larger diameter than the other, so as to feed the positive carbon more than the negative. The said shaft is rotated by a clock-train to feed the carbon-carriers and the carbons, but is modified in its action to positively keep the carbons at an unvarying distance by an arm connected with a rocker, which latter is controlled in its action by main and derived circuit magnets, preferably arranged horizontally, the relative amount of current passing through said magnets to control the apparatus being dependent upon the length of the arc, as in ordinary arc lamps.

The invention consists, also, in certain features of construction and arrangement and details thereof, which will be hereinafter set forth, and particularly pointed out in the claims appended hereto.

Figure 1 is a plan view of an arc lamp adapted for locomotive head-lights embodying my invention. Fig. 2 is a front elevation thereof; Fig. 3, an end elevation of the same at the left hand of Figs. 1 and 2; Fig. 4, an end elevation at the right hand of the same; Fig. 5, an elevation of the same with the front half of the lamp removed; Fig. 6, a side elevation of the shaft controlling the feed of the carbons; Fig. 7, a side elevation of a portion of the latter, partly sectioned and on a larger scale; Figs. 8 and 9, respectively, an elevation and plan of a cut-out; Fig. 10, a cross section of my carbon-holder.

The same letters of reference indicate the same parts throughout the various figures of the drawings.

A is the base of the apparatus, which is shown in the drawings as resting upon two wooden pieces, B B.

C is a frame carried by said base and supports the shaft D, which controls the feed of the carbons. The frame C supports at its back a frame, E, which carries a clock-train for rotating said shaft. At the forward part this frame C supports a frame, F', which is carefully insulated from C, as shown in Figs. 3 and 4. Above the frame F' is arranged another frame, F², which is or may be in electrical communication with the frame C and other parts of the apparatus.

The frame F' and the parts carried by it are electrically separated from the main portion of the apparatus and the frame F², the former of which carries the carbon-feeding rack G' and the latter the carbon-feeding rack G², both of which are coupled to and slide with the rods H' and H², respectively. From the carbon-feeding rack G' depends a hanger, I', which by ball-and-socket joint supports the carbon-holder K that clamps the carbon L'. From the carbon-feeding rack G² depends corresponding parts indicated by the same letter, having the index 2 for supporting the carbon L². These carbons are kept in alignment by two posts, M' and M², respectively, provided at their upper ends with anti-friction rollers, so as to afford little resistance to the same. Both of these posts are insulated from the base-plate A. From the hangers I' I² depend pivoted pieces N' and N², respectively, which carry

rollers adapted to travel upon wires O′ and O², attached to the posts M′ and M², and supported at their outer ends by any suitable means beyond the apparatus. These rollers and wires are to prevent any sagging of the carbon-carriers and carbons at their outer ends, so as to keep them in a horizontal position as nearly as possible throughout.

The shaft D passes through the apparatus and carries a wheel, *a′*, that engages with the carbon carrier rack G′ and is suitably insulated from said shaft. This wheel has preferably, say, twenty-four teeth. Beyond this wheel *a′* and carried by the same shaft is another wheel, *a²*, of less diameter—say fourteen teeth—which engages with the carbon-carrier rack G². When the shaft carrying these wheels is rotated by the clock-train, it will cause both carbons to feed. The positive one, L′, will be fed through a greater distance because of the larger diameter of the gear-wheel *a′* which impels it.

Upon the shaft D between the frame C is a toothed wheel, *b*, held in place by a collar, *c*, and a collar, *d*, provided with a flat disk, *e*, carrying a pawl. The toothed wheel *b* is loosely mounted on the shaft D and has a toothed wheel, *f*, integral therewith engaged by the aforesaid pawl, so that the wheel *b* (see Fig. 7) may turn freely in one direction, but will rotate the shaft when turned in the other direction. The wheel *b* is adapted to be controlled by a tooth, *g*, mounted upon a cross-arm, P. The tooth is free to slide in the end of said cross-arm, and is provided with a pin working in a slot therein to keep it from rotating and to limit its play. It has a spring for holding it up in its normal position. (See Fig. 5.) To the arm P is secured a rocker, Q, which is supported between the frame C by screws forming a pivotal connection therefor. (See Figs. 3 and 4.) Depending from one end of said rocker-arm Q is a yoke, R, supporting the cores of main magnets S, which are wound with coarse wire and are in series with the main line and carbons. From the other end of the rocker-arm Q extends a vibrating piece; T, pivoted to said rocker-arm at *h*. This vibrating piece is attached at its inner end to a small rod, *i*, encircled by a spiral spring, and having a base-plate at one end, through which the rod *i* is adapted to slide in and out, and having at the other end a nut, between which and the base-plate the spiral spring lies. By turning the nut in one or the other direction a greater or less tension is put upon the spring. By this construction it will be observed that the vibrating piece T is capable of a downward movement independently of the rocker-arm Q, for the rod *i* and the spring surrounding it permit this action, the base-plate of the rod *i* being perforated and resting against the parallel edges of the rocker-arm Q (see Fig. 1) accommodating this function. From the vibrating piece T pivotally depends another yoke, U, carrying the cores of electro-magnets V, wound with fine wire, and in a derived circuit around the lamp. The cross-arm P at its lower end is provided with limiting stops *k k*, mounted in a bracket secured to the frame C. It is also provided with a tension-spring, *l*, and adjusting-screw, *m*, supported by an angle-piece secured to the plate A.

W is the positive binding-post, which is insulated from the base-plate A, and is connected with the derived-circuit magnets U and the main magnets S.

n is a binding-screw for attaching the other extremity of the wire from the magnet S to the lower frame, F′, carrying the carbon-feeding rack G′, in electrical communication with the carbon L′, all of which, as before described, is electrically separated from the upper frame, F², carrying the second carbon-carrier rack G². Normally the carbons are together.

The clock-train being wound up, the current is turned on and passes from the binding-post W, in the direction of the arrows, through magnets S to binding screw *n* upon the lower carbon-carrying rack-frame, and by way of this to the positive carbon L′, to the second carbon, L², *via* the carbon-carrying rack G², to its frame F², and from thence to the frame C and base-plate A to the negative binding-post X, with which the said frame F² is in electrical connection. The carbons being together will cause an excess of current to pass through the main magnets S, (the derived-circuit magnets being depleted of current,) and this will energize the magnets S so strongly that they will draw down the rocker-arm Q and impel the tooth *g*, carried by the cross-arm P, against the toothed wheel *b*, (see Fig. 5,) and by means of the pawl-engaging ratchet *f*, forming a part of said toothed wheel, will produce a rotation of the shaft D, which will effect reciprocation of the carbon-carrier rack and a separation of the carbons. The arc now will begin to burn, and the tooth *g* will remain between the meshes of the wheel *b* until the arc becomes abnormal, when the derived-circuit magnets V will become energized to such a degree as to draw down the rocker Q and free the wheel *b*. The said wheel being free to turn in the opposite direction, the shaft D is not disturbed by the backward movement of the tooth *g*, which by means of this backward movement frees itself from the said wheel *b*. The tooth *g* being mounted on a spring, is also afforded additional facility for escaping the wheel *b* upon backward movement. The wheel *b* having now been liberated from the restraining action of the tooth *g*, which is drawn away from it by the derived-circuit magnets V, as before described, the clock-train now actuates the shaft D and slowly feeds the carbons together. The magnets S becoming now more and more strongly vitalized, draw the rocker-arm Q down, while at the same time as the carbons approach the derived-circuit magnets V become less strongly magnetized and exert less pull upon the rocker-arm. As the tooth *g* enters the meshes between the wheel *b*, it is

depressed thereby until it takes well into the same, and is then forced upward by the spring upon which it rests between the teeth of said wheel. When the carbons approach near together, the tooth *g* is impelled by the magnets S against the wheel *b*, and thus effects a separation of the carbons to the proper degree. It will be seen, therefore, that the tooth *g* modifies the feeding action of the clock-train by holding it when the carbons are a proper distance apart, by actuating the shaft D to separate the carbons when too near together, and when the tooth is withdrawn permitting the clock-train to feed the same. The spring *l*, attached to the end of the cross arm P, connected with the cross-arm Q, hastens or postpones the action of the tooth *g* carried upon it as its tension is increased or diminished, thus regulating the length of the arc between the carbons. The stops *k k* serve to limit the play of said cross-arm.

Y is a pin projecting downwardly from the yoke U and adapted to strike against a latch, Z, pivoted to a post, *o*, on the base and holding an arm, *p*, away from binding-post W. The arm *p* is attached to a spindle, *q*, provided with a thumb-screw encircled by a spiral spring, *r*, (see Fig. 8,) the whole of which is surrounded by a recessed cylinder, *s*, which is a little shorter than the spindle *q*, so as to allow a slight vertical play of the same and the arm *p*, so that when the spindle is pulled downward by the thumb-nut the arm *p* will free the latch Z, and the spring *r* place the same in contact with the binding-post W, completing the circuit from the same to the binding post X by way of the base-plate A, as the arm *p* is in electrical communication with said base. Should the carbons fail to feed, the magnets V would draw down the yoke U and draw down the vibrating piece T, compressing the spring surrounding the pin *i* which holds it to the rocker-arm Q, (see Fig. 5,) the cross arm P being in this instance against the limiting-stop *k*, as shown in the drawings. The pin Y will then strike the latch Z and cause it to liberate the arm P and cut the lamp out of circuit. This could also be accomplished by hand, as before described, so that the lamp can either be manually or automatically cut out of circuit. In another application, Serial No. 249,231, filed September 9, 1887, I have described and claimed this combined hand-switch and automatic cut-out. I therefore lay no claim to the same in this application, except in combination with the peculiar mechanism of this case, as will be seen by refence to the claims making a part of this specification.

Between the escapement-wheel *t* (see Fig. 4) and the clock-train which controls the rotation of the shaft D that moves the carbon-carrier racks G′ and G², I interpose a pawl and ratchet, *u v*, respectively, so that the carbon-carriers can be slid backward without operating the escapement of said clock-train. This allows the carbon-carriers to be slid back with facility.

I have shown in the drawings, at the forward end of shaft D, a ratchet-wheel, *w*, which is adapted to be engaged by a pawl, *x*, that can be swung into position when needed, so as to hold the carbon-carriers in position when slid apart to replenish the same with fresh carbons. Without this provision, or a provision of this character, when the carbons were separated, the clock-train would run them together again. The pawl *x* is only brought into requisition when it is desired to hold the apparatus from operation. A milled head, *y*, of insulating material, is provided for the shaft D, and the carbon-carriers may be separated by turning this milled head. The shaft D should be carefully insulated throughout and removed from electrical contact with the frame F′, carrying the carbon-rack G′, as will be seen by reference to Fig. 6. The pawl-and-ratchet arrangement just described and the milled head for turning the shaft D in a reverse direction to the rotation effected by the clock-train could be placed upon the shaft D at the rear of the apparatus, if desired, and would perhaps be a preferable arrangement. It will be observed that when the carbon-carrier racks are slid back for the purpose of furnishing fresh carbon to the lamp the clock-train is rewound by this operation, and the tension thrown upon the spring of the train by sliding the carbon-racks backward is sufficient to feed them forward. The lamp is therefore capable of rewinding itself by the mere act of putting carbons in it. At any rate, one winding of the clock-train is sufficient to operate the lamp for a long time, by reason of the rewinding effect spoken of above.

In Figs. 1, 2, and 10 is shown my carbon-holder K. This consists of a stationary part, 1, and a removable part, 2, each cylindrical and semicircular and adapted to receive the end of the carbon. Around the same is placed a ring, 3, held in place thereon by collars 5 5, cast on each part. The said ring is provided with a thumb screw, 4, so that the same may be screwed down to firmly hold the removable part 2 in place and bind the aforesaid parts together to securely hold the carbons. The two collars 5 5 on the holder form, in effect, a groove for the ring 3. So far as I am aware, this carbon-holder I believe to be novel. Its simplicity and efficiency are its chief features. It can also be readily manipulated so as to insert or remove the carbons.

It will be evident to those skilled in the art that the magnets S and V may be arranged vertically over one another and the cross-arm Q controlled thereby as readily as in the arrangement herein set out. I do not wish, therefore, to confine myself to the magnets being horizontally arranged. It will be noted that the vibrating piece T being pivoted to the rocker-arm will allow the cores of the magnets a nearly vertical movement and prevent friction of the same against the interior sides of the magnets, thus not interfering with the sensitiveness of the apparatus.

Having now fully set forth my invention and stated its mode of operation, I wish to have it understood that I do not limit myself to the exact construction described, as the same may be varied in many ways by those skilled in the art without departing from the spirit of my invention; but

What I desire to claim, and secure by Letters Patent of the United States, is—

1. The combination, substantially as hereinbefore set forth, of the carbon-carrier racks G′ and G², supported in frames F′ and F², suitably insulated from each other, hangers I′ and I², depending therefrom, supporting carbon-holders by ball-and-socket joints, the horizontally-arranged carbons L′ and L², guide-pulleys supporting the same near the arc to keep said carbons in alignment, a track suitably supported, and pulleys adapted for the same to support the carbons and carbon carrier racks at their outer ends.

2. The combination, as hereinbefore set forth, of the carbon-carrier racks G′ G², frames F′ and F², carrying the same and suitably insulated from each other, hangers I′ and I², carbons carried thereby horizontally arranged, guide and supporting pulleys for the same near the arc to keep the carbons in alignment, guide and supporting pulleys connected to the hangers remote from the arc and running on a suitably-supported wire or track, a shaft, D, with spur-wheels thereon, adapted to engage and move said carbon-carriers, a clock-train for positively actuating said shaft, and electro-magnets for modifying the rotation of said shaft to keep the arc practically constant.

3. The combination, as hereinbefore set forth, of a shaft adapted to effect the feeding of an arc lamp through the instrumentality of a suitable motor, main and derived circuit magnets, and a rocker-arm controlled thereby, with a cross-arm adapted to engage a toothed wheel on said shaft and modify the rotation of the same, so as to keep the arc practically constant.

4. The combination, with the wheel *b*, carried by the shaft D, also carrying pawl and ratchet therefor, of the spring-actuated tooth *g*, substantially as described.

5. The combination of the shaft D, adapted to feed the carbons by rack and pinion through the instrumentality of a clock-train, loosely-mounted wheel *b* thereon having ratchet integral therewith, a pawl rigidly mounted upon said shaft engaging said ratchet, and a tooth interposed by the action of the main and derived circuit magnets between the teeth of said wheel to arrest the feed of the carbon or to advance the same by being impelled against said wheel to separate the carbons, or to be freed from said wheel by the differential action of said magnets to allow the clock-train to feed, substantially as described.

6. The combination of the shaft D, adapted to feed the carbon by means of racks and pinions through the instrumentality of the clock-train, the wheel *b* and ratchet *f* integral therewith, loosely mounted upon said shaft, with pawl carried by the same engaging said ratchet, the main and derived circuits S V, and the rocker-arm Q, connecting the two together, with cross-arm P, having spring actuated tooth *g*, for the purpose described.

7. The combination of the shaft D, adapted to feed the carbons of an arc lamp by means of racks and pinions through the instrumentality of a clock-train, wheel *b*, carried by said shaft and coupled thereto by pawl and ratchet, main and derived circuit magnets S and V, rocker Q, connecting the same, cross-arm P, with spring-actuated tooth *g*, adapted to co-operate with said wheel *b*, and tension-regulating spring and limiting-stops for the above.

8. The combination of a shaft, such as D, adapted to feed an arc lamp by means of a clock-train, a main and derived circuit magnet controlling the same through the agency of a rocker, Q, and tooth *g* engaging a pinion on said shaft, and the pivoted vibrating piece T, mounted on said rocker and coupling the yoke of either magnet thereto, whereby the cores of the magnet may move in a vertical line and rubbing against the interior side of said magnet be prevented, for the purpose set forth.

9. The combination, as hereinbefore set forth, with the rocker Q, of the pivoted vibrating piece T, held by a spring to the same, the cross-arm P and limiting-stops, the pin Y, depending from the yoke U, sustained by said vibrating-piece, and an automatic cut-out operated, substantially as described, by said pin.

10. A clock-train adapted to impart motion to one or more carbon carriers by means of a shaft, as D, a pawl and ratchet between the escapement of the clock-train and said shaft, so that the carbon-carriers may be retrograded without actuating the escapement, and a second pawl and ratchet, for holding said shaft in any desired position, operated at will.

11. A clock-train adapted to impart a positive motion to one or more carbon-carriers by means of a shaft, as D, to feed the carbons, a pawl and ratchet between the escapement of the clock-train and said shaft, so that the same may be freely retrograded, electro-magnets, and intermediate connections controlling the feed of said shaft by means of a loosely-mounted wheel coupled to the same by pawl and ratchet, so as to permit the aforesaid retrograde movement, substantially as described.

12. A clock-train adapted to impart positive motion to one or more carbon-carriers by means of a shaft, as D, to feed the carbons, a pawl and ratchet between the escapement of the clock-train and said shaft, electro-magnets controlling the action of said feed by means of a tooth engaging a loosely-mounted wheel coupled by a second pawl and ratchet to said shaft, whereby said shaft may be retrograded to separate the carbon-carriers and carbons, a milled head, *y*, for effecting such retrograde movement of said shaft, and a third pawl and ratchet brought into operation at

will for holding said shaft in opposition to the clock-train.

13. The combination, with the two carbon-carrier racks G′ and G², hangers I′ and I² adjustable thereon, each carrying its own carbon, and carbon-holders supported by ball and-socket joint in said hangers, between the same and the carbons, substantially as described, whereby the carbons may be adjusted in position and aligned, as set forth.

14. The combination of the carbon-carrier racks G′ G², the hangers and carbon-carriers supported from the same, holding the carbons in position, the shaft D, having pinions a' and a^2, engaging said carbon-carrier racks, a clock-train adapted to rotate said shaft in one direction and feed the carbons, a toothed wheel, b, loosely mounted upon said shaft and coupled thereto by pawl and ratchet, rocker Q, pivoted to the frame of the lamp, with cross-arm P adapted to engage said toothed wheel, and main and derived circuit magnets S and V, substantially as described.

15. The combination of the carbon carrier racks G′ and G², carrying the carbons, supporting-pulleys for the same at and remote from the arc to keep them in alignment, a shaft, D, having pinions a' and a^2 of different diameter engaging said carbon-carrier racks, a clock-train adapted to rotate said shaft to feed the carbons, main and derived circuit magnets controlling a rocker, Q, and cross-arm P, adapted to control the rotation of the shaft, limiting-stops and tension-regulating devices for the latter mechanism, a spring-held vibrating piece pivoted to said rocker, and a pin, substantially as Y, and a cut-out operated by the same.

In testimony whereof I have hereunto set my hand and seal, this 8th day of September, 1887, in the presence of two subscribing witnesses.

JAMES E. GASTON. [L. S.]

Witnesses:
D. F. MOURTAN,
A. W. CHANEY.