(No Model.) 2 Sheets—Sheet 1.

M. N. LYNN.

ELECTRIC LAMP.

No. 315,524. Patented Apr. 14, 1885.

Fig. 1

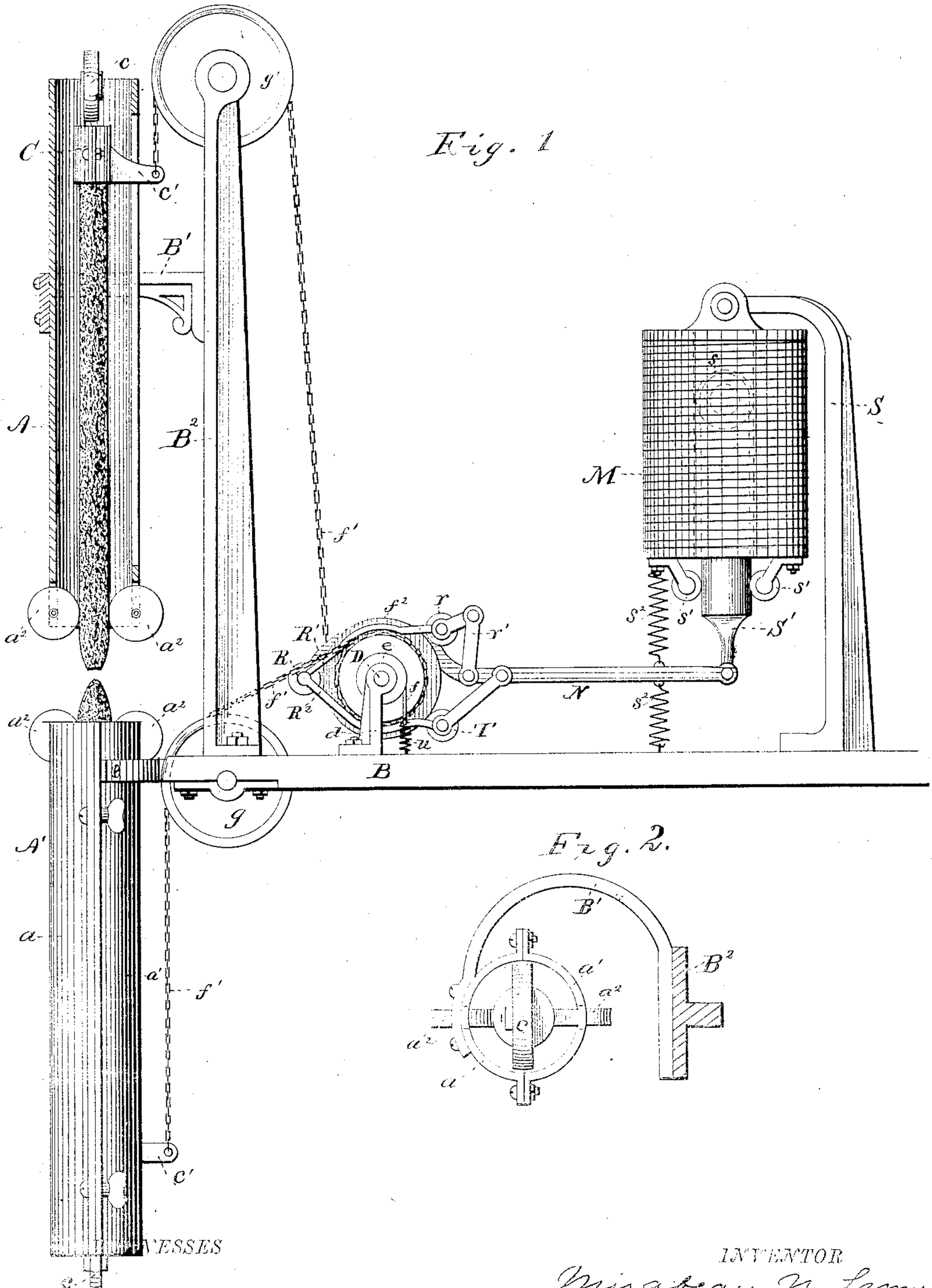

Fig. 2.

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Fig. 4.

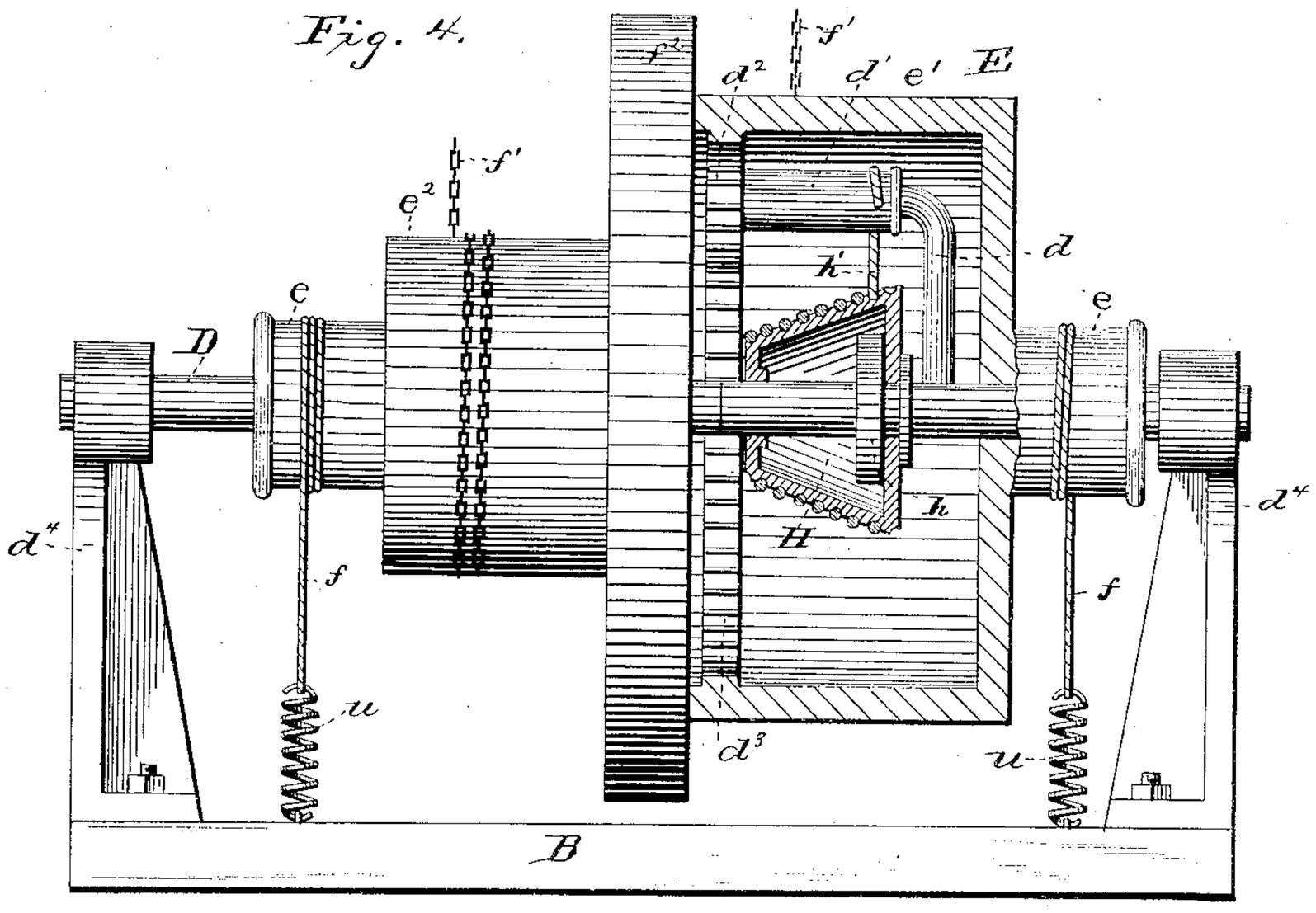


Fig. 3.

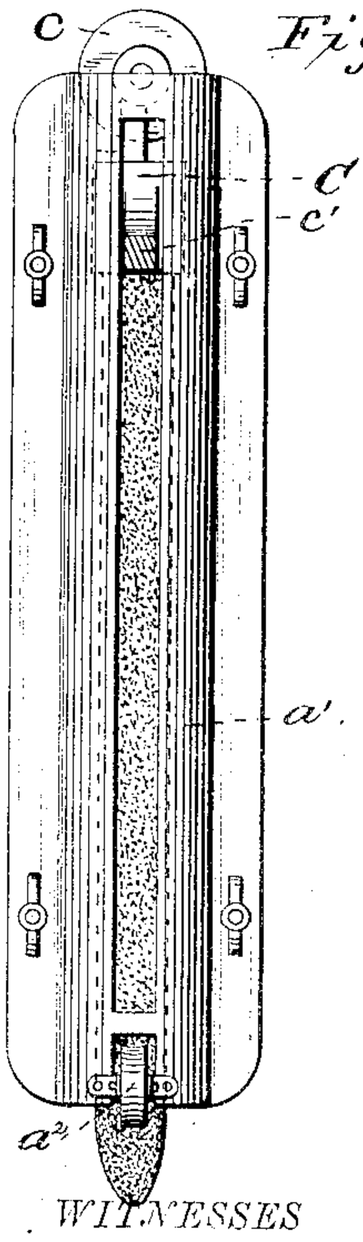


Fig. 5.

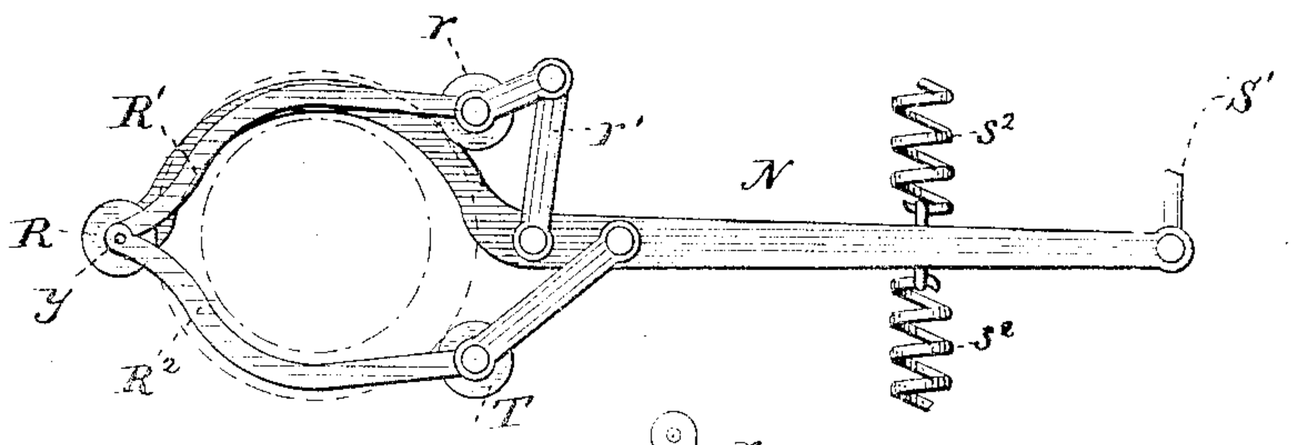
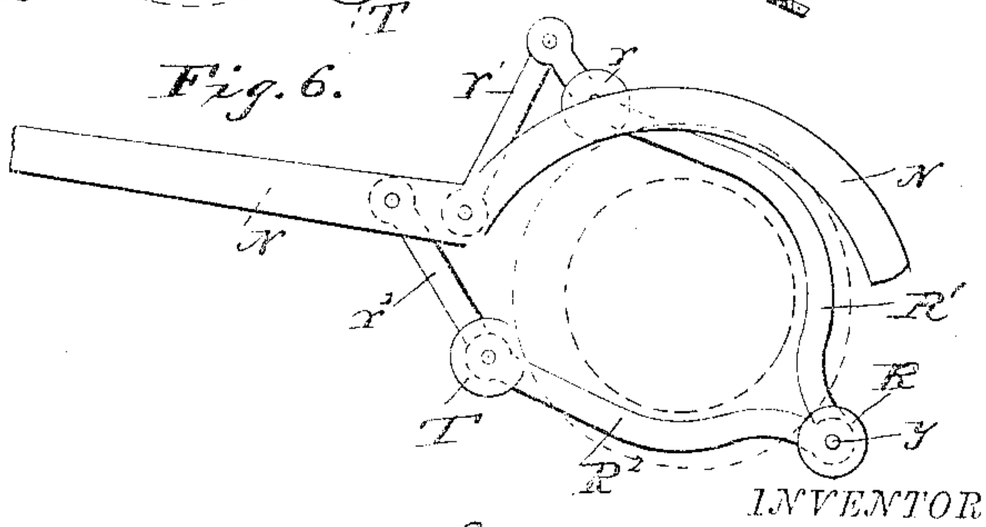


Fig. 6.



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UNITED STATES PATENT OFFICE.

MIRABEAU N. LYNN, OF RISING SUN, INDIANA, ASSIGNOR TO THE OHIO POWER AND LIGHT COMPANY, OF DAYTON, OHIO.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 315,524, dated April 14, 1885.

Application filed November 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, MIRABEAU N. LYNN, of Rising Sun, in the county of Ohio and State of Indiana, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

My present invention relates more especially to that class of electric-arc lamps containing two movable carbons which are caused to simultaneously approach or recede to feed the carbons or form the arc and at a rate proportional to the consumption of the carbons; and it consists, essentially, in the manner of supporting and mounting the operative parts of such a lamp, and also in certain improvements the mechanism for controlling and effecting in the simultaneous movements of the carbons, all as hereinafter more fully set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a lamp embodying and illustrating my invention. Figs. 2 and 3 are detail views of the guiding-tube for the carbons. Fig. 4 is a side elevation, partly in section, of the winding-drum and its attachments. Fig. 5 is a view of the brake-lever and connections. Fig. 6 is a view of the brake-lever and its connections, taken on the opposite side from Fig. 5, showing the lever elevated and the brake applied.

Similar letters of reference in the several figures indicate the same parts.

The tubular guides A A′, in which work the carbon-carriers, are supported at or near the extreme end of the bed-plate B, the upper guide, A, being secured to a curved horizontal arm, B′, fastened to the vertical post B^2, and the lower guide, A′, being bolted to the edge of the bed-plate. These guides A and A′ are each made in two sections, *a a′*, provided with flanged edges and united by thumb-screws, so that one section can readily be removed to permit access to its interior. Within these guides work the carbon-carriers C, each provided with a roller, *c*, slightly less in diameter than the interior of the guide, and the latter is provided with friction-rolls a^2 to guide and support the carbons. In the rear section of each guide is cut a longitudinal slot for the passage of the arm *c′* on the carbon-carrier, and to this arm is attached the cord or other suitable operating mechanism for moving the carrier up and down in the guide.

The manner of constructing, arranging, and supporting the guide-tubes and carbon-carriers, as above described, is advantageous in that the carbons are projected at about equal distances above and below the bed-plate whereon the operating mechanism is located. Moreover, the carbon carrying and guiding mechanism is practically isolated from the feeding mechanism, and the carbons and their carriers are always accessible for inspection and repair.

The operating mechanism, which is here shown in connection with the guides and carriers above described, is mounted upon the bed-plate back of the vertical post B^2. It consists, essentially, of fixed shaft D, supported in suitable bearings, d^1 d^1, secured to the bed-plate, and carrying the drum E, which latter is free to turn upon said shaft. The drum E is composed of five sections or divisions—the two outer and smaller sections or pulleys, *e e*, upon which the cords *f f* are wound in opposite directions, the differential pulleys or drums *e′* e^2, to which the connecting chains *f′* *f′* are fastened, and the relatively narrow but enlarged pulley or brake rim f^2, upon which the brake mechanism operates. The cords or chains *f f* are wound in relatively opposite directions upon the drums or pulleys *e e*, the cord attached to the lower carbon-carrier passing over a pulley, *g*, supported on the bed-plate, and being wound upon the smaller drum or pulley, e^2, while the other chain, after passing over a pulley, *g′*, mounted in the top of the post B^2, is fastened to the larger drum or pulley, *e′*. The relative diameters of the two drums or pulleys *e′* e^2 are such as will compensate for the unequal consumption of the carbons, so that as the drums revolve the traverse of the upper positive carbon will be about twice as great of the lower negative carbon, and as the leverage exerted by the dependent carriers in opposite directions is greatest on the side attached to the larger drum the other carrier is made relatively heavier sufficiently so to compensate for the difference in the leverage

and to maintain the carriers in equilibrium. Turning loosely upon the shaft D, and located within the drum E, is a cone-pulley, H, and within the said pulley a spring, *h*, whose ends are attached, respectively, to the shaft and pulley.

To the shaft is secured a crank-arm, *d*, upon which is mounted a sleeve, *d'*, provided at one end with a pinion, d^2, co-operating with the internal toothed-ring, d^3, secured to the drum E. A cord, *h'*, is attached to and wound upon the sleeve *d'*, the opposite end being secured to the larger end of the cone-pulley H, constituting a fusee and barrel, the design being to secure a constant and uniform pressure or force upon the drum in the direction necessary to effect the simultaneous approach of the two carbons. Not only is a practically constant and uniform feeding force thus maintained, but the mechanism is adapted to be reset when run down by the simple act of inserting the carbons, for when the lower carbon-carrier is drawn down to permit the insertion of a carbon the drum is rotated and the cord unwound from the pulley onto the sleeve, thus winding up the spring. As the spring tends at all times to draw the carbons together, it is necessary that some means be provided for controlling such movements to form and preserve the normal arc, and with this end in view I have applied an automatic brake to the drum, controlled by the current, and acting in opposition to the spring with a force varying in proportion to the resistance of the arc. This regulating and controlling mechanism is composed of an electro-magnet or solenoid, M, included in the lamp-circuit, and suspended by a pivot to a support, S. Within said solenoid is a core-piece, S', carrying a roller, *s*, at one end, and working between guide-rollers *s' s'*, fastened to the end of the solenoid, and to the lower end of the core is pivoted the brake-lever N, which is sustained and balanced by the opposing springs s^2 s^2, extending the one from the solenoid to the lever and the other from the lever to the bed-plate. To the lever N are pivoted the links r' r^2, the opposite ends of said links being pivoted, respectively, to the curved links or levers R' R^2, extending the one above and the other beneath the pulley *e'* and to one side of the brake-rim f^2. The links or levers R' R^2 are pivoted together on the axis *y* of a roller, R, which latter rests in contact with the brake-rim f^2. The lever R' carries a similar roller, *r*, and the lever R^2 a rubber or friction roller or block, T. Both of said rollers *r* and T making contact with the brake-rim. The lever N is extended beyond the point of attachment of the links r' r^2, and curved, as shown, to clear the pulley e^2, and the end of said lever is arranged to bear upon the pivot *y* of the roller R when the former falls to the feeding-point. In this position the outer end of the lever is sustained upon the brake-rim by the rollers *r* R, lever R', and link *r'*, the friction-roller T resting but lightly, if at all, in contact with the brake-rim. When the lever N is elevated by the solenoid, it first causes a backward movement of the levers R' R^2 upon their sustaining-rollers *r* R, until the end of the lever clears the pivot of the roller R, and the further movement of the lever N operates through the links r' r^2 to draw the ends of the levers R' R^2 together, thus causing the brake-rim to be firmly grasped between the rollers *r*, R, and T, the latter being made of rubber or some elastic material, so as to increase the friction or "bite" upon the brake-rim. The springs s^2 s^2 operate not only to in a measure sustain and balance the lever N, but also to insure the action of the lever N upon the levers R' R^2 and insure the proper contact with the brake-rim.

The levers N, R', and R^2, with the rollers arranged in the manner shown and described, constitute an efficient brake mechanism, which will readily grasp and retain the drum when the lever N is elevated by the attraction of the solenoid, but will afford little or no opposition to the rotation of the drum when the lever falls. When there is no current passing through the coils of the solenoid, the lever is sustained by the rollers R *r* and the upper spring, s^2, the rubber roller T resting but lightly, if at all, against the brake-rim f^2; hence the drum is free to be revolved by the spring *h* through the connecting mechanism, such as described. As soon, however, as the current is established through the solenoid by the contact of the carbons, the end of the lever is elevated, the brake-rim is grasped by the rubber roller T, and the drum is moved back against the power of the spring. This backward movement of the drum continues until the carbons have been separated a sufficient distance to form the desired arc. As the carbons are thus separated the power of the solenoid is decreased in proportion to the increase in the resistance of the arc until a point is reached where the force of the spring *h* and the power of the solenoid will exactly balance each other, and the carbons will be held at the proper distance apart to form the desired arc.

As the carbons are consumed, and the resistance increased thereby, the power of the solenoid gradually decreases, and the force of the spring, which is at all times constant, predominating, the carbons are fed together proportionally. This movement of the carbons under the differential action of the two opposing forces, the one constant and the other varying in proportion to the resistance of the arc, continues until the lever in its downward movement relieves the grip of the rubber roller T, and permits a new feed to be made.

The springs s^2 s^2, acting in opposition to each other upon the lever, tend to support and retain the latter in position, at the same time relieving the friction upon the two rollers, and permitting the core of the solenoid to be raised and lowered without allowing it to become displaced or fall too low.

The carbons usually employed in lamps of

this kind are of unequal size and weight, and although the carbon-carriers are balanced, there would be more or less disturbance of the balance by the variation in the relative weight of the upper and lower carbons. To provide for this difficulty, I have added the two pulleys *e e* to the drum E, and wound upon them, but in relatively opposite directions, the cords *f f*, having the tension-springs *u u* attached thereto.

As thus arranged, one of the springs is adjusted to balance the upper carbon and the other the lower, no matter how much they may differ in weight when inserted in the carriers.

The cord to which the spring for balancing the lower carbon is attached is unwound as the carbon is consumed and fed upward, and the tension of said spring is thus decreased proportionally to the diminution in weight. On the other hand, as the upper carbon decreases in weight and is fed forward, the tension of its balancing-spring is somewhat increased, but in a uniform degree, thus rendering the overbalancing power practically uniform.

Having thus described my invention, what I claim as new is—

1. In an electric lamp, the sectional and slotted guide secured to the vertical post by the bent arm, in combination with the carbon-carrier, substantially as described.

2. In an electric lamp, and in combination with the carbons, the carbon-carriers, intermediate connecting mechanism, and the differential pulleys, the fusee, barrel, and connecting mechanism, whereby a constant and uniform feeding force is applied to the pulleys, substantially as described.

3. As a means for effecting the uniform rotation of the mechanism for controlling the feed of the carbons, and in combination therewith, the fusee, barrel, and operating-spring arranged to operate upon the carbon-feeding mechanism, substantially as described.

4. In an electric lamp, and in combination with the carbon-carriers, the differential pulleys and connecting-chains, a spring-motor operating with a constant and uniform force to feed the carbons, and a brake actuated by an electro-magnet and operating in opposition to the spring-motor, substantially as described.

5. In an electric lamp, and as a means for effecting the feed of the carbons and formation of the arc, a rotating drum with which the carbon-carriers are connected, a spring-motor operating upon said drum with a uniform power, and a brake actuated by an electro-magnet operating upon said drum in opposition to the spring-motor, substantially as described.

6. In an electric lamp, and in combination with the rotating drum, differential pulleys, connecting-chains, and carbon-carriers, the fusee, and barrel located within the drum and geared thereto, substantially as described.

7. In an electric lamp, and in combination with the carbon-carriers, connecting-cords, and rotating drum provided with the differential pulleys, a spring-motor acting upon said drum in a direction to cause the approach of the carbons, a brake-rim also applied to said drum, and a friction-brake and actuating electro-magnet, said brake being applied in opposition to the spring-motor with a force proportional to the resistance of the arc, substantially as described.

8. In combination with the rotating drum, attached carbon-carriers, spring feeding mechanism, and brake mechanism, the balanced carbon-carriers, the small pulleys, reversely-wound cords, and attached springs, substantially as described.

9. In an electric lamp, and in combination with the rotating drum, attached carbon-carriers, and feeding mechanism, the lever carrying the links, friction-rollers, and the rubber roller, substantially as described, said rollers operating on a brake-rim attached to the drum and the lever operated by an electro-magnet, as and for the purpose set forth.

10. In an electric lamp, as a means for controlling and effecting the movements of a drum to which the carbon-carriers are attached, and in combination with said drum, a lever operated by an electro-magnet and supported upon a brake-rim by two rollers, one journaled in the lever and the other in a supplemental lever pivoted at one end to the first-mentioned lever and at the other connected by a link, and a third lever connected to the first-mentioned lever and carrying a friction-clamp applied to and operating upon the brake-rim, substantially as described.

11. In an electric lamp, the combination of the carbon-carriers, the tubular guides within which they move back and forth, the friction-wheels on the carriers, and the friction-wheels mounted on the tubes and adapted to support the inner ends of the carbons, substantially as described.

12. The combination of the tubular guides in which the carriers work with the carriers having the arms projecting through the slots in the tubes, the cords to which said arms are connected, the pulleys and the shaft, and the differential pulleys for imparting to the carriers simultaneous motions of different degrees, substantially as described.

13. The combination, with the movable carriers and the main shaft, of the pulleys by which the carriers are given simultaneous though unequal motions, the drum mounted on said shaft, and the fusee and barrel motor connected to said drum, substantially as described.

In witness whereof I, the said MIRABEAU N. LYNN, have hereto set my hand this 22d of October, 1883.

MIRABEAU N. LYNN.

Witnesses:
C. P. JACOBS,
H. H. FULTON.