(No Model.) 2 Sheets—Sheet 1.

J. OLMSTED.

ELECTRIC LAMP.

No. 255,186. Patented Mar. 21, 1882.

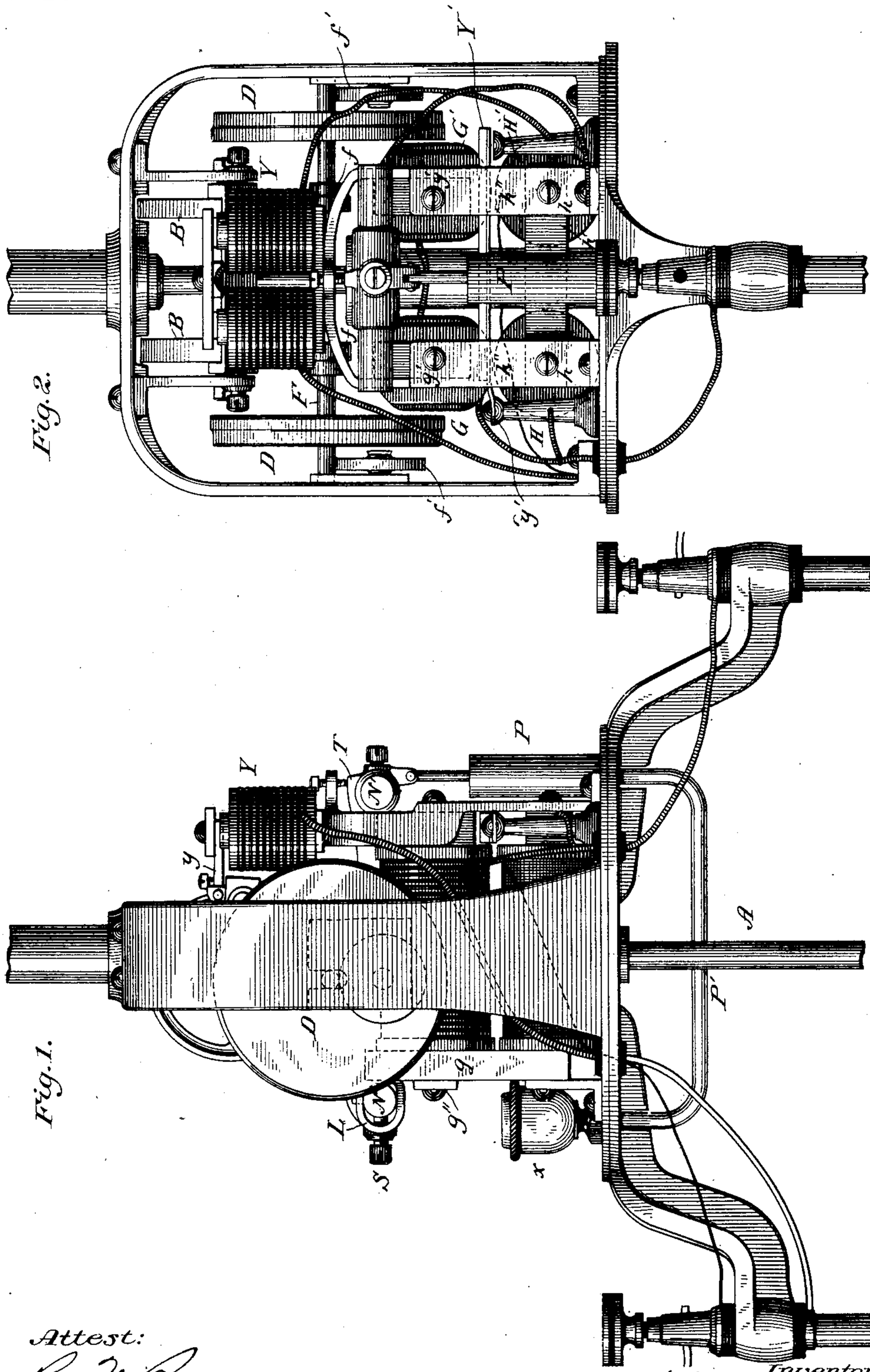

Fig. 2.

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2,

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Fig. 4.

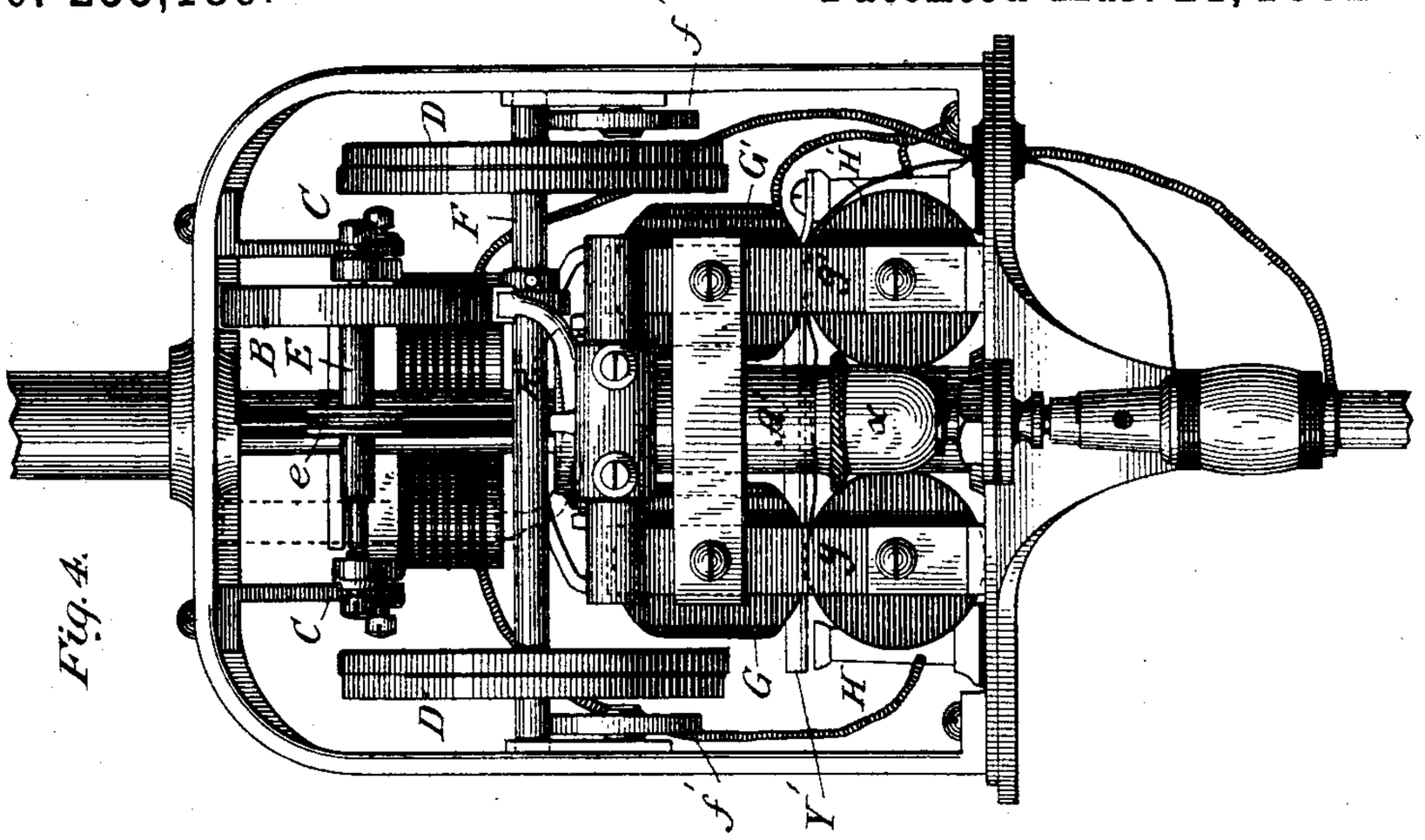

Fig. 5.

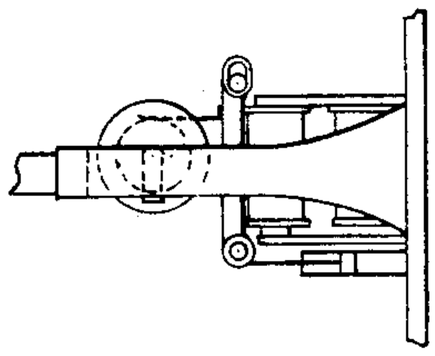

Fig. 3.

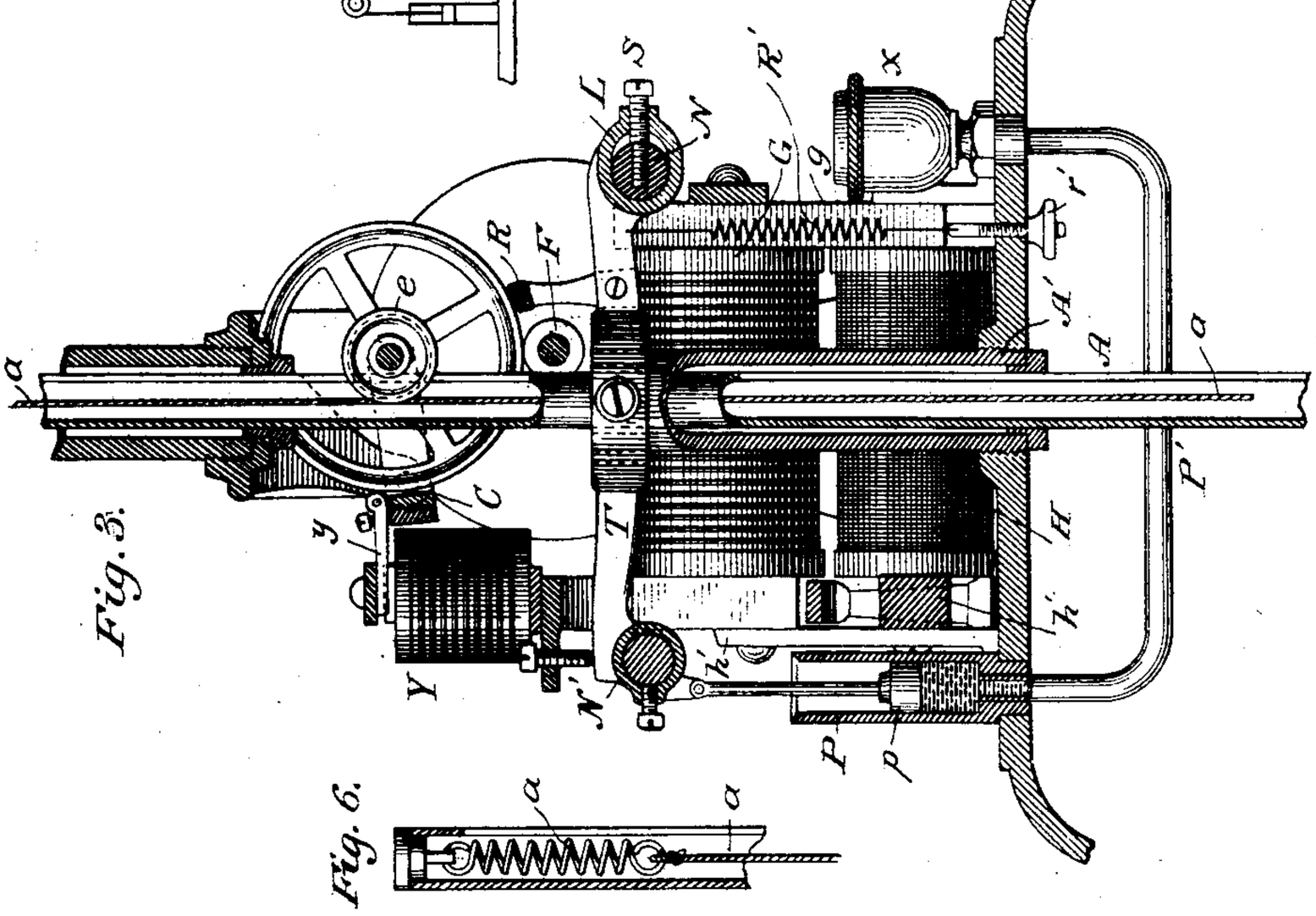

Fig. 6.

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UNITED STATES PATENT OFFICE.

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ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 255,186, dated March 21, 1882.

Application filed June 23, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH OLMSTED, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification, reference being had to the drawings accompanying and forming a part thereof.

My invention relates to electric lamps in which the light is produced by a powerful current of electricity passing between the juxtaposed points of two pencils of carbon, which are caused to approach each other by the instrumentality of suitable feed-regulating mechanism, the rate of the feed motion being dependent upon and commensurate with the consumption of the carbons and the strength of the current passing through them.

The invention involves the employment and disposition of special mechanism, hereinafter to be described, for accomplishing the above results, the nature of the said mechanism being such as, first, to limit the feed due to the consumption of the carbons or to slight variations in the current-strength to a slow and even motion; second, to cause the carbons to drop instantly together when from any cause an interruption of the arc has taken place or its length and resistance abnormally increased; and, third, to render more accurate and delicate the action of the electro-magnets controlling the feed.

In the drawings hereto annexed, Figure 1 is a side elevation of the operative portions of a lamp embodying my invention; Fig. 2, a rear illustration of the same; Fig. 3, a central vertical section of the feed mechanism; Fig. 4, a front view, in elevation, of the same. Fig. 5 is an illustration of the method of applying the magnets forming part of this invention to a lamp of different construction; and Fig. 6, a sectional view, in detail, of a portion of the carbon-carrier.

Similar letters in the several figures refer to corresponding parts.

A is the hollow carbon-holding rod, along one side of which is a slot of sufficient width to permit the partial introduction of the grooved pulley-wheel *e* on a shaft, E, journaled at the end of the long arm of a swinging frame, C C, pivoted in two arms depending from the stationary lamp-frame, as shown in Fig. 2. Around the pulley *e* passes with one or two turns a cord, *a*, contained within the hollow holder, its ends being held by hooks or otherwise fastened to pins at opposite ends of the interior of the holder. From this it will be seen that as the carbon-holder rises or descends it causes the pulley *e* and shaft E to revolve, and that if the cord *a* be sufficiently taut or wound about the grooved pulley *e* several times, the descent of the holder will depend upon and be controlled by the revolution of shaft E. In order that the cord may always be taut, a small spiral spring, *a'*, is used to connect its upper end with the hook inside the hollow holder. In this way the slack is always taken up by the spring. As a substitute for the cord and pulley, a rack and pinion may be used, the carbon-holder in such case being solid and threaded, and the pulley supplanted by a pinion.

B B are two disks or brake-wheels of equal diameter, fixed to shaft E on opposite sides of pulley *e*. These wheels may be either smooth or serrated about their peripheries.

Immediately below the shaft E is a second shaft, F, journaled in grooves in the opposite sides of the lamp-frame, and made vertically adjustable by the anti-friction wheels *f' f'*, upon which it rests. In place of the wheels *f' f'*, however, ordinary movable and adjustable plates may be used, in which the ends of the shaft are journaled.

f f are two wheels of small diameter, fixed to shaft F in such position as to engage with the wheels B B when the latter are lowered by the swinging frame C C.

On each end of the shaft F are secured the flat circular boxes D D. These are formed from thin sheet metal, and contain a number of radial arms in their interior, so that when partially filled with oil, glycerine, or a similar heavy fluid, they act as retarding or brake mechanism to the revolution of the shaft to which they are fixed.

Beneath the above-described system of shafts and wheels are located the electro-magnets. These consist of two pairs of cores, G G' and H H', the first pair being wound with wire of low resistance, included in the main or light

circuit, the latter wound with fine wire of very high resistance, forming part of a shunt or derived circuit around the lamp, the direction of winding in both pairs being such as to produce an opposite polarity as between the adjacent poles of the cores of the same pair, and the same polarity as between any pole of one pair and its corresponding or adjacent pole in the other. At one end the poles of the main magnets G G′ are free, while those of the shunt-magnets lying beneath them are connected by a magnetic cross-bar, *h*′, bars *h*″, of brass or other non-magnetic material, being used to connect the two pairs of cores, and serving as supports. At the rear or opposite ends of the cores the upper set is connected to the lower by the vertical magnetic cross-bars *g g*, a horizontal connection serving simply as a support, being made by a non-magnetic bar, *g*″. This arrangement of cores and connecting-bars may be regarded as forming a single horseshoe electro-magnet, bent back upon itself, each branch containing a bobbin of coarse wire included in the main circuit, and another of high resistance included in the shunt or derived circuit, these latter coils being wound to exert a magnetic effect opposed to that of the first, from which it follows that the points of maximum attraction of opposite polarity to that in free ends of cores G G′ will vary according to the relative strength of the current in the main and shunt circuit coils; and this would be true, though to a less extent, were the poles *h* not joined by a magnetic bar.

Between the cores of the electro-magnets is fixed a tube, A′, through which passes the carbon-holder A, and to which is pivoted a centrally-branched armature-lever, T. At one extremity of the said lever (being that extending slightly beyond the free poles of the magnets G G′) is fixed a soft-iron armature, N′. The opposite end of lever T is provided with a tube, L, elliptical in cross-section, in which a similar armature, N, is inserted and adjustably held by a screw, S.

P is a dash-pot, the piston *p* of which is linked to armature-bar T, and is made to fit the walls of the cylinder, so that no oil or glycerine which may be used therein can escape between them. In the bottom of the cylinder is a small aperture, through which a passage-way for the liquid is formed, said passage being continued to a closed oil-cup, *x*, by means of a small pipe, P′. As the piston rises or falls it draws the liquid from cup *x* into lower part of cylinder P, or forces it back, as the case may be, and from this construction it is evident that no leakage can take place when the lamp is tipped or laid on one side, as in transportation. By means of cup *x*, which is closed by a screw-cap, the level of the liquid is adjusted or fresh liquid introduced. The cup *x* is not necessarily placed at such a distance from cylinder P as is shown in the drawings. It may be placed immediately beside the cylinder or made in one piece with it, the interior spaces in the two being separated by a partition or diaphragm in which is an aperture of the requisite size.

At a short distance from the fulcrum of lever T, and in the side of the armature N, is a bifurcated upright, R, screwed to or integral with the lever, and of such length and shape as to raise the brake-wheels B B a short distance above the friction-wheels *f f*. An adjustable tension-spring, R′, with screw *r*′, serves to draw down the armature N.

The above described devices form the feed mechanism proper, their action being as follows: Assuming that the carbons are in contact when a current is directed through the lamp, the main magnets become strongly energized, the points of maximum attraction being the one at the free poles *g*′ and the other at some point beyond the point formed between the rear poles of the main cores and the connecting-bars *g*. Armature N will consequently be drawn down in front of poles *g*′ against the force of the spring R′. Arms R, being raised, carry up the brake-wheels B B and separate the carbons, the wheels being prevented from revolving by their engagement with the arm. In this condition the parts remain until by the consumption of the carbon the length and consequent resistance of the arc increases. This causes a greater amount of current to flow through the shunt-magnets and a corresponding change in the position of the points of attraction opposed to that existing in the free poles of the magnets, causing them to recede from their former position until with the aid of spring R′ the end of lever T, to which armature N is attached, is drawn down. This movement continues until wheels B B are lowered into contact with friction-wheels *f f* and released from engagement with arms K. The weight of the carbon-holder and the carbon attached instantly causes the shaft E to revolve, and, were it free, to turn with a rapidity that would cause the carbons to fall together in an exceedingly short time. The shaft F, however, which is capable of only a slow rotation when impelled by the weight which is now applied to it, controls, by means of the friction-wheels, the rotation of brake-wheels B B, and only allows the carbon to slowly descend, thus giving ample time for the normal magnetic conditions to be re-established and to overcome the inertia of the lever, which is drawn down on the side of the free poles at just the proper moment, raises the brake-wheels B B off from the friction-disks *f f*, and checks their rotation. In this manner a slow, steady, and even motion of all the parts is assured, the feed motion of the carbons being controlled by the retarding oil-chambers D D, and the rapid movement of the armature being restrained by the dash-pot P. The carbon points therefore will maintain their relative position, and will never fall together, unless the current is actually broken for an appreciable length of time. It sometimes happens,

however, that the continuity of the circuit in the lamp is broken, as by the breaking off of pieces of the pencils or by sudden interruptions in the current, which extinguishes the arc. In this case the only path for the current is through the fine wire of the shunt-magnets, so that should the interruption continue for any length of time, the lamp, as well as the generator supplying the current, is liable to be injured. To provide against this, and to bring the carbons instantly into contact when the circuit in the lamp has for any cause been interrupted, I employ the mechanism illustrated in connection with the feeding devices. It consists of a small electro-magnet, Y, the coils of which are in a circuit independent of the lamp, and which is only closed when by the reason of the cessation of current through the coils G G′ the cores inclosed thereby have lost their magnetic attraction, or when by reason of an abnormally-increased length of the arc the strength of the current in said coils has been so much reduced as to exert only a small proportion of their normal magnetic effect. The devices for effecting this consist of an ordinary swinging magnetic arm, Y′, with an adjustable retractile spring, *y′*, arranged in any convenient manner in the neighborhood of one or both of the magnetic poles *g′*, and so adjusted that when the magnetism in said pole or poles has been reduced to a certain predetermined limit it will recede from the magnet and complete the circuit through magnet Y.

In front of magnet Y is an armature attached to an arm, *y*, forming the short arm of the swinging frame C C. When under the conditions above specified the magnet Y is energized it draws down its armature. This raises the wheels B B off from the arm K or friction-wheels *f f*, as the case may be, so that being free the weight of the carbon and its holder causes them to revolve with considerable rapidity. In this way the carbon points come together before any damage can have been done to the lamp or machine, and as soon as the circuit is re-established through the carbons the magnet Y loses its power, and the wheels B B fall upon the arms K.

In Fig. 5 I have shown a modified application of the improved form of electro-magnets to a lamp. In this case the arms K are supplanted by a spring, which acts as a brake with wheels the equivalent in other respects to the ones described. The same magnets are capable of being applied to lamps of other kinds, the main advantage claimed for them being that both ends of the cores of the main magnet are utilized, their action being controlled by the opposing forces of the shunt or high-resistance cores.

In practice many portions of the above-described lamp may be considerably varied without departing from the spirit of my invention. For instance, the retarding devices D D may be simple fans, or the rotation of the shaft F may be controlled by a time-escapement. So, too, for the remaining portions of the lamp, mechanical changes may in many instances be made without affecting the main object which I have in view.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in an electric lamp, of a carbon-carrier, a shaft capable of both rotary and vertical movement, and carrying one or more brake-wheels whose rotation is made to depend upon the movement of the carrier, an electro magnet and pivoted armature for controlling the vertical movement of the said brake-wheels, and one or more friction-wheels placed in a position to intercept the downward movement of the brake-wheels at a predetermined point and release them from engagement with the armature, as and for the purpose set forth.

2. The combination, in an electric lamp, with a pinion-shaft or its equivalent connected with the carbon-carrier, and capable of both rotary and vertical motion, of a second shaft capable of a retarded rotary motion only, and an electro-magnet having an armature arranged to raise and lower the pinion-shaft so as to prevent the rotation of the same when raised, but to permit it to revolve when lowered into engagement with suitable friction-wheels on the second shaft, as and for the purpose described.

3. In an electric lamp, the combination of a carbon-carrier, one or more brake-wheels carried by a swinging frame and connected with the carbon-carrier so as to be revolved by the movement thereof, an electro-magnet and an armature adapted to control the vertical movement of the said brake-wheels, and rotary retarding devices placed in such position with reference to the brake-wheels that the latter when brought by the movement of the armature into contact therewith will be freed from engagement with the said armature and allowed to slowly revolve for a sufficient length of time to effect the necessary feeding together of the carbons, as described.

4. In an electric lamp, the combination, with a pivoted armature and the feed mechanism connected therewith, of an electro-magnet the cores of which form a U having its ends bent back upon themselves and wound with coarse wire included in the main circuit, the portions of the cores adjacent to the connecting-bar or neutral point being wound with fine wire in a shunt about the lamp, and exerting an opposite magnetic effect to that produced by the main coils, as and for the purpose set forth.

5. The combination, with an electro-magnet composed of cores G G′ and H H′, magnetically connected in pairs, as described, of an armature-bar and armatures N N′, the bar being pivoted at or near a point midway of the length of the main cores G G′, so that the attraction of both poles of the said cores may be utilized, as set forth.

6. The combination, with the armature-bar

T, of a dash-pot composed of two chambers, P and *x*, the interior spaces within which are filled with oil or a similar heavy fluid and connected by means of a narrow duct or opening, as described.

7. In an electric lamp, the combination of a carbon-carrier, a shaft carrying a pinion or its equivalent engaging therewith, electro-magnetic detent mechanism controlling the revolution of the shaft, an armature connected with the pinion or its shaft, and an electro-magnet included in a normally-open shunt-circuit about the lamp and operating by its attraction for the armature on the closing of the said circuit to release the pinion from engagement with the detent mechanism and allow the carbon-carrier to fall, as and for the purpose set forth.

8. In an electric lamp, the combination of a carbon-carrier, one or more brake-wheels carried by a swinging frame and connected with the carbon-carrier, so as to be revolved by the movement thereof, electro-magnetic detent mechanism for maintaining the movement of the brake-wheels proportionate to the consumption of the carbons, and an electro-magnet in a normally-open shunt or derived circuit about the lamp operating on the closing of said circuit to raise the brake-wheels out of engagement with the detent mechanism by its attraction for an armature attached to the swinging frame, substantially as and for the purpose set forth.

9. The combination of pinion-shaft E, carried by a swinging frame, wheels B B, and a shaft, F, journaled in fixed or adjustable bearings and provided with rotary retarding devices, with an electro-magnet and armature-bar T, having a projecting arm, K, for raising or lowering the shaft E, as and for the purpose set forth.

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