(No Model.)

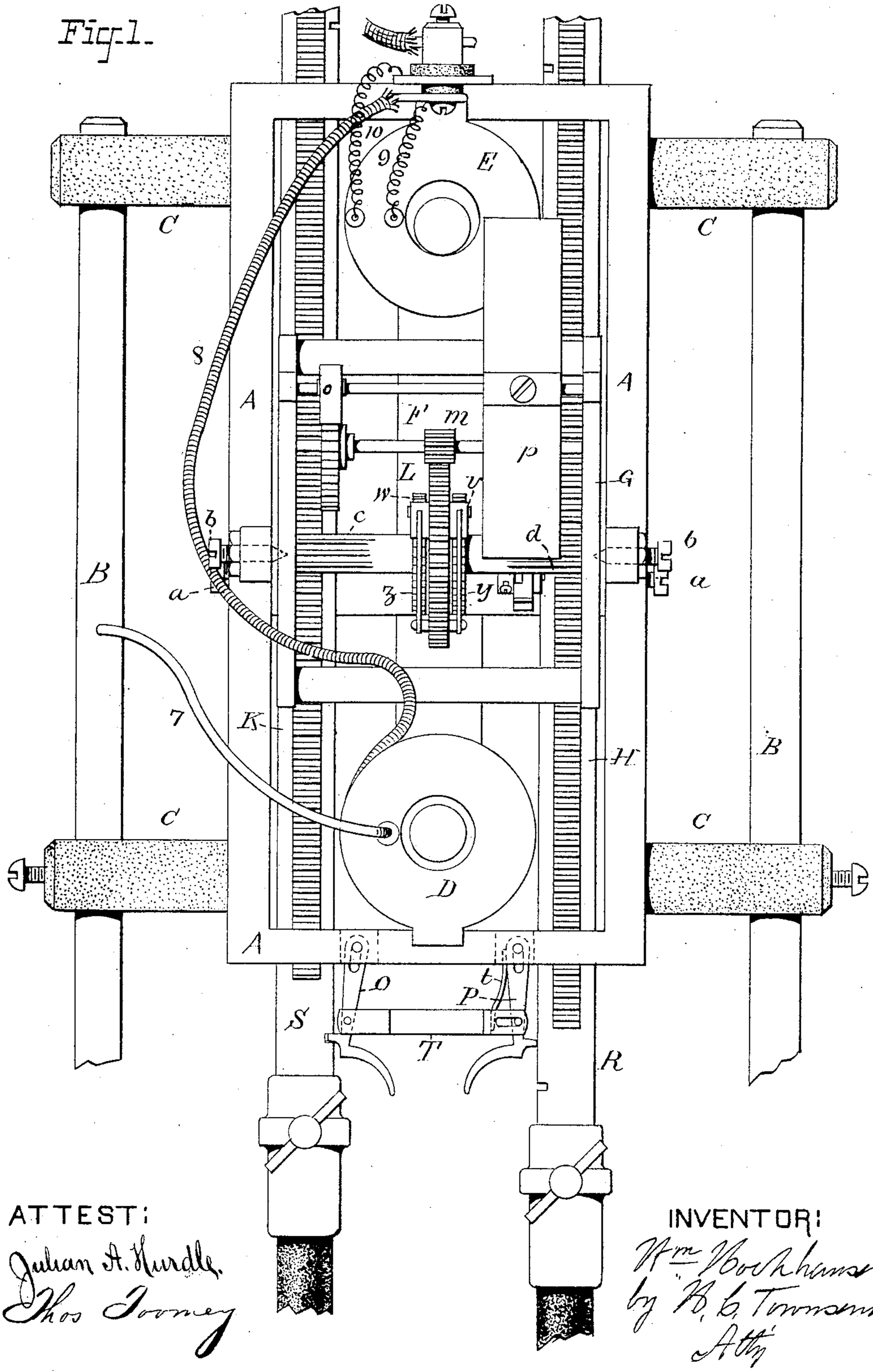
2 Sheets—Sheet 1.

W. HOCHHAUSEN.

ELECTRIC ARC LAMP.

No. 271,458. Patented Jan. 30, 1883.

Fig. 1.



ATTEST:

Julian A. Hurdle.
Thos Toomey

INVENTOR:

Wm Hochhausen
by R. G. Townsend
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(No Model.)

2 Sheets—Sheet 2.

W. HOCHHAUSEN.

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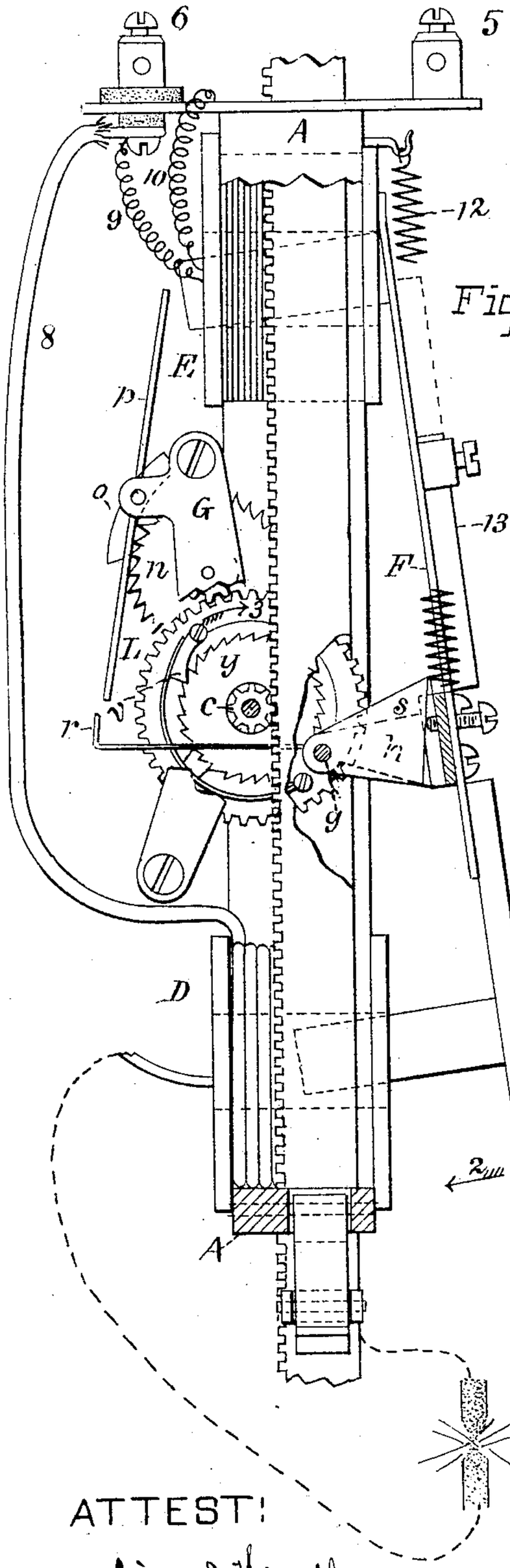

Fig. 2.

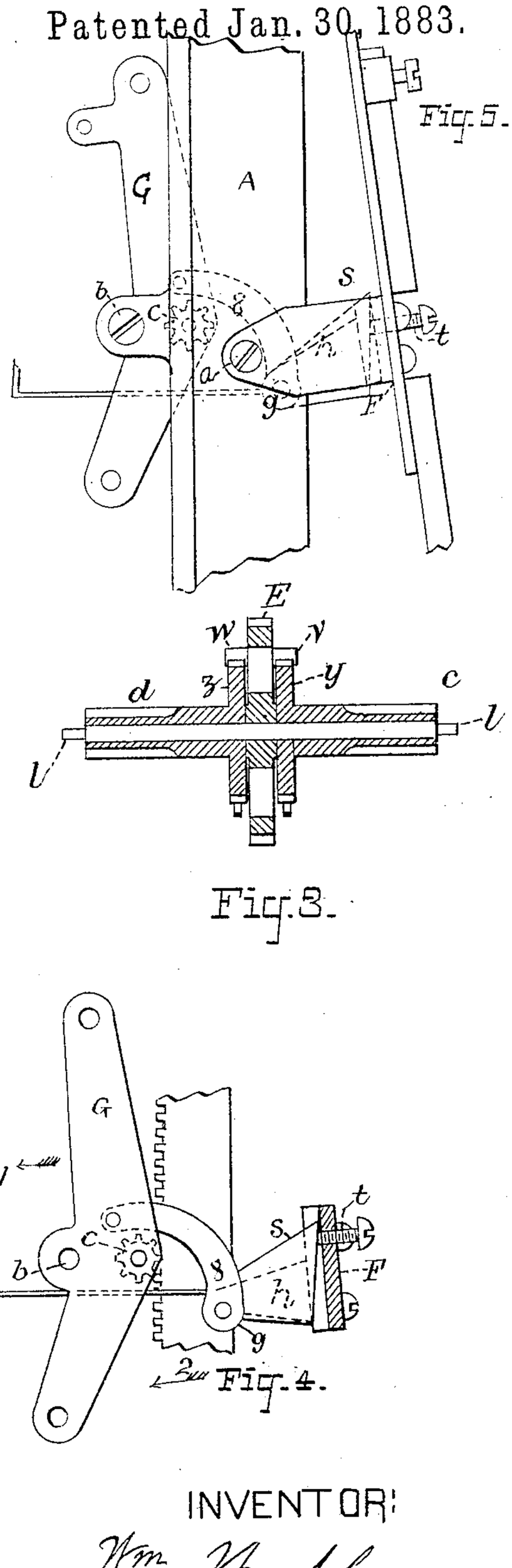

Fig. 5.

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM HOCHHAUSEN, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 271,458, dated January 30, 1883.

Application filed February 3, 1882. (No model.)

To all whom it may concern:

Be it known that I, WM. HOCHHAUSEN, of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

My invention relates to electric lamps of the type in which the movement of the carbon sticks or pencils toward one another to compensate for combustion is automatically controlled by the action of clutches or by the movement of a train of wheels geared to the carbon-carrier, the action of the clutch or the movement of the train being dependent upon electro-magnets or other devices, influenced by the electric current, according to the varying combustion of the carbons.

My invention relates more particularly to electric lamps of the above type in which two sets of carbons are employed, one set being held from movement until the carbons of the other set have been consumed, when the former set is released and consumed in the same manner as the latter.

The object of the first part of my invention is to so combine a single retarded gear-train and detent with two carbon-carriers that either carbon-carrier may be controlled by said train and detent in the ordinary manner without interference with or from the other, the combination being such that while one carbon-carrier is in action the other is stationary, while, vice versa, when the first carbon-carrier has completed its movement and its carbon is consumed the second may be controlled in the same manner as the first by said train, so that its carbon may in turn be fed and consumed.

The object of the second part of my invention is to provide an automatic locking and releasing device applicable to carbon-carriers however fed or controlled, and independent of the feed-controlling devices so constructed that either carbon-carrier at the completion of its movement may, through said releasing device, unlock the other, and so that, further, either carbon-carrier may be raised to the starting-point for the insertion of a fresh carbon, and locked at that point while the other carbon-carrier is feeding, and without interfering with the action of the latter carrier.

To these ends my invention consists in a certain novel and simple combination of parts for connecting the two carbon-carriers to the same retarding and governing mechanism, the nature of which will be specified in the claims.

My invention also consists in the combination, with two carbon-carriers, of certain novel intermediate locking and unlocking devices, constructed so that either carbon may be locked and when locked may be released by the other.

My invention consists, also, in other novel constructions and combinations, which will be specified in the claims.

In the accompanying drawings, Figure 1 is a rear elevation of the lamp. Fig. 2 is a side elevation, with a portion of the supporting-frame removed in order to better show the internal construction. Figs. 3 and 4 show in partial view and in section details of construction. Fig. 5 is a side view of a portion of the armature-lever, showing the manner in which it is mounted in the frame and its connection to the lever carrying the gear-train.

A represents the supporting-frame, upon which are mounted the electro-magnets which control the movements of the feed mechanism. In or upon said frame are pivoted the frame carrying the train of wheels geared to the carbon-carriers, and the lever supporting the armatures or the vibrating cores for the controlling electro-magnets.

B B are rods supporting the parts upon which the lower carbons are mounted in any ordinary way, and with one or both of which said carbons are electrically connected. These rods pass through or are attached to posts C C C C, of hard rubber or other suitable material, which project from the frame A and are suitably attached thereto.

D is an electro-magnetic coil or helix in the main or direct circuit with the carbons, and E a coil or helix of high resistance in a derived circuit around the carbons. These coils or helices serve to give movement to a pivoted lever in any ordinary manner, the movements of said lever in turn actuating the feed-controlling portion of the lamp. The spools upon which the coils or helices are wound are attached to the upper and lower cross-bars of frame A. In the present instance the cores of the coils or helices are movable and are mounted upon and supported by the lever which is indicated by the letter F, and is provided with

bracket-arms projecting at right angles therefrom, and pivoted on the frame A at the points *a a*, Figs. 1 and 5.

G is a swinging frame, which carries the gear-train connected to the rack-gears upon the carbon-carriers, and which is swung to and fro by the lever actuated by the coils D and E in such a way as to raise the carriers slightly to form the arc and hold them at the properly-regulated height to give an arc of the right length while the current is of proper force. The swinging frame G is pivoted at *b b* in frame A, and at a point to one side of the pinions *c d*, which gear with the carbon-carriers, as shown more clearly in Figs. 4 and 5. Movement is imparted to frame G by a curved link, *f*, connected to the frame G above its line of support, and pivoted upon a stud, *g*, on a plate, *h*, which is attached to the under side of the armature-lever F. The stud *g* is below the line of support of the lever F and nearer to the main-circuit coil D, so that as the lower end of the lever is swung to the left, or in the direction of the arrow 2, by the preponderating attraction of the main-circuit coil D the frame G is made to rock upon its pivots and is turned at the point *b* in such a way as to cause its upper end to swing in the direction of the arrow 1 and to raise the portion of the frame in which the pinion *c* is mounted, so as to lift said pinion, and with it the carrier geared thereto, the turning of the pinion being prevented in the well-known manner by the simultaneous engagement of a detent with the fly or escapement devices. The construction and arrangement of these devices as herein employed will be presently described. By this means the carbon-carrier is raised to form the arc. H and K represent the carbon-carriers, which are geared to the controlling-train in the following manner:

L is a gear-wheel, which is mounted upon a spindle, *l*, which turns freely in the frame G. Said wheel engages with a pinion, M, the shaft of which is also mounted upon the frame G, and is provided with an escapement-wheel, *n*, or other equivalent device for retarding the movement of the pinion.

The escapement-lever is indicated at *o* and its vibrating fly at *p*. The movement of said fly and escapement, and the consequent movement of the train, is controlled by a detent, *r*, attached to a plate, *s*, which is mounted upon the stud *g* with curved link *f*. The adjustment of the detent to determine the point in its movement at which it shall engage with the fly is made by means of a screw, *t*, mounted on the lever F and bearing against plate *s*, as shown in Fig. 4. Connected to gear-wheel L, upon either side thereof, and moving with the same, are two spring-actuated pawls, *v* and *w*, which engage respectively with the ratchet-wheels *y* and *z*, which latter are fixed to or so connected with the pinions *c* and *d* as to turn with the same. The pinions *c d* turn freely and independently of one another upon the spindle *l*, and are connected each with one of the carbon-carriers. The teeth of the ratchet-wheels *y z* have the same set or direction, so that, as will be readily seen, the movement of either carbon-carrier downward would, through its connected pinion, move the wheel L in the direction of arrow 3, Fig. 2. It is not necessary, however, that both carriers and their pinions should move in order that the wheel L may turn. For instance, if pinion *c* and wheel *y* be held stationary by the locking of the carrier-gearing with the pinion, pinion *d* may, through ratchet and pawl *z w*, impart movement to wheel L, since in such a case the pawl *v* will slip over the teeth of ratchet *y*. So, also, pinion *c* and wheel L may turn together independently of pinion *d* and its connected ratchet-wheel *z*, the pawl *w* in the latter case slipping over the teeth of the latter wheel as the pawl is carried around with wheel L. As will be seen, therefore, either carbon-carrier may, through its pinion *c* or *d*, be controlled in its movements by the wheel L, whatever the condition of the other. If while one carbon-carrier with its pinion and ratchet be moving with and under the control of the wheel L the other carrier be raised by hand for the purpose of inserting a new carbon, a reverse movement will be given to the ratchet-wheel of the latter, the teeth of which will slip by its pawl without disturbing or interfering with the action of the wheel L and the ratchet-wheel, pinion, and carrier, whose feed said wheel is for the time controlling.

The devices which engage with the carbon-carriers, and serve to lock the same and hold them from movement until automatically released by the descent of a carrier to a point where its carbon is nearly consumed, are shown in Fig. 1.

O and P represent two locking and releasing detents hung in slots in the lower cross-bar of the frame A, and to one side of the carbon-carriers R and S. Each detent is pivoted upon a pin or rivet, which passes through an elongated slot in the upper ends of the detents, so that said detents may swing to and fro in a horizontal line or may be moved upward bodily for a short distance, the latter provision being for the purpose of allowing the carrier which is locked by a detent to rise with the other carbon-carrier when the latter is raised by the movement of the frame which bears the pinion gearing with the carriers. The toes or projections at the lower ends of the detents O P are adapted to engage in slots cut in the sides of the carbon-carriers, as shown, one of said slots being cut near the bottom of the rack-bar, and at such a point that when a new carbon is inserted said carbon will be held out of contact with the lower, if the detent be in engagement with the rod at that point. The slot in the upper end of the carrier is cut at such a point that it will coincide with the toe upon the detent when the carbon is entirely consumed. T is a link

connecting the two detents, and provided at one end with an elongated slot, through which passes a pin upon detent P. A spring, *t*, bears against the inner side of P and rests in a slot in the end of the link T. This spring serves as a yielding or spring connection between the two detents and allows either to be thrown back out of engagement with its rod, although the other detent may be bearing against the side of the carrier at a point between the two slots or notches in the side of the same. It also assists in the action of automatically locking and unlocking the rods. This spring is by preference provided with an adjusting-screw for adjusting its tension. The circuits through the lamp are of the ordinary kind. The positive binding-post, which is in electrical connection with the frame of the lamp, is indicated at 5, and the negative binding-post, which is insulated from the frame, is indicated at 6. From the positive binding-post the current passes into the frame of the lamp through the upper carrier to the arc, to the negative carbon, and thence through one of the supporting-rods for the latter to the main-circuit magnet D, which is connected with a supporting-rod, B, by means of a wire, 7. A wire, 8, conducts the current from the magnet D to the negative binding-post. The derived circuit which contains the coil E is from the frame of the lamp through wire 10, through coils E and wire 9 to the negative binding-post. A spring which assists the action of the derived-circuit coil and acts in opposition to the main-circuit coil is indicated at 12, while 13 represents an elongated block of iron, which may be adjusted to and from the core of the derived-circuit coil and fixed at any desired point. This device is the same as that patented to me by United States Letters Patent No. 246,137, dated August 23, 1881, and serves to adjust the force with which the core is drawn within the coils E.

The action of the mechanism in feeding the carbon and regulating the length of arc is well understood. In forming the arc or in lengthening the same the attractive influence of the main-circuit coil D preponderates, so as to swing the frame G in such a direction as to lift the pinions and the connected carriers. The same movement throws the detent *r* into engagement with the fly *p*, or tends to keep it in engagement therewith, so as to prevent the train of wheels from rotating and the carbon-carrier from descending. When the attractive influence of the derived-circuit coil becomes strong enough to disengage the detent from the fly, the carbon-carrier, which is for the time being unlocked, is allowed to descend freely by the action of gravity, movement being imparted to the train and its connected fly or retarding device through the pinion *c* or *d*, the connected ratchet-wheel, the pawl upon the same side of the wheel L with the ratchet-wheel, wheel L, pinion M, &c.

Under the conditions represented in Fig. 1, the carrier R is feeding, the movement of S being prevented by the locking-detent O, which engages with a notch in the side of the carrier, and is held therein by the action of the spring *t*, which presses the bar T to the left, and is kept in a state of tension, so as to exert a force in this direction by reason of the fact that the detent P is held to one side so long as it bears against the rod between the notched portions thereof. The feeding of R takes place in the manner just described, the pawl *w*, which bears upon the edge of ratchet-wheel *z*, connected to carrier S, in the meantime sliding backward freely over the ratchet-teeth. When the carrier R is lifted at the commencement of the operation, or at any subsequent stage, the carrier S, although locked, is free to move with it, so as not to interfere with the action, this result being attained by pivoting or mounting the locking-detent O in the manner before described, or in such a way as to allow it to yield in obedience to the upward movement of the carrier S, and to move upward with it. The feeding of carrier R continues until the carbon is consumed, and the notch in the carrier coincides with the toe or projection of its detent P. When this point is reached the detent O is disengaged from carrier S, the disengagement being effected by the weight of the carrier and its carbon, which tends to throw the detent to the right, the point of support of the detent being, as shown, to the right of the vertical line which passes through the point of bearing of said detent and its carrier. This movement is permitted by the relief of the tension of the spring *t*, owing to the movement of the detent P to the right under the action of the spring. Simultaneously by the action of the spring *t*, which is under a slight degree of tension, and by the lateral movement communicated to the locking-detent P through the link T by the action of O, the toe of detent P is thrown into the upper notch on R, thus locking the same from further movement. The rod S, thus being unlocked, is free to feed, and it continues to feed until its carbon is consumed in precisely the same manner as the carbon of R. As soon as the notch upon the lower end of S passes the toe of the detent, the latter is held permanently to the right by the intermediate surface between the upper and lower notches. While the carrier S is feeding, a new carbon may be inserted in R, and the carrier set to be released by S when the carbon of S has been consumed. For this purpose it is only necessary to withdraw the detent P by hand from the upper notch of R, the yielding or spring connection *t* between the two detents permitting this to be done, and to raise the same to a point where the toe will engage with the notch in the lower part of the carrier. This upward movement is accomplished without interference with the action of the mechanism in controlling the feed of carrier S, since the teeth of the ratchet-wheel connected to the pinion of R and upon the right side of the

wheel L slip by the pawl *v*, which serves to connect said pinion and wheel L when the carrier R is being fed. When the carrier S has fed to a point where the notch at its upper end coincides with the detent O, the rod R, which has been up to this time held locked, is allowed to free itself by its own weight and the weight of the carbon, the tension of the spring *t*, which up to this time has prevented the detent P from being thrown out of the notch, being at this moment relieved, because the detent O is free to move to the left under its force. Simultaneously the rod S is locked and held locked. A fresh carbon may be connected to S in the way before mentioned in connection with the operation of inserting a carbon in R.

My invention is not limited to any particular kind of feed-regulating mechanism, nor to any particular construction of the locking and releasing devices which engage with the carbon-carrier, since the gist of my invention in its broadest scope consists in locking and releasing the carbon-carriers by devices entirely independent of those employed for regulating their feed. So far, then, as this feature of the invention is concerned, it would be within its scope to regulate the feed of the carbons by electro-magnetic and mechanical devices entirely independent of one another. It is therefore also obvious that the locking devices may be varied, and that the particular construction invented by me and herein described might be employed with other mechanisms for regulating the feed.

I am aware that it is not new to combine in the same lamp two sets of carbons, and to cause one set when consumed to automatically release the other set, and I do not therefore make any broad claim thereto.

It is obvious that other mechanical movements besides the particular one described might be employed for connecting the same retarding train to two carbon-carriers, so as to allow either to be fed under the control of the train while the other is held stationary; and I do not limit myself to the particular construction of the intermediate devices for communicating motion from both carriers to the same retarding or escapement and detent device. I also wish it to be understood that I do not limit myself to the particular retarding devices herein described.

What I claim as my invention is—

1. The combination of two carbon-carriers, the pinions *c d*, connected ratchet-wheels *y y*, and the common intermediate wheel, L, carrying upon each side a pawl engaging with a ratchet-wheel, *y*.

2. The combination, substantially as described, of the carbon-carriers, the pinions and ratchet-wheels, the intermediate wheel and its spring-pawls, and the common spindle or shaft for said wheels, and pinions mounted in the pivoted frame of the gear-train.

3. The combination, with the main and derived circuit magnets, of a gear-train mounted in a swinging frame, detent devices for controlling the movements of the train, two carbon-carriers geared to the train, and means, as described, interposed between the carriers and the common gear train, whereby either carbon-carrier may be allowed to feed when the other is locked.

4. The combination, substantially as described, of a carbon-carrier and a locking device for locking the carrier, supported in the manner described, so as to be capable of moving with the carrier when the same is raised by the action of electro-magnetic lifting devices of the lamp.

5. The combination, substantially as described, with two carbon-carriers, of a reciprocally-acting locking and releasing device, constructed in two parts, and a spring or yielding connection between the two portions of the locking device, as and for the purpose described, so that either portion of the locking devices may be withdrawn when the carbon-carrier is to be raised for the purpose of renewing the carbons.

6. The combination, with a carbon-carrier, of a locking-detent, substantially such as described, pivoted to one side of the carrier and above the point at which it engages with the carrier, so that the weight of the carrier will automatically free it from said detent when the detent is free to move.

7. The combination of the two notched carbon-carriers, the two locking-detents, and the intermediate connecting rod or bar.

8. The combination, substantially as described, of the two carbon-carriers, the locking-detents bearing against the side of said carriers, and the intermediate spring.

9. The combination, substantially as described, of the carbon-carrier notched or slotted at two extreme points, and a locking-detent adapted to engage with the carrier at both said points.

10. The combination, substantially as described, of two notched carbon-carriers, two pivoted locking and releasing detents, the connecting link or bar, and the interposed pressure-spring.

11. The combination, substantially as described, of the two notched carbon-carriers, the pivoted locking and releasing detents, mounted as described, so as to be capable of moving vertically with the carriers, the intermediate connecting-link, and the interposed pressure-spring.

WILLIAM HOCHHAUSEN.

Witnesses:

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THOMAS TOOMEY.