

J. A. STUART.
ELECTRIC ARC LAMP.

No. 482,986.

Patented Sept. 20, 1892.

FIG. 1.

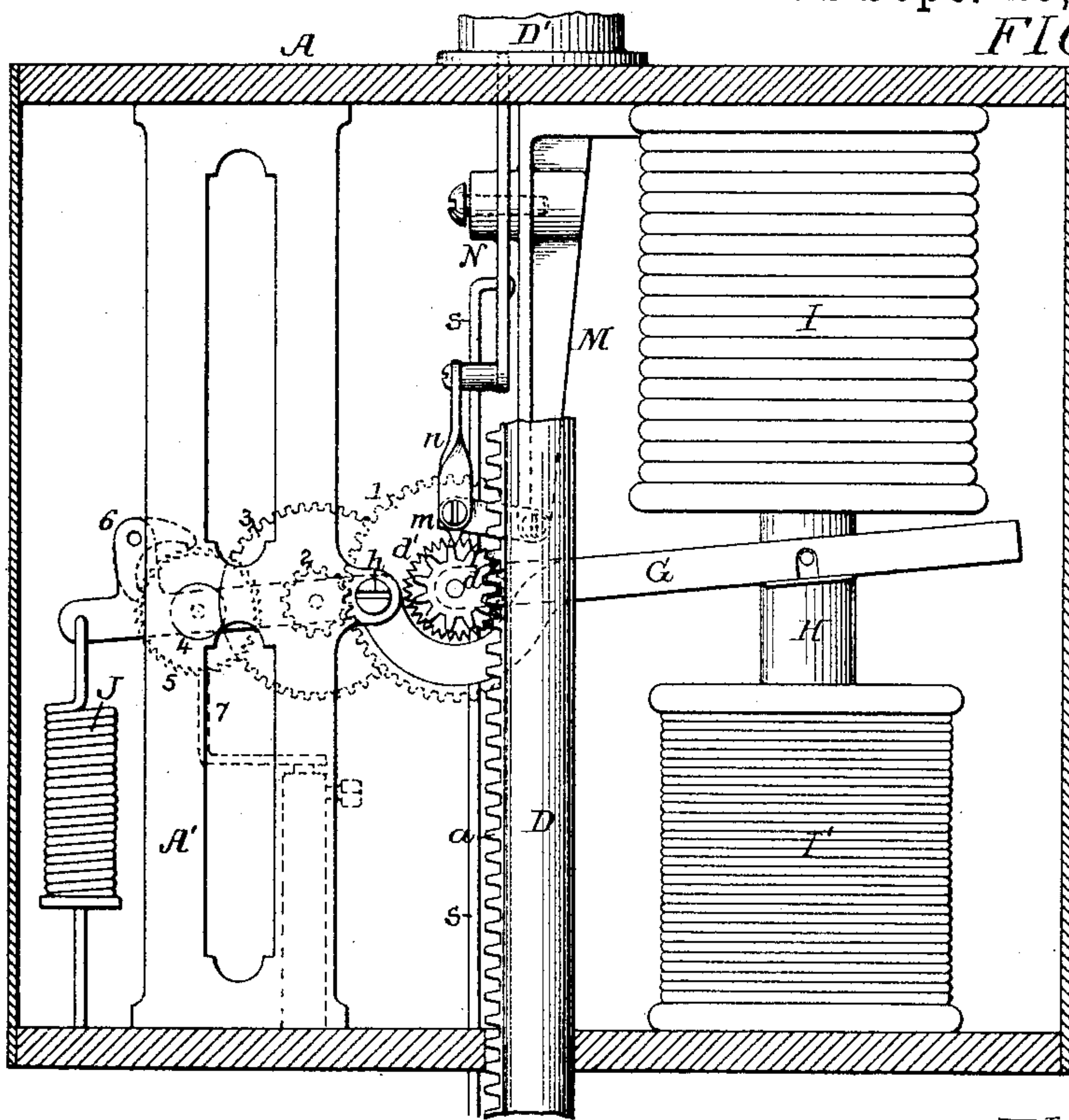
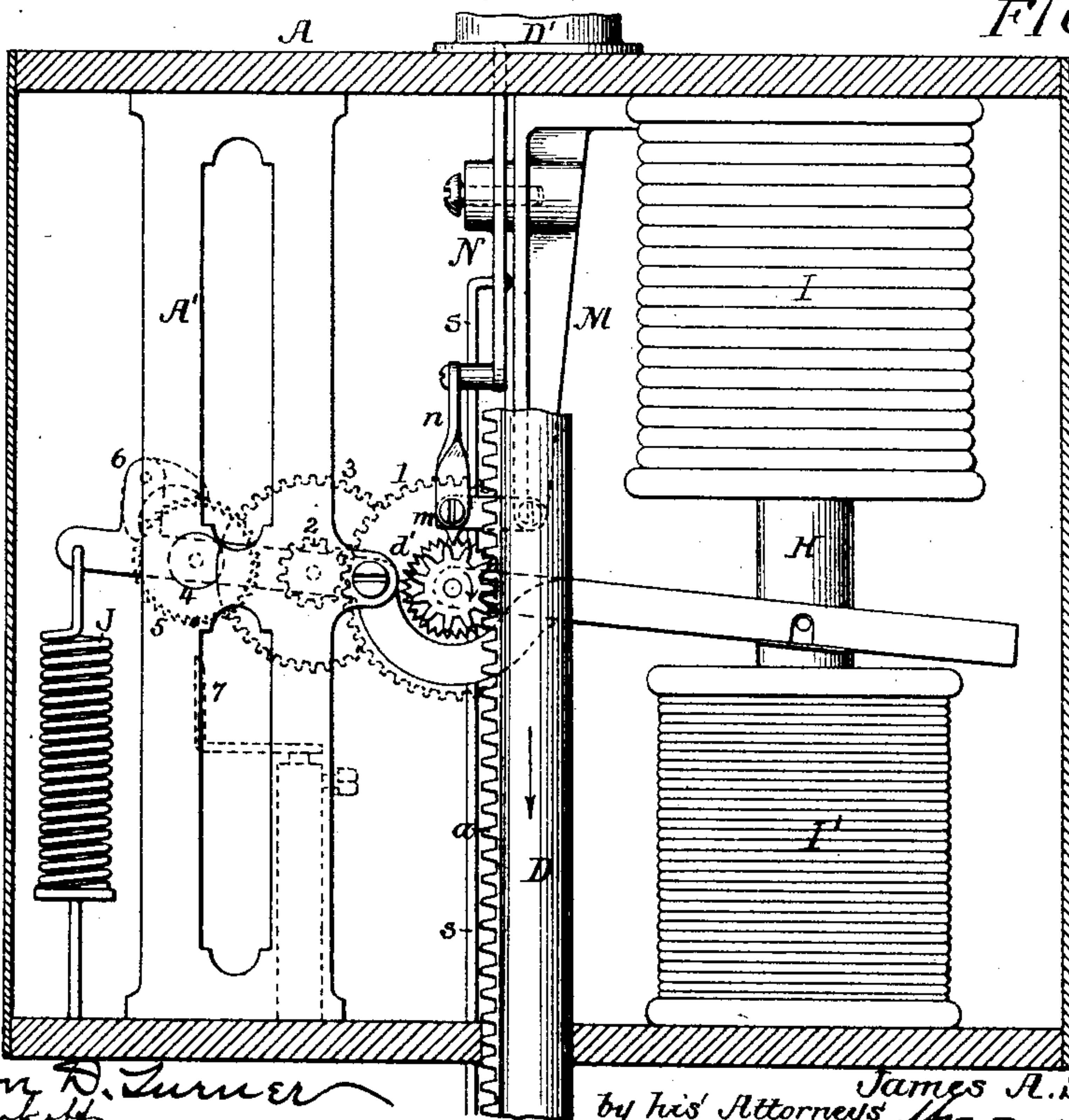


FIG. 2.



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James A. Stuart
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FIG. 4.

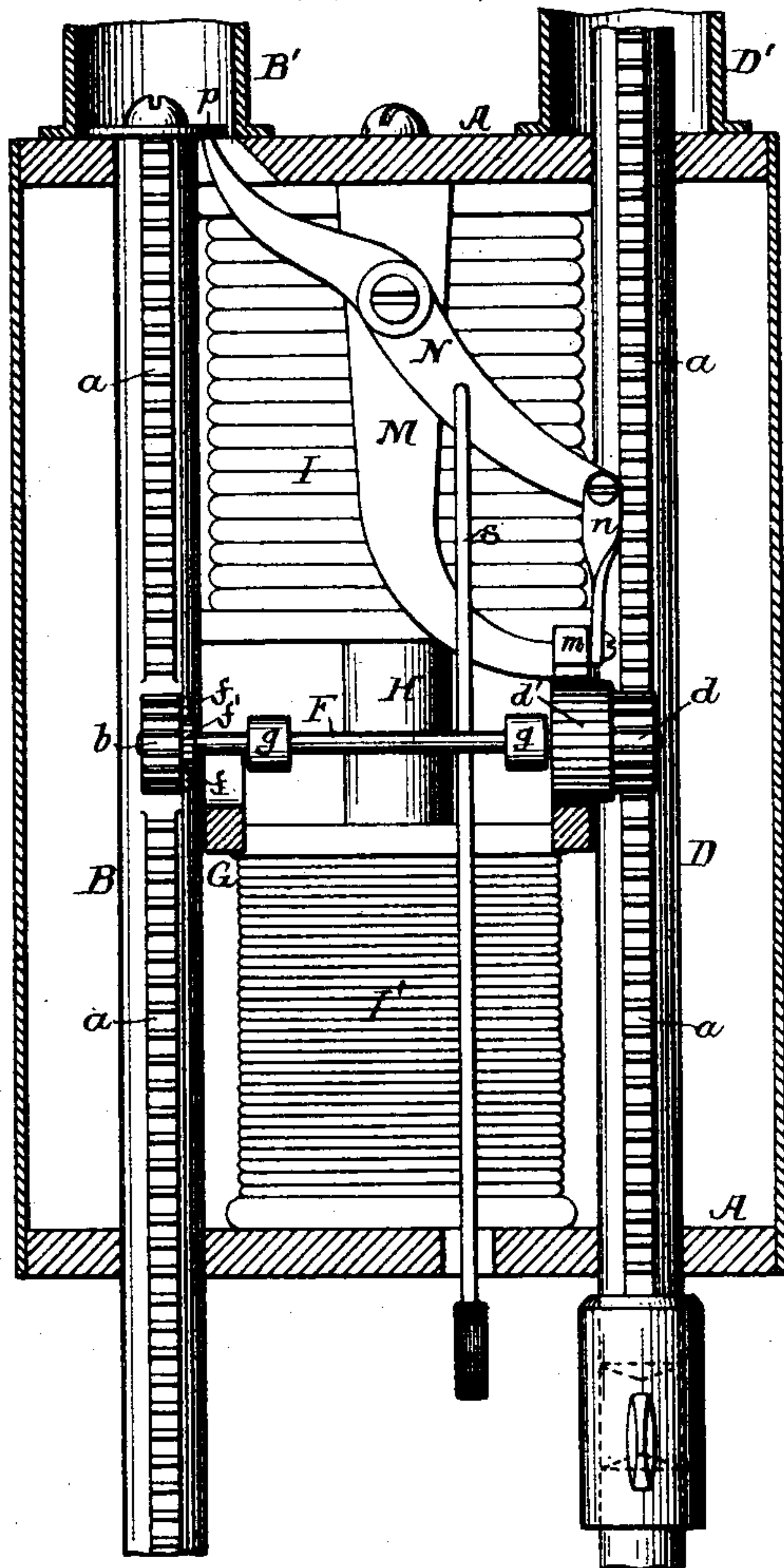


FIG. 3.

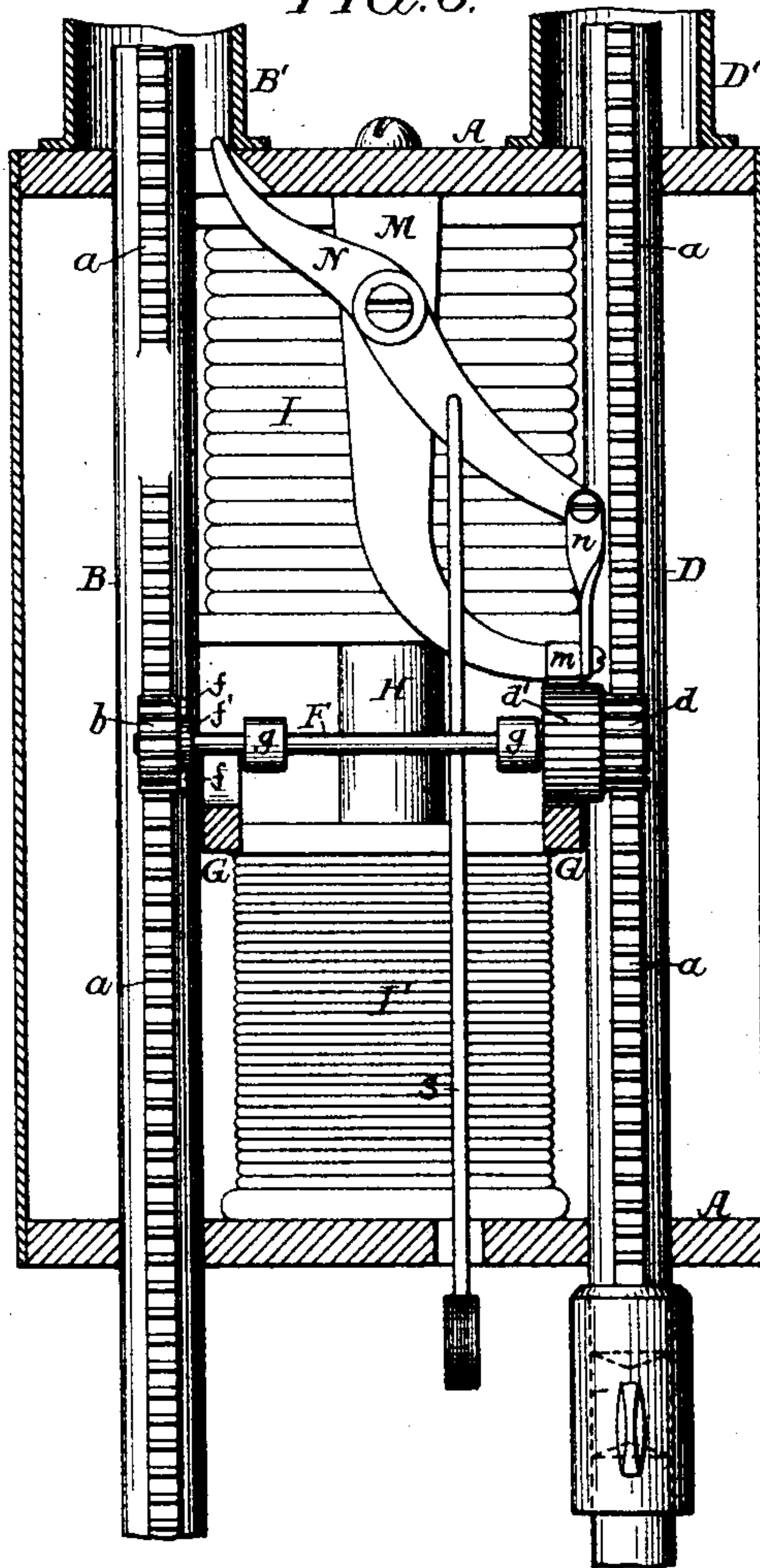


FIG. 5.

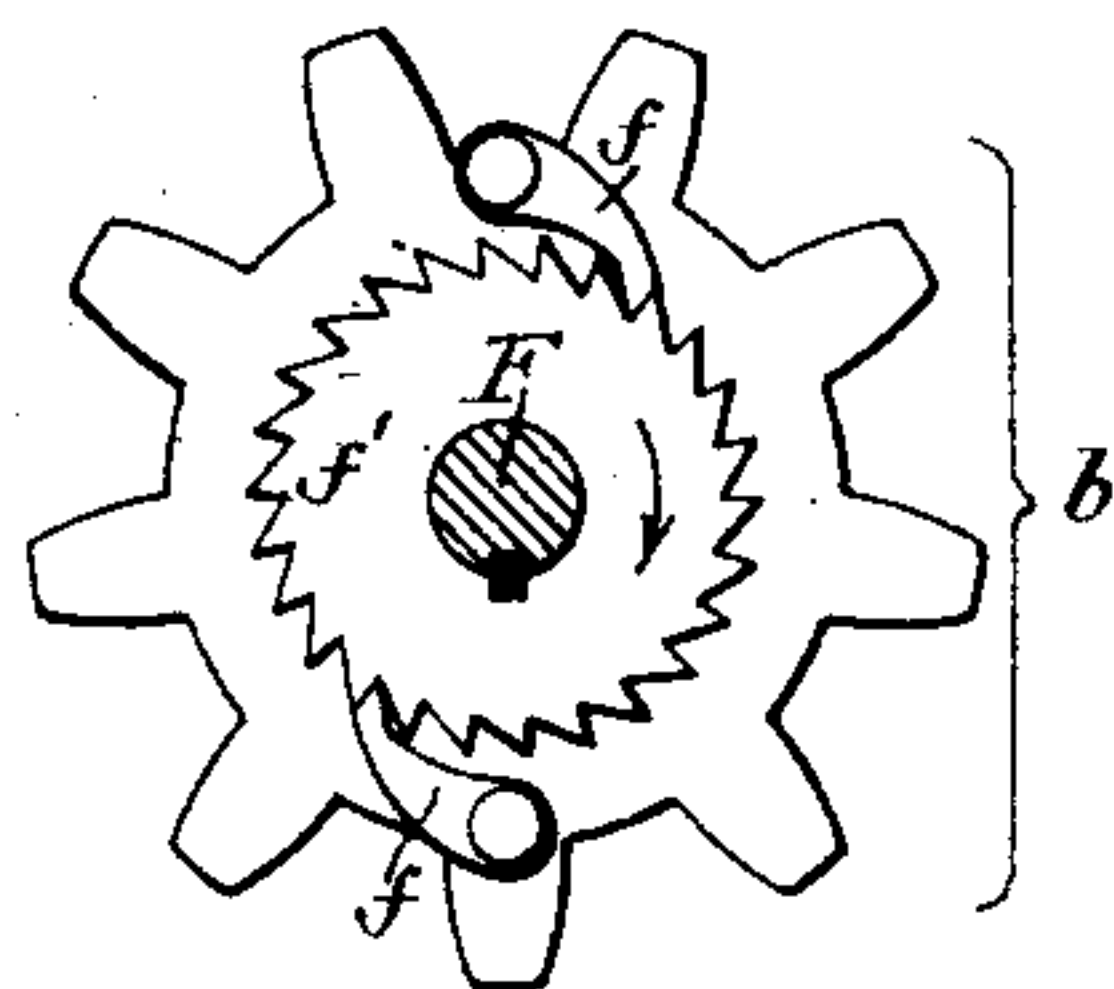
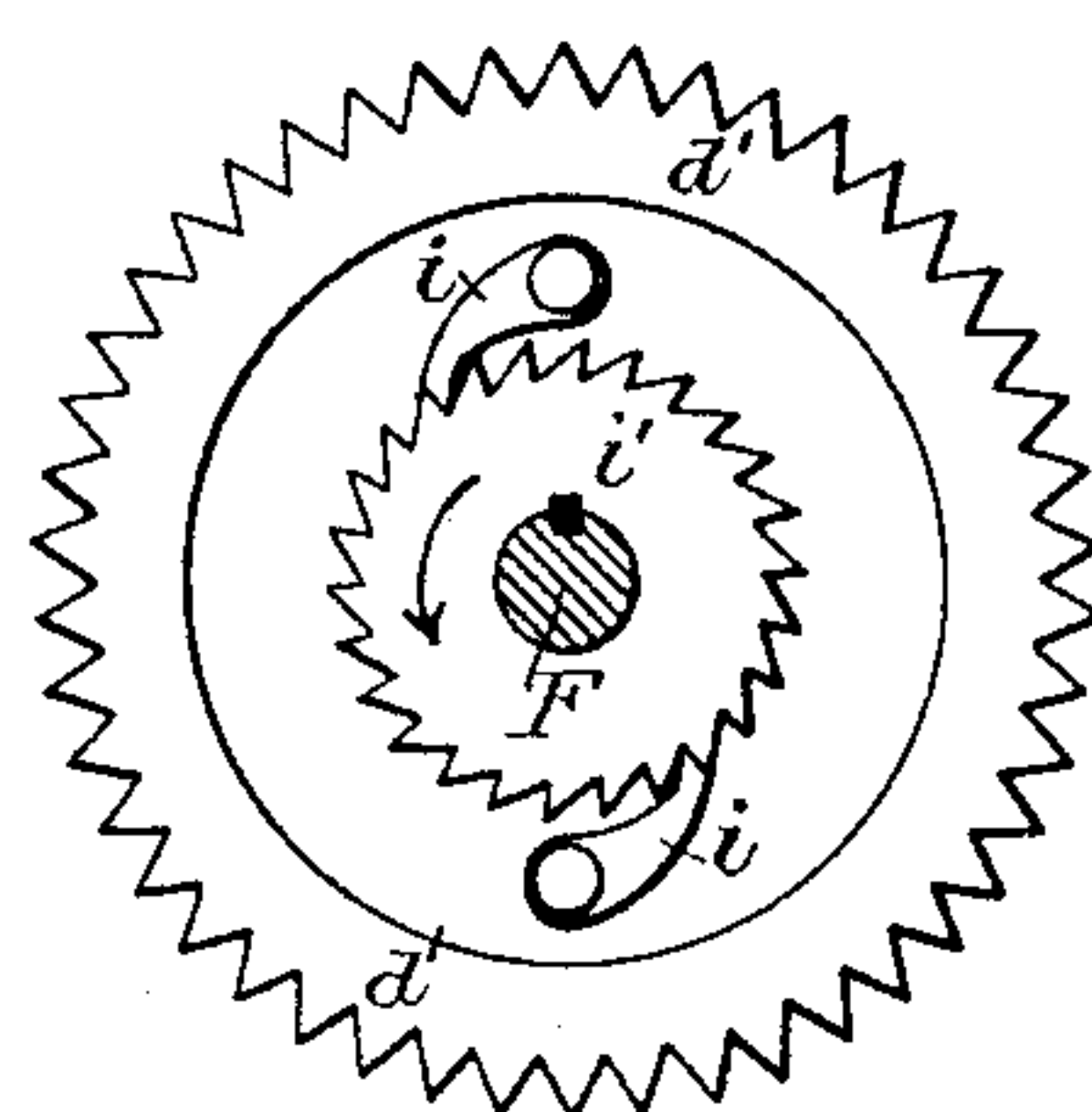


FIG. 6.



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UNITED STATES PATENT OFFICE.

JAMES A. STUART, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOHN BUCHANAN, OF SAME PLACE, AND THOMAS MARRIN, OF BROOKLYN, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 482,986, dated September 20, 1892.

Application filed July 20, 1891. Serial No. 400,127. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. STUART, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention consists of certain improvements in that class of electric-arc lamps known as "double" or "duplex" carbon lamps, in which there are two sets of carbons so constructed that when the first set has been consumed or burned out the second set will be automatically switched into the circuit, the object of my invention being to provide simple and efficient means whereby when the first set of carbons is burned out the second set will be brought under control of the regulating mechanism and the latter will be entirely relieved from the weight of the upper-carbon holder of the first set, so that the lamp will then act in the same manner as a single-carbon lamp while the second set of carbons is being consumed. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of sufficient of a double-carbon lamp to illustrate my invention, the inclosing casing being shown in section and the parts being in the position assumed when the arc is formed. Fig. 2 is a like side view with the parts in the position for permitting the feeding down of the upper-carbon holder, so as to form a new arc. Fig. 3 is an end view, partly in section, showing the parts in the position which they assume before the first set of carbons has been burned out. Fig. 4 is a similar view showing the parts in the position which they assume when said first set of carbons has been completely burned out and the second set brought into use, and Figs. 5 and 6 are detached views of parts of the mechanism.

A represents part of the frame or casing inclosing and carrying the regulating mechanism of a duplex carbon-lamp, B and D representing the two carbon-holders, which are suitably guided in said frame, and when the lamp is first trimmed—that is to say, when new carbons have been applied to both hold-

ers—the latter project upward into tubes B' and D', mounted on the top of the frame A, as shown. Each carbon-holder has a rack *a*, and when the first set of carbons is in action the holder B, carrying the upper carbon of said set, is in such position that its rack engages with a pinion *b*, which is loose on a shaft F, but carries a pair of pawls *f*, engaging with a ratchet-wheel *f'*, secured to said shaft F, the latter being carried by suitable bearings *g* upon a forked lever G, which is hung at *h* to a suitable support on the fixed frame A', one arm of this lever being acted upon by a solenoid-core H, controlled by a pair of magnets I I', the other arm being under control of a spring J.

The rack *a* of the carbon-holder D, which carries the upper carbon of the second set, meshes with a pinion *d*, which is secured to or forms part of a notched wheel *d'*, the latter being loose on the shaft F, but carrying pawls *i*, which engage with a ratchet-wheel *i'*, secured to the shaft, as shown in Fig. 6, so that each of the pinions *b* and *d* is caused to turn the shaft F when rotating in one direction, but is free to turn on said shaft when rotating in the opposite direction.

The shaft F is in this class of lamps connected to a train of escapement-gearing, that shown by dotted lines in Figs. 1 and 2 comprising a train of wheels 1, 2, 3, and 4, an escapement-wheel 5, and an escapement-lever 6, and the magnets I I' are so constructed and so located in the circuit that when the arc is properly formed between the carbons of the acting set the core H will be attracted by the magnet I and the lever G will occupy the position shown in Fig. 1 of the drawings, the escapement-train being then locked by the engagement of a stop plate or catch 7 with the escapement-wheel 5 or some other available wheel of the escapement-train.

The weight of the upper carbons and their holders, acting through the medium of the racks *a* upon the pinions *b* and *d*, tends to turn the latter in the direction of the arrow, Fig. 2, and it is the movement in this direction which, owing to the ratchet-and-pawl connections, is imparted to the shaft F. When, however, the escapement-train is locked, as

shown in Fig. 1, there can be no movement of said shaft or of the pinions *b* and *d* in the direction of the arrow. Hence the carbon-holder of the acting set is prevented from descending so as to bring the carbon points together and destroy the arc. When the carbon points burn away, however, to such an extent as to unduly increase the length of arc, the excessive resistance presented by the arc causes such a change in the relative strength of the magnets *I I'* that the core *H* is attracted by the magnet *I'* and the lever *G* is moved to the position shown in Fig. 2, so as to release the escapement-train, and thereby permitting the weight of the upper-carbon holder of the acting set to turn its pinion and the shaft *F* until the carbon has been fed downward to a sufficient extent to again shorten the arc and decrease the resistance so as to cause the magnet *I* to again raise the core *H* and restore the parts to the position shown in Fig. 1.

While the first set of carbons is in action there should be no feed of the upper-carbon holder of the second set; but when the first set of carbons has been burned out and the second set of carbons must be brought into action the weight of the first carbon-holder should then be removed from the regulating mechanism, so that the latter will simply control the single-carbon holder *D* in the same manner as in a single lamp. My invention therefore comprises simple means for effecting the locking of the upper-carbon holder of the second set while the first set is in action or unlocking the said upper-carbon holder of the second set when the first set of carbons has been burned out and for preventing the weight of the carbon-holder of said first set from interfering with the proper action of the regulating devices during the burning of the second set of carbons.

Depending from the top of the frame *A* of the lamp is a bracket *M*, and to the lower end of the same is hung a dog *m*, which has a tooth for engaging with the teeth of the notched wheel *d'*, said dog being connected by a link *n* to one arm of a lever *N*, which is hung to the bracket *M*, the other arm of said lever projecting into the path of a cap or collar *p* at the top of the carbon-holder *B*. When the first set of carbons is in action, therefore, the parts occupy the positions shown in Figs. 1, 2, and 3, the teeth of the dog *m* engaging with the wheel *d'* and preventing any downward feed of the carbon-holder *D* of the second set of carbons, even when the escapement-train is released, as before set forth, such release simply permitting the downward feed of the carbon-holder *B* of the first set and the shaft *F* turning in the wheel *d'* and pinion *d* and the teeth of the ratchet-wheel *i'* slipping past the pawls, the dog *m* following the rise and fall of the wheel *d'*, caused by the movement of the lever *G*, owing to the fact that said dog is connected to the preponderating end of the lever *N*. When, however,

the first set of carbons has been burned out, the descent of the carbon-holder *B* is such that the cap *p* acts upon the upper arm of the lever *N* and moves the same to the position shown in Fig. 4, so as to effect the withdrawal of the dog *m* from engagement with the notched wheel *d'*, whereby the pinion *d* is unlocked and the downward feed of the carbon-holder *D*, under control of the regulating devices, is thereby permitted, the carbon-holder *B* under these circumstances being supported by the lever *N*. Hence no portion of the weight of said carbon-holder *B* is borne by the regulating-lever *G* during the time that the second set of carbons is in action.

It will of course be understood that when the first set of carbons is in action the weight of both carbon-holders *B* and *D* is borne by the regulating-lever *G*; but this is not objectionable, because the upper-carbon holder *D* is then contained almost wholly within the casing of the lamp and is protected from the wind and weather; but when the first set of carbons has been burned out the carbon-holder *B* projects almost entirely below the casing and is subjected to the action of the wind, and in cold weather is liable to be heavily coated with ice, so that if its weight under these circumstances is added to the load upon the regulating-lever *G* the latter is frequently rendered inoperative.

In order to insure the quick and definite operation of the lever *N*, I discontinue the rack *a* of the carbon-holder *B* at such point that when the carbon carried thereby is about burned out the lower section of the rack will leave the pinion *b* and a drop of the carbon-holder *B* will thereby be permitted, so that there will be a sudden impact of the cap *p* upon the upper arm of the lever *N*, thereby insuring the withdrawal of the dog *m* from engagement with the notched wheel *d'*. When the parts are in this position, the movements of the shaft *F*, due to the turning of the pinion *d* by the downwardly-feeding carbon-holder *D*, simply carry the teeth of the ratchet-wheel *f'* past the pawls *f* in the direction of the arrow, Fig. 5, without imparting any movement to the pinion *b*, and the movements of the regulating-lever *G* simply cause said pinion *b* to move up and down to a slight extent in the gap or recess formed in the rack *a* of the carbon-holder *B*. A rod *s*, depending from the lever *N*, projects below the lower plate *A* of the frame, so that the pinion *d* of the carbon-holder *D* may be unlocked by hand to permit movement of said carbon-holder in trimming or inspecting the lamp.

The devices described for locking and unlocking the carbon-holder of the second set of carbons, while of a very simple character, are certain and effective in their action and are entirely free from any dependence upon springs, which when as light as necessary cannot safely be relied upon to perform their proper functions in all cases in a structure such as an electric lamp, which is liable to be

used in exposed situations, where the mechanism is more or less incompletely protected.

I have shown the bracket M as depending from the top of the fixed frame of the lamp; but it will be evident that said bracket may be located in any other position which convenience may suggest without departing from my invention.

In some cases the dog *m* may engage with an extension of the pinion *d*, or the dog *m* and link *n* may be dispensed with and the lower arm of the lever N caused to engage directly either with the toothed wheel *d'* or with the pinion *d* in case said wheel *d'* is dispensed with.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination, in a duplex-carbon arc lamp, of the regulating-lever carrying a shaft with escapement mechanism, and a pair of pinions free to turn on the shaft in one direction, but provided with clutching mechanism for engaging the shaft when turned in the opposite direction, the two carbon-holders, one having a rack engaging with one pinion and the other having a rack engaging with the other pinion, and a locking-lever controlling the pinion of the second carbon-holder and engaging with the first carbon-holder when its carbon has been burned out, so as to unlock the pinion of said second carbon-holder, substantially as specified.

2. The combination, in a duplex-carbon arc

lamp, of the regulating-lever, its escapement shaft and pinions, the two carbon-holders, one having a rack engaging with one pinion and the other a rack engaging with the other pinion, the rack of the carbon-holder of the first set being discontinued, so as to release its pinion when the carbon is burned out, and a locking-lever controlling the pinion of the second carbon-holder and engaging with the first carbon-holder when the latter drops on releasing its pinion, so as to trip said lever and release the second carbon-holder, substantially as specified.

3. The combination, in a duplex-carbon arc lamp, of the regulating-lever carrying an escapement-shaft, with pinions, the two carbon-holders, one having a rack engaging with one of said pinions and the other a rack engaging with the other pinion, the rack of the first carbon-holder being discontinued, so as to release its pinion when the carbon is burned out, a locking-dog retaining the pinion of the second carbon-holder, and a lever connected to said dog and engaging with the first carbon-holder when the latter drops on releasing its pinion, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES A. STUART.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.