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G. G. WAGNER.

ELECTRIC ARC LAMP.

No. 514,139. Patented Feb. 6, 1894.

Fig. 1.

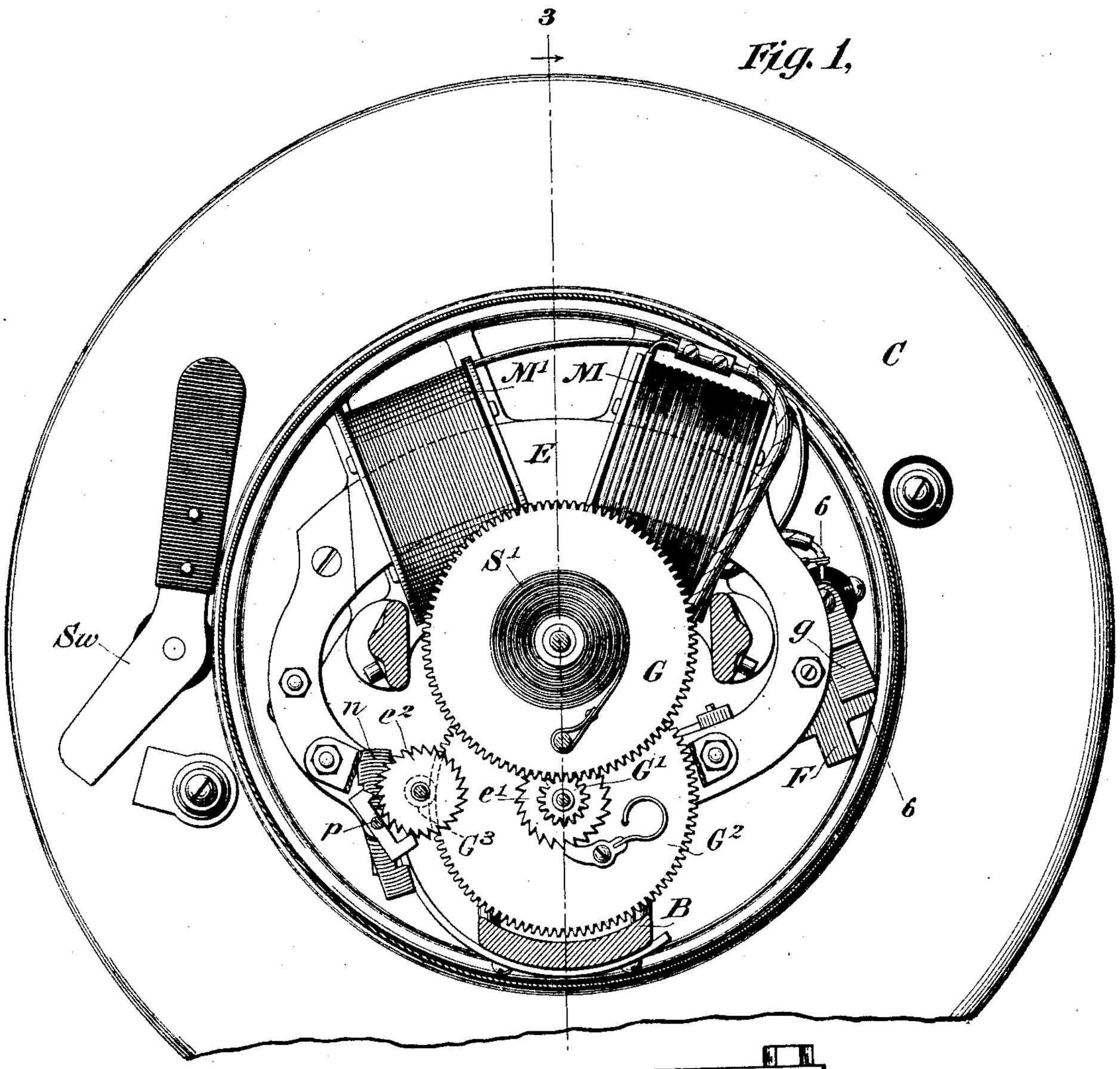

Fig. 8.

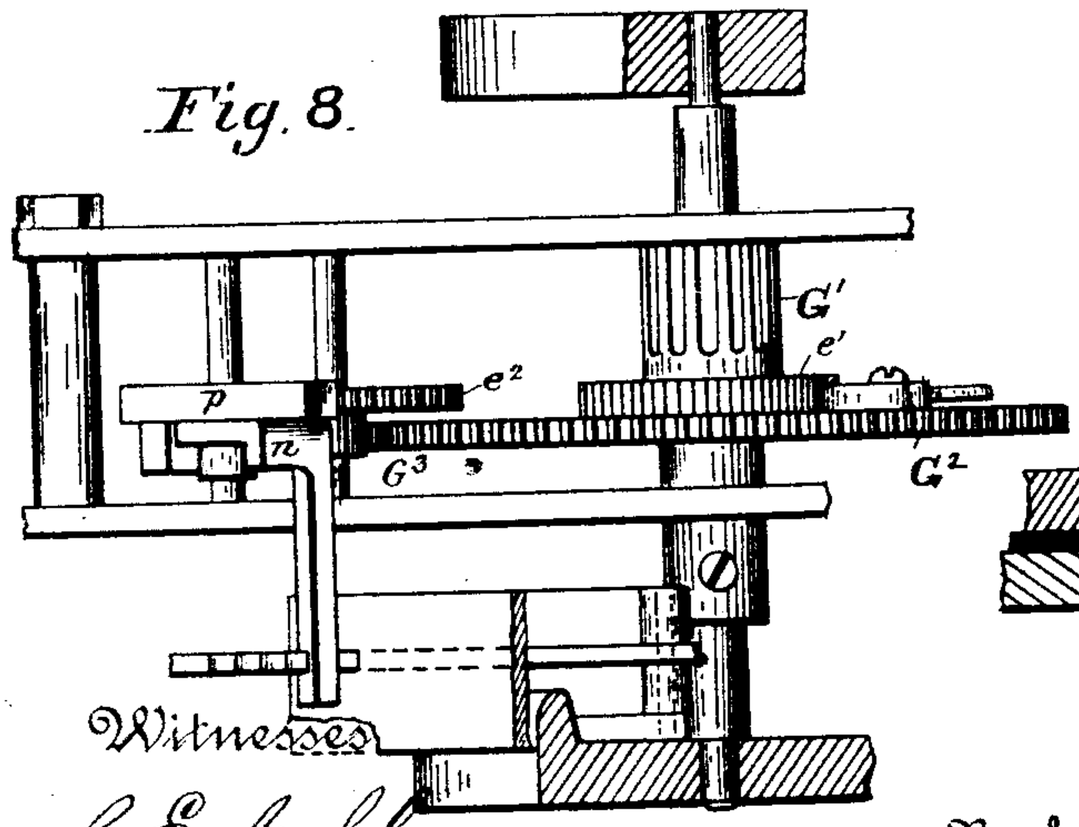

Fig. 7.

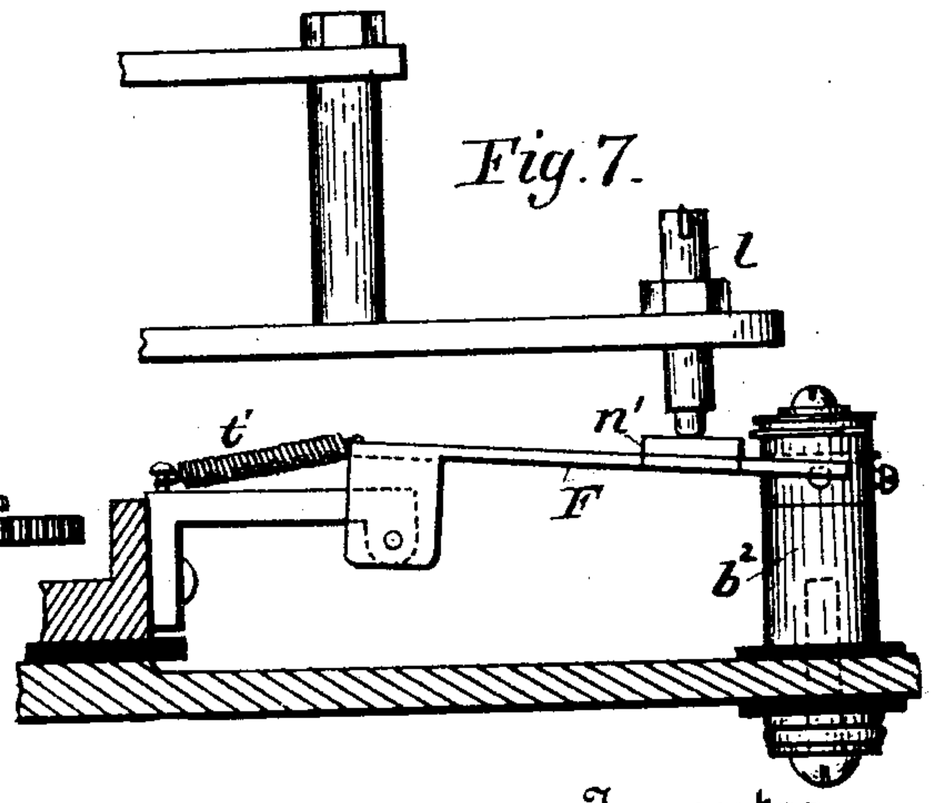

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Fig. 2,

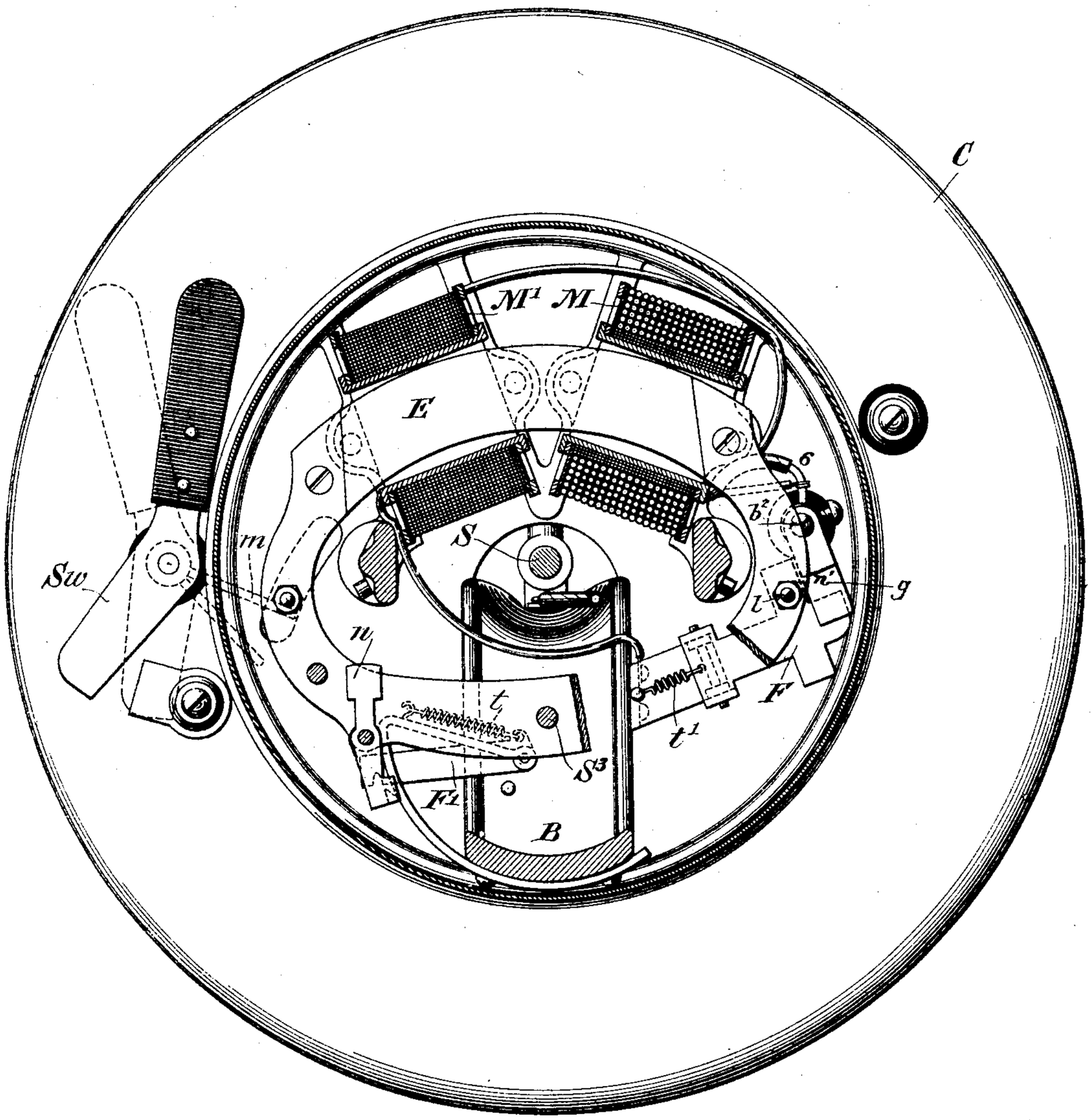

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Fig. 3,

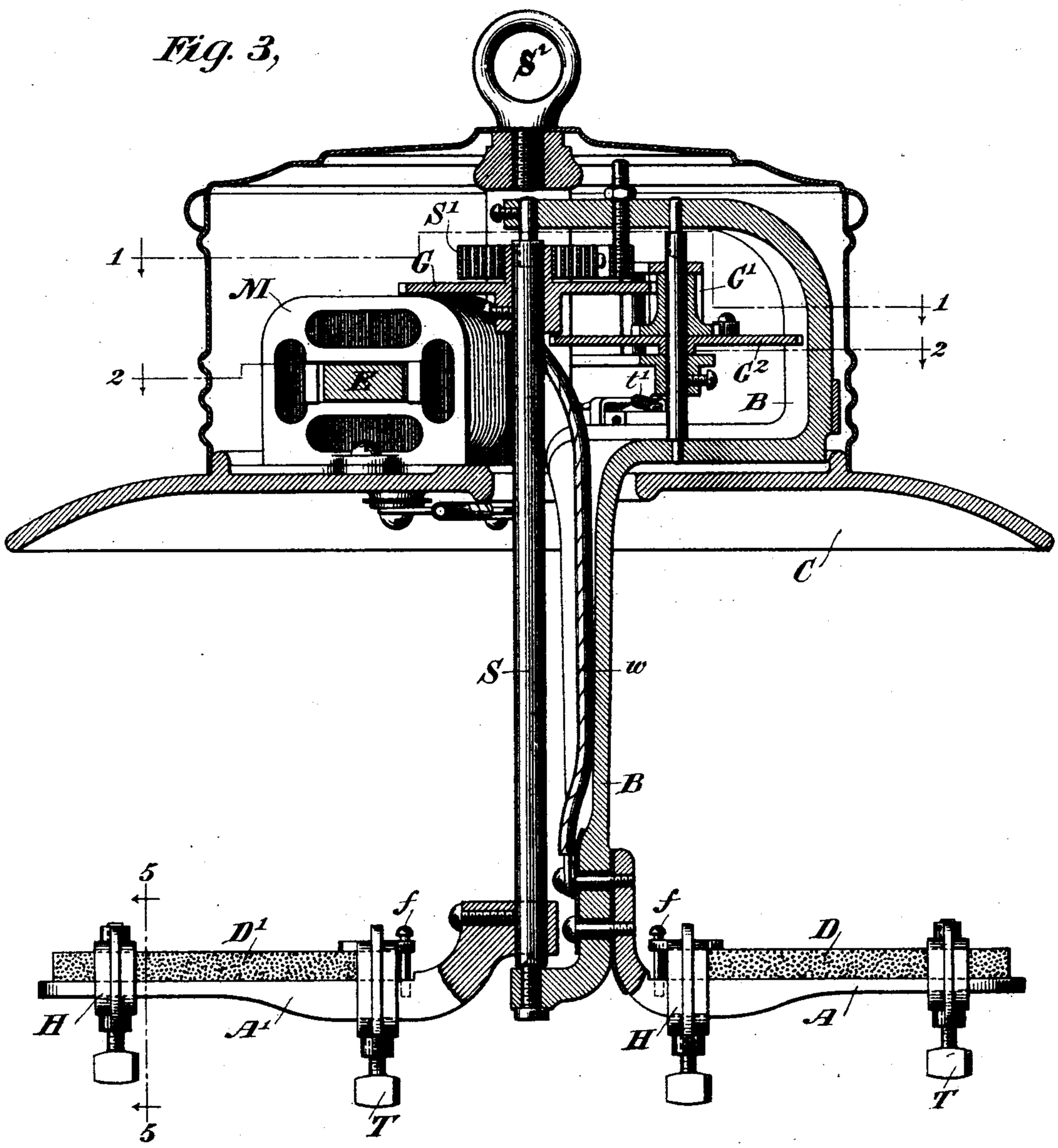

Fig. 5,

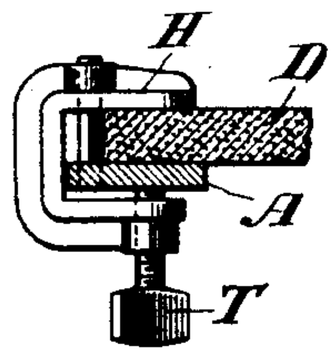

Fig. 6,

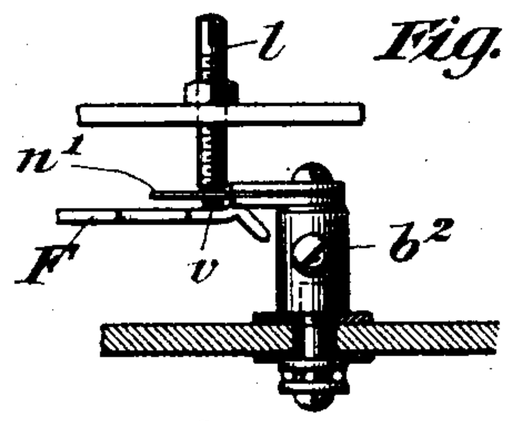

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Fig. 4,

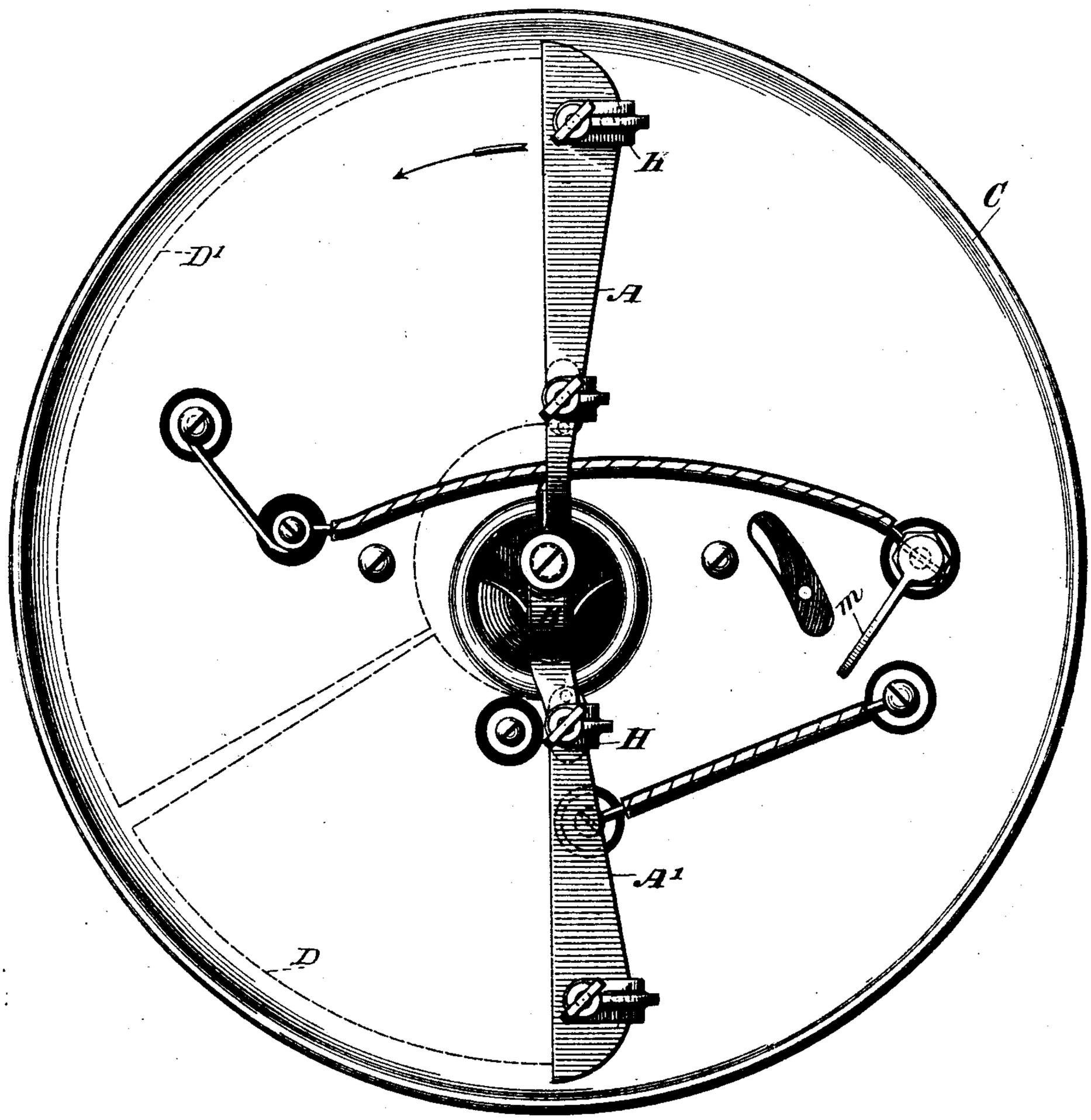

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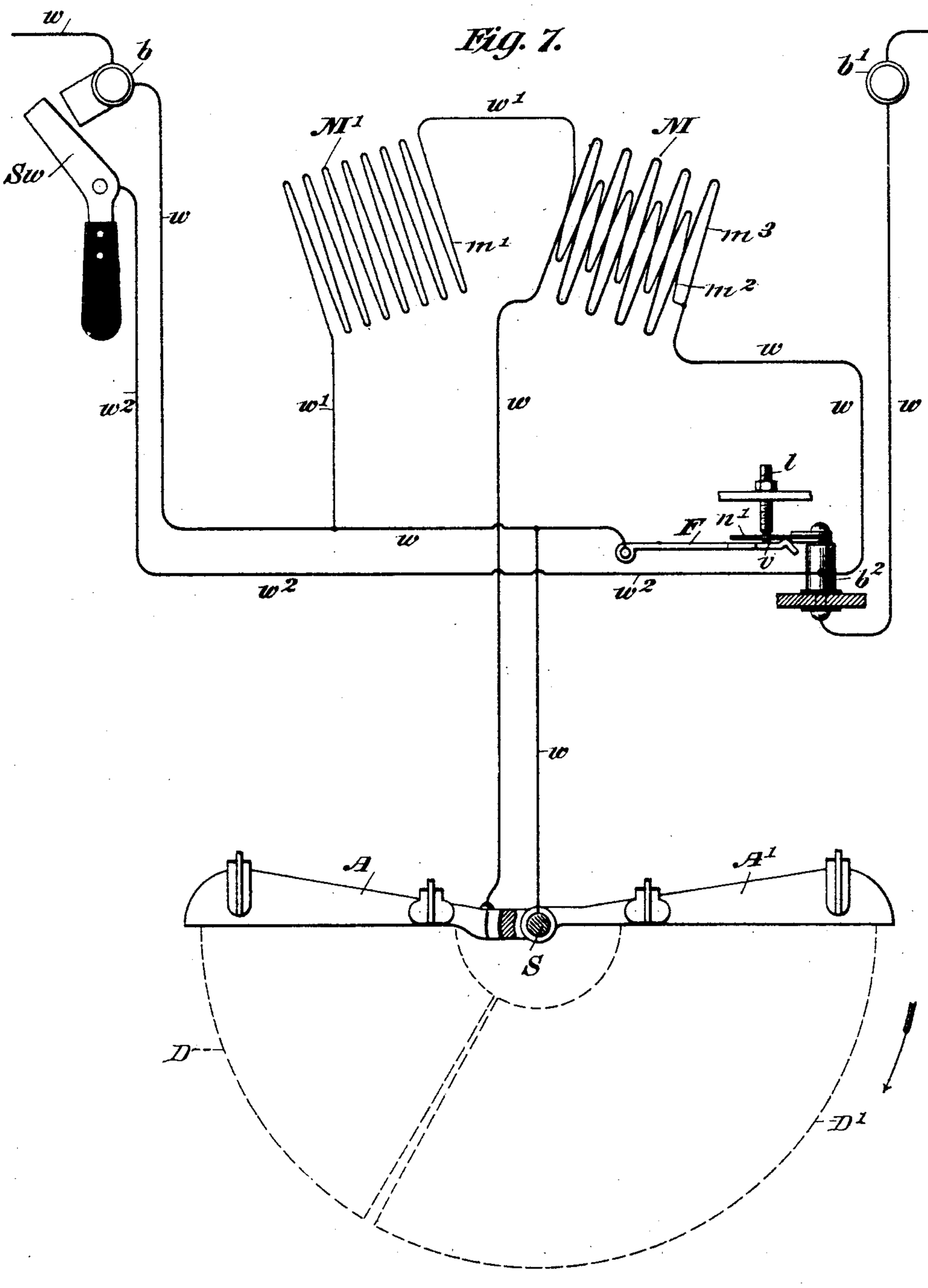
Fig. 7.



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UNITED STATES PATENT OFFICE.

GUSTAVUS G. WAGNER, OF NEW YORK, N. Y., ASSIGNOR TO THE INTERIOR CONDUIT AND INSULATION COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 514,139, dated February 6, 1894.

Application filed November 15, 1892. Serial No. 452,091. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVUS G. WAGNER, a citizen of the United States of America, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Arc Lamps, of which the following is a specification.

My invention relates to improvements in that type of arc lamps in which the electrodes consist of material made in the shape or conformation of sectors or parts of a circle, and are fed horizontally toward each other through the agency of electro-magnetic controlling apparatus.

My invention has for its objects, first, the construction of a lamp of this type in which the parts shall be compactly arranged within a small space, and, second, the adaptation of an automatic cut out apparatus to such a lamp and in such manner that the carbons may be automatically cut out under abnormal conditions of current, and, third, to provide such a lamp with the several details of construction and arrangement of parts hereinafter described, all of the novel features of which are particularly pointed out in the claims at the end of this specification.

For a full and clear understanding of the invention reference is had to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view taken through Fig. 3 on the broken line 1—1 and as seen looking in the direction of the arrows. Fig. 2 is a similar view taken through the same figure on the broken line 2—2. Fig. 3 is a vertical sectional view taken through Fig. 1 on the line 3—3 and as seen looking in the direction of the arrows from left to right. Fig. 4 is a vertical plan view as seen looking at Fig. 3 from the bottom toward the top of the drawings. Fig. 5 is a detail view illustrating the clamp attachments for the carbon electrodes. Fig. 6 is also a detail view illustrating the automatic cut out apparatus, and Fig. 7 is a diagrammatic view illustrating the circuits of the lamp. Figs. 8 and 9 are sectional views taken respectively on the lines 4—4 and 5—5, Fig. 1.

Referring now to the drawings in detail in all of which like letters of reference represent like parts wherever used, C constitutes the base of the lamp adapted to support the operative parts and to act also as a reflector for throwing the rays of the lamp downward.

B constitutes the main support or arm for sustaining the mechanism of the lamp and is preferably cast of the conformation shown in Fig. 3 so as to have journal bearings for an upright shaft S in its upper and lower ends, and also for clock mechanism, consisting of a train of gear wheels G, G′, G^2, &c., the main gear wheel G being splined directly on the upper end of the upright shaft S and connected to the body or frame of the lamp by a main or driving spring S′ which is adapted to cause the shaft S to rotate and carry with it the carbon supporting arm A′ in the direction of the arrow shown in Fig. 7.

A is a fixed horizontal carbon supporting arm and D, D′ are the carbon electrodes of flat disk like shape securely held in position upon the arms A and A′ by clamps H and set screws T, *f f* being guide screws fitting in grooves in the upper face of the arms A and A′. The rigid arm A it will be observed is thoroughly insulated from the body or frame of the lamp B while the movable arm A′ is in direct electrical contact therewith.

M and M′ are solenoid coils, the former of comparatively low resistance, and the latter of high resistance, said coils being so wound as to oppose each other in their pull upon the magnet core E which is pivotally secured in the upper portion of the lamp frame so as to rock back and forth.

An examination of Fig. 7 will clearly disclose the nature of the windings of the two coils, the winding m^3 of the low resistance coil being connected to the conductor *w* at its opposite ends, and the winding m^2 beneath the winding m^3 being differential or the reverse of the coil m^3, said coil m^2 being connected by the conductor *w′* with the coil *m′* of the high resistance solenoid M′.

The train of gear wheels G, G′, G^2, &c., ends in an escapement e^3 adapted to impel an escapement pallet *p* borne by an upright shaft which carries an arm *n* with a downward extension adapted to make mechanical contact with a notch in the outer end of the adjustable lever F′ so that when the solenoid core

E (see Fig. 2) is turned sufficiently far in the direction of the rotation of the hands of a watch or from left to right the clock mechanism will be checked by the extension of the lower end of the arm *n* coming into contact with the notch on the outer end of the adjustable lever F′, said lever having a spring *t* which permits the free or outward end to be advanced as desired for the purpose of lengthening the arc to any desired length.

F is a pivoted cut out lever having a spring *t′* attached to its upper side and to the frame of the lamp, the function of said spring being to lift the lever into contact with the under surface of the metallic contact plate *n′* when the switch actuating pin *l* is carried sufficiently far to the right (see Fig. 7) to clear it from the outer end of the lever.

S^w is an operating switch adapted to shunt the lamp when it is so desired. Attached to this switch S^w is an arm *m* (see Fig. 2) the free end of which comes in contact with a pin on the lower side of the magnet core E so that when turned into the position shown in dotted lines in that figure the arm *m* will force the solenoid core E to the right and rupture the short circuit between the cut out spring or arm F and the contact plate *n′*.

The operation of the apparatus is as follows: Suppose the carbons to be normally in contact with each other and the switch S^w to be closed. (See Fig. 7.) In the position indicated in Fig. 2 with the full sized carbons in place, the driving spring S′ has been put under tension in carrying the arm in the reverse direction of the arrow, and the two carbons D and D′ normally rest against each other. Suppose then the switch S^w be closed or in the position shown in dotted lines in Fig. 2; this short circuits the lamp as will be seen on examination of Fig. 7 as follows: The current entering by the conductor *w* on the left hand binding post *b*, switch S^w, conductor w^2, binding post b^2, conductor *w*, binding post *b′* to line, but the act of turning the switch S^w just named and illustrated in dotted lines in Fig. 2 causes the arm *m* carried by the same switch to force the solenoid core E to the right, thereby causing the pin *l* and its insulating contact point *v* to ride over the curved end of the spring F thereby rupturing the circuit between the lower extended lug of the spring F seen on the right in Fig. 2 with the upper contact plate *n′* seen in Fig. 7, so that the shunt path *w* connected to the lever F is now ruptured between the binding post b^2 and the juncture of the two conductors *w w′*. The switch S^w is now turned into the position shown in full lines in Fig. 2 and also in Fig. 7. The current is therefore ruptured through the shunt w^2 and takes the following path: from the binding post *b* to the conductor *w* to the rotary shaft S through the arm A′, carbon D′, carbon D, and arm A. The upper screw which holds the arm A to standard B, conductor *w*, low resistance coils m^3 of magnet M and thence by conductor *w* to binding post b^2, binding post *b′* out to line. At the same time a derived current path of high resistance is formed at the junctures of the conductors *w* and *w′* on the left passing by the coil *m′* of the solenoid M′, conductor *w′*, differential coil m^2, conductor *w*, where it joins the other or main current and passes out to line. The coil m^3 of the solenoid M however has sufficient influence upon the solenoid core E to rotate it from left to right as seen in Figs. 1 and 2 and from right to left as seen in Fig. 7, thus establishing the arc between the two carbon electrodes D and D′. Consequently they burn away and are allowed to be fed forward by the main spring M as they thus burn away, until the solenoid core is checked in its motion to the right by the escapement pallet and escapement *n* coming into contact with the notch in the end of the lever F′. After a time however the differential coil m^2 and the opposing coil *m′* of the high resistance solenoid M′ overpower the magnet M and draw the core E in a reverse direction, thus releasing the escapement and allowing the carbon A′ to be fed forward under the influence of the clock mechanism G, G′, &c., and its propelling spring S′. This continues until the forward feed is checked by the escapement lever *n* and the notch on the end of the lever F′ as before. Should an abnormal current at any time pass through the high resistance coil M′ owing to a rupture of the carbons or any unforeseen accident it will turn the solenoid core E sufficiently far to the left for the pin *l* to ride over the upwardly curved extension of the lever F, thus allowing the lug on the outer end of this lever to come into electrical contact with the upper yielding spring *n′* thereby automatically establishing a shunt circuit around the lamp which cannot be broken until an attendant reaches the lamp and manipulates the switch S^w as already described.

I do not limit myself to the specific details of construction herein described and shown as many of the features of my improvement may be departed from in general terms and still come within the scope of my claims hereinafter made.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An arc lamp having a fixed and a movable carbon holder, the latter attached to a vertical shaft operatively connected to a train of gearing in combination with a single solenoid core extending through two solenoid coils, one of which is in circuit with the carbons and the other in a by-path or shunt circuit and an escapement carried by the solenoid core adapted to come into mechanical contact with a stop on the frame of the lamp, substantially as described.

2. An arc lamp having a fixed and a movable carbon holder, the latter attached to a vertical shaft, a train of gearing for feeding the movable carbon forward as it burns away;

an escapement for regulating the length of the arc and an automatic electro-magnetic cut out device in combination with a shunting switch having an arm adapted to break the shunt path formed automatically, establish a new shunt path and put the lamp in condition to work again when the switch is opened, substantially as described.

3. In an arc lamp carbon feeding mechanism for feeding the carbons together as they burn away in combination with a single solenoid core operatively connected to an escapement for regulating the length of the arc, said core being surrounded by three coils as follows, one low resistance coil in the arc circuit and two high resistance coils in series with each other and in a permanently closed shunt, one of said coils being reversely wound to the main coil and located beneath it, substantially as described.

4. An arc lamp having an electro-magnetic cut out which acts to shunt the lamp for abnormal currents in combination with a hand switch having means for rupturing the shunt established automatically and circuit connections for establishing a second or independent shunt and at the same time placing the lamp in condition to work when the switch is again manipulated.

5. In an arc lamp an electro-magnetic cut out which shunts the lamp for abnormal currents, a hand switch having mechanical connections for rupturing the shunt thus established and placing the lamp in condition to work and electrical connections whereby when the first shunt is ruptured a new shunt is made and the lamp again rendered operative when the last named shunt is broken.

6. An arc lamp having a pair of carbon holders one of which is fixed and the other movable and attached to a vertical rotary shaft operatively connected to a train of gearing, in combination with a pair of solenoids having a curved core adapted to move in a plane parallel with the carbons and an escapement carried by the core adapted to check the train of gear and regulate the length of the arc, substantially as shown and described.

GUSTAVUS G. WAGNER.

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