

(No Model.)

W. P. FREEMAN.  
ELECTRIC ARC LAMP.

No. 294,027.

Patented Feb. 26, 1884.

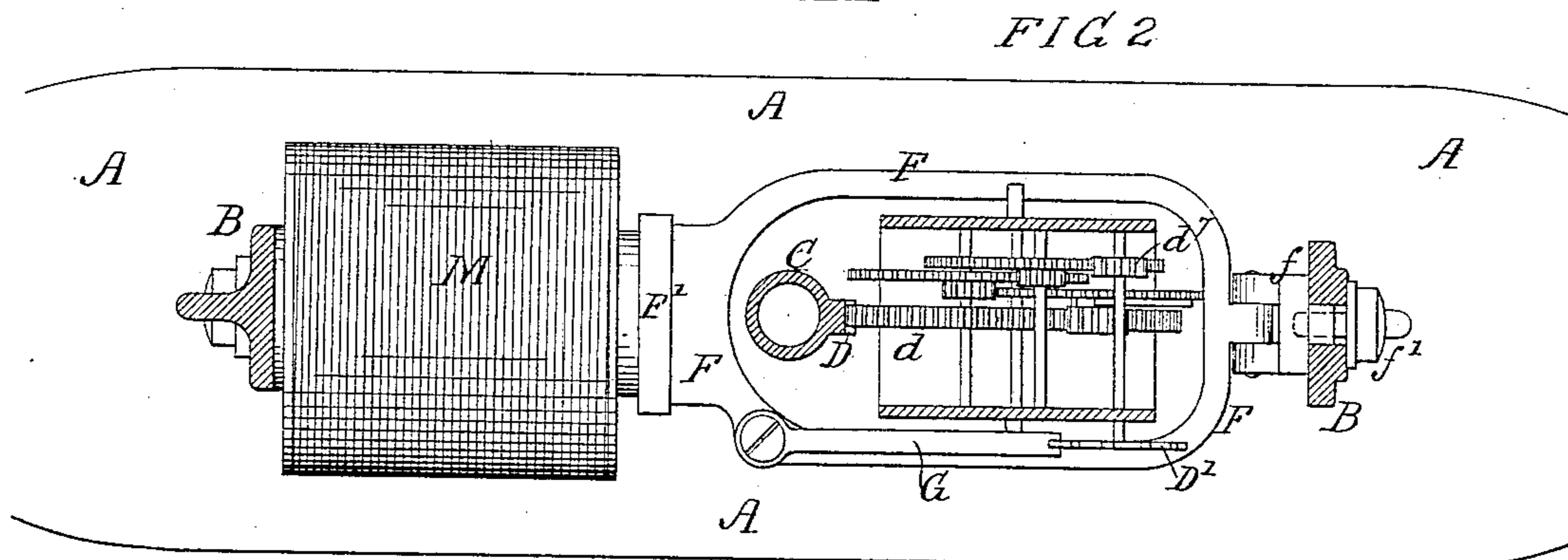
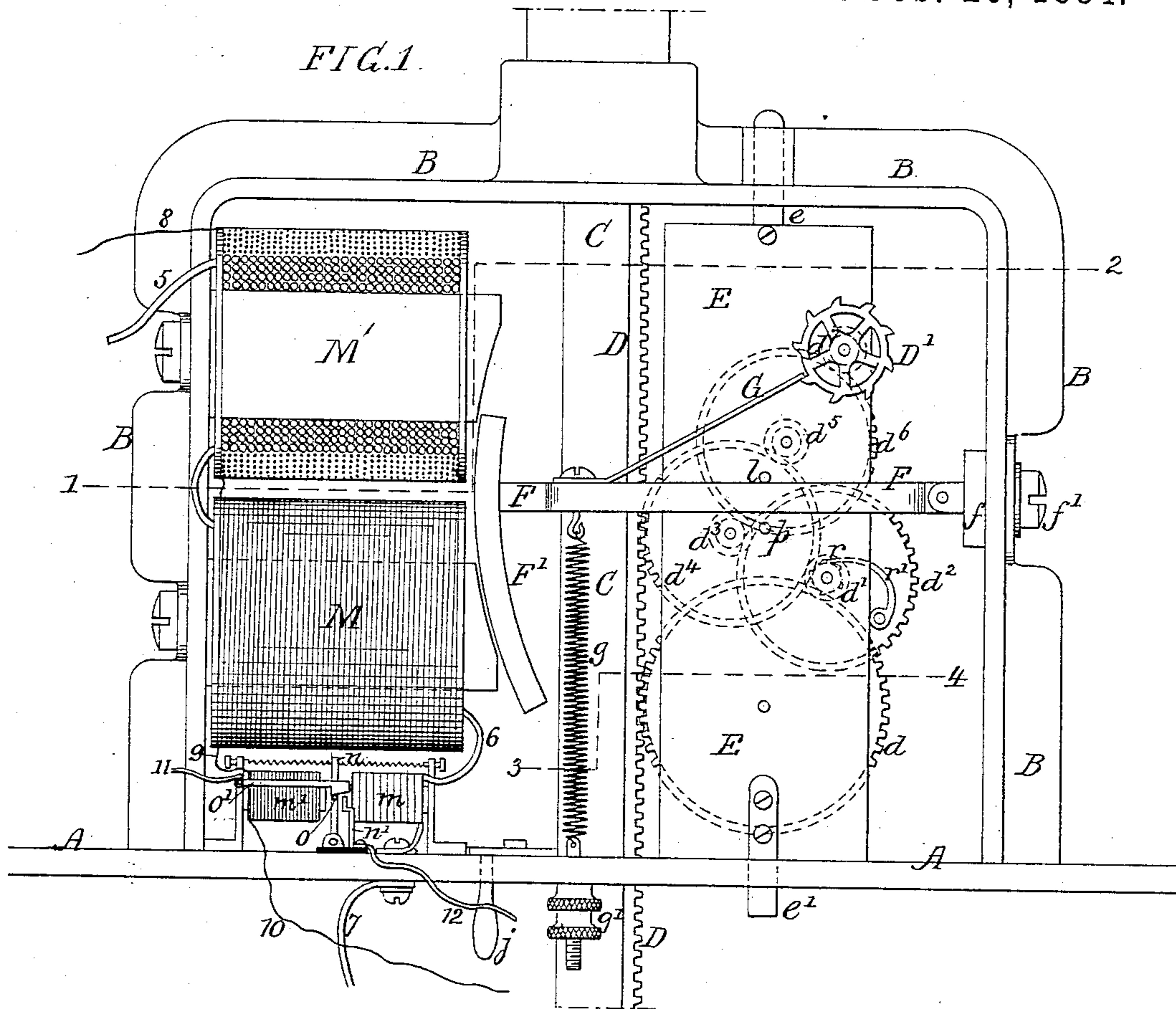
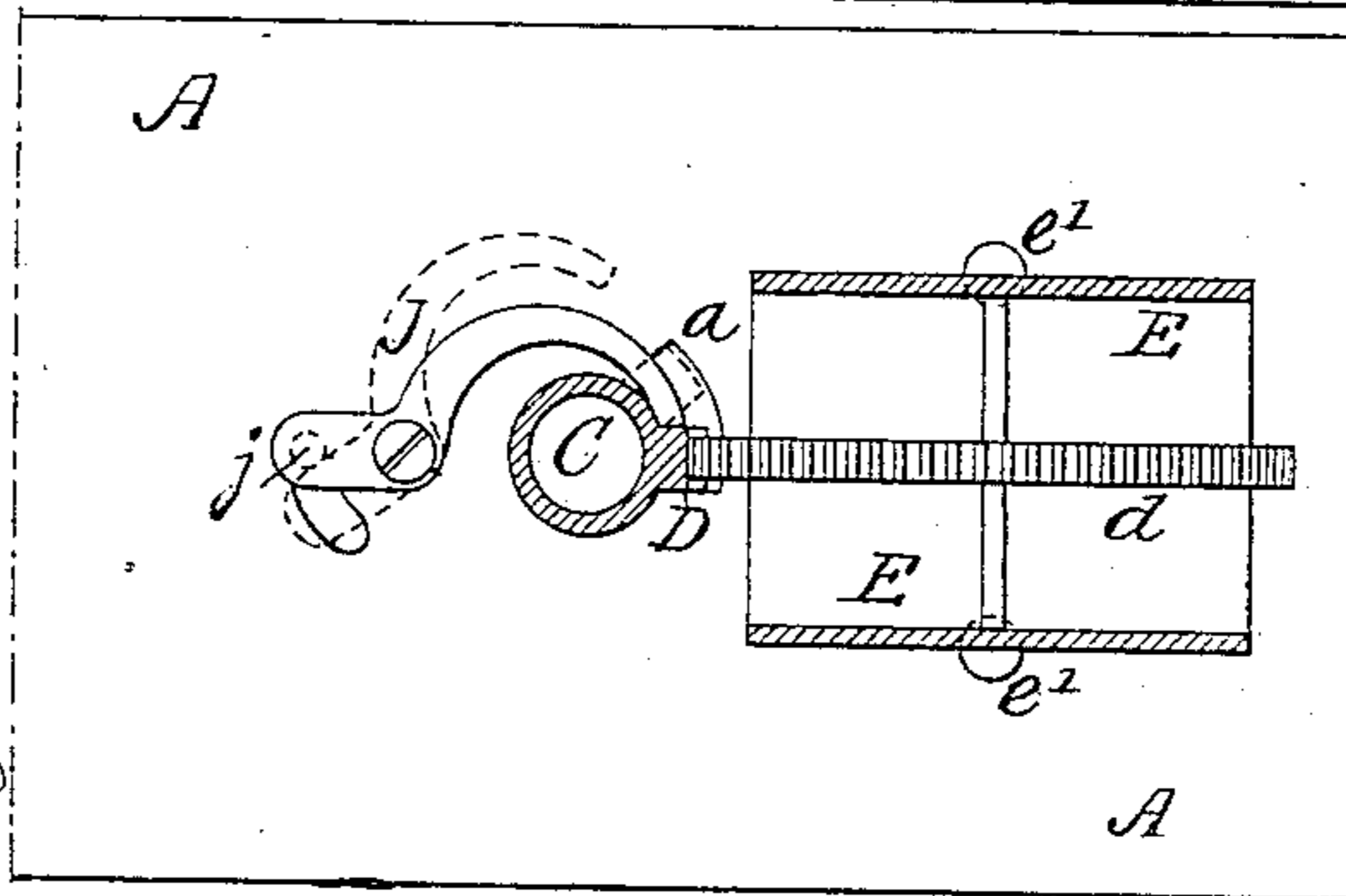


FIG. 3.



WITNESSES:  
Harry Dury  
Hamilton D. Turner.

INVENTOR:  
W. P. Freeman  
By his Attorneys  
Howson & Son

# UNITED STATES PATENT OFFICE.

WARREN P. FREEMAN, OF BROOKLYN, NEW YORK, ASSIGNOR TO WILLIAM F. JOBBINS, OF SAME PLACE.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 294,027, dated February 26, 1884.

Application filed March 9, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WARREN P. FREEMAN, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have  
5 invented certain Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention consists of certain improvements in the construction of that class of electric-arc lamps in which the movable carbon is  
10 fed forward by gravity under the control of a shunt-magnet operating a retainer, and train of gear-wheels gearing into a rack on the carbon-holder, as more fully described herein-  
15 after.

In the accompanying drawings, Figure 1 is a side view, partly in section, of my improved arc-regulating devices; Fig. 2, a sectional  
20 plan on the line 1 2, Fig. 1; and Fig. 3, a sectional plan of a portion of the device on the line 3 4.

A is the horizontal cross-plate, which forms the upper portion of the frame of the lamp, and supports the arch B and the arc-regulating  
25 devices, as shown in Fig. 1. Through the center of this arch and through the center of the plate passes the vertical rod C, forming the holder for the positive carbon.

To one of the upright legs of the arch B are  
30 bolted the electro-magnets M M, which are double-wound with coarse wire in the main circuit, and fine wire in a shunt-circuit, the main and shunt coils being wound so as to have opposing magnetic effects on the cores,  
35 the main-circuit coils causing attraction of the armature, while the shunt-coils cause it to be repelled. A pivot-block, *f*, is secured to the opposite leg of the arch B by a bolt, *f'*, so as to be adjustable in a vertical slot in the arch,  
40 and to this block is pivoted the armature-lever F, carrying at its outer end the curved armature F', to be acted on by the electro-magnets M M, under the control of a spring, *g*, provided with suitable adjusting devices, *g'*, Fig. 1.  
45 This armature-lever is bifurcated, as shown in Fig. 2, so as to extend on both sides of the movable frame E, carrying the train of gears, as well as the carbon-rod C. This gear-frame E may have a limited vertical movement between the plate A and the top of the arch, and

is provided with guide-pins *e e'*, passing through the plate and arch for that purpose.

On the carbon-rod C is formed a vertical rack, D, into which gears the first wheel, *d*, of the train *d, d', d'', d''', d'', d'', d''', d''*. The axis  
55 of this last wheel of the series carries a ratchet or break wheel, D', preferably outside of the frame E, and an arm or catch, G, carried wholly by the armature-lever F, is adapted to come into contact with this wheel, to retain the latter  
60 and the gear-wheels, and through the wheels the carbon-holder C, except when the armature-lever is in its lowest position in contact with a stop pin or pins, *p*, preferably on the frame E. Lifting pins or projections *l* are formed on  
65 the movable frame E in such a position that on the upward movement of the armature-lever, immediately after the arm G has locked the wheel, the said lever F will come into contact with the pins *l*, and on the continued up-  
70 ward movement will lift the frame E, and with it the rod C, owing to the locked condition of the train of gears. The main circuit entering at one of the usual binding-posts on the frame of the lamp passes through the con-  
75 ductor 5, coarse-wire coils of the electro-magnets M, and thence by the conductor 6 through the coils *m* of the automatic cut-out hereinafter referred to, plate A and flexible conductor  
80 7 to the lower part of the upper-carbon holder, in the usual manner, thence passing through the negative carbon frame or conductor to the exit binding-post. The shunt-circuit is through the conductor 8, fine-wire  
85 coils of the electro-magnets M, conductor 9, coils *m'* of the cut-out, and conductor 10 to the exit binding-post. When no current is passing through the coils of the electro-magnets, the armature-lever F will be in its lowest  
90 position in contact with the stop *p*. When the lamp is put in circuit, the current through the main-circuit coils of the electro-magnets M will cause the attraction of the armature and elevation of the lever F, so as to first lock  
95 the wheel D' by the arm G, and then the elevation of the frame E by the pins *l*, thereby causing the elevation of the upper carbon and formation of the arc. As the current in the  
shunt increases and overbalances the magnetic effect of the main-circuit coils on the mag- 100

nets, the armature and lever F will descend  
 and allow the frame E and carbon-holder to  
 descend until they reach the position shown in  
 Fig. 1, and on a continued descent of the lever  
 5 F the wheel D' will be released from the arm  
 G and the train of gears be free to turn, to  
 allow the descent of the rod C and feeding  
 forward of the upper carbon. The consequent  
 increase of current in the main circuit will  
 10 raise the armature and again lock the wheel  
 D'. The carbon-holder C may be raised to  
 allow of the insertion of a fresh carbon while  
 the rack D remains in gear with the wheel *d*,  
 owing to the pawl-and-ratchet connection *r r'*  
 15 of the pinion *d'* with the wheel *d*; but I prefer  
 to cut a segmental slot, *a*, Fig. 3, in the plate A,  
 and a similar one in the arch B, to allow the  
 rod C to be turned partially around to throw  
 the rack D out of gear with the wheel *d*, as  
 20 indicated by dotted lines in Fig. 3, so that the  
 rod can be raised free from the wheels and put  
 into gear again at any desired point of the rack.  
 A retaining-lever, J, pivoted to the plate A  
 and having a handle, *j*, accessible on the out-  
 25 side, is adapted to bear against the side of the  
 rack, as shown in Fig. 3, to keep it in gear  
 with the wheel *d*, the said lever being mova-  
 ble to the position indicated by dotted lines,  
 when it is desired to free the rack. The auto-  
 30 matic cut-out coils *m m'* in the main and shunt  
 circuits, as above referred to, are arranged with  
 poles facing each other, and between them is  
 a pivoted armature, *n*, with suitable adjust-  
 able springs, the armature being mounted on  
 35 an insulated base and provided with a pin, *o*.  
 A catch, *o'*, pivoted to but insulated from the  
 frame, rests on this pin, and is connected  
 through a conductor, 11, with one of the bind-  
 ing-posts of the lamp. An insulated contact,  
 40 *n'*, is connected through the conductor 12 with  
 the other binding-post of the lamp. The arma-  
 ture-springs are so adjusted that under nor-  
 mal working conditions of the lamp the arma-  
 45 ture will be maintained in a position to hold  
 the catch in its raised position and out of con-

tact with the point *n'*; but when the current in  
 the shunt-circuit increases beyond a certain  
 point, (as when the feeding devices cease to  
 act,) the armature *n* will be attracted by the  
 electro-magnet *m'*, and the catch *o'* allowed to 50  
 drop, and, coming into contact with *n'*, will  
 complete the circuit through the conductors 11  
 12; and cut the lamp out of circuit and lock it so.

I claim as my invention—

1. The combination of the movable carbon- 55  
 holder of an electric-arc lamp having a rack,  
 with a movable frame carrying a train of gears,  
 electro-magnets in the main and shunt circuits,  
 an armature-lever adapted to raise the mova-  
 ble frame, and a catch or arm carried wholly by 60  
 the said armature-lever, to lock and release  
 the gears, substantially as set forth.

2. The combination of the movable carbon-  
 holder of an electric-arc lamp having a rack,  
 with a movable frame having lifting-pins and 65  
 carrying a train of gears, and ratchet or break  
 wheel, and with electro-magnets in the main  
 and shunt circuits, and an armature-lever car-  
 rying a catch for said ratchet or break wheel  
 and adapted to act on the said lifting-pins, all 70  
 substantially as described.

3. The combination of the movable carbon-  
 holder having a rack, and the frame slotted  
 for the passage of said holder, with a train of  
 wheels gearing with the rack, and a retaining- 75  
 lever, J, as and for the purpose specified.

4. The combination of electro-magnets *m m'*  
 in the main and shunt circuits, and armature  
*n*, carrying a catch-pin, with a contact, *n'*, and  
 pivoted catch adapted to come in contact with 80  
 the latter on its release by the catch-pin and  
 conductors 11 12, substantially as set forth.

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

WARREN P. FREEMAN.

Witnesses:

JAMES C. EADIE,  
 HUBERT HOWSON.