

(No Model.)

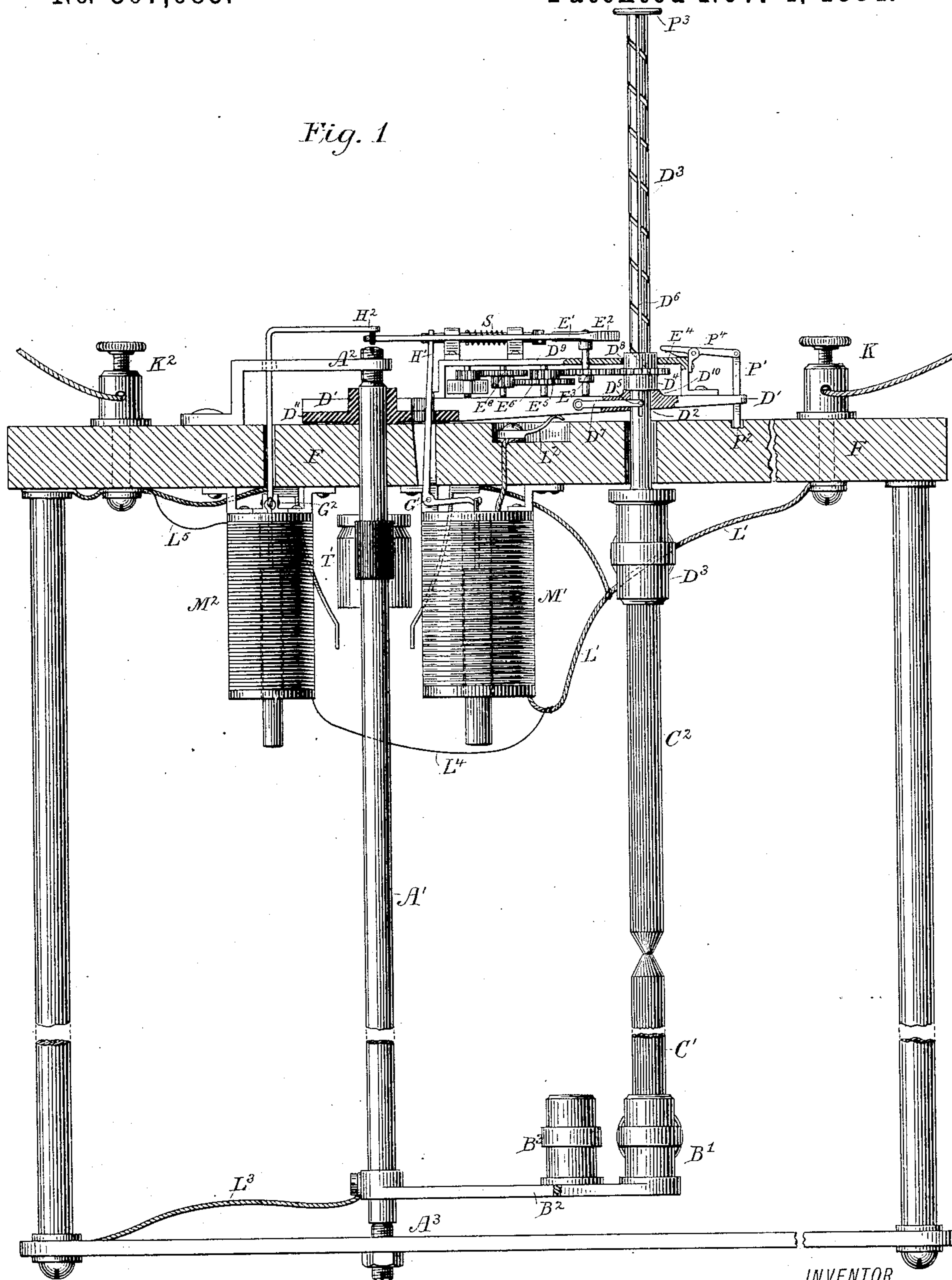
2 Sheets—Sheet 1.

R. J. SHEEHY.
ELECTRIC ARC LAMP.

No. 307,683.

Patented Nov. 4, 1884.

Fig. 1



WITNESSES

Wm A. Shunk
Geo W. Brock

INVENTOR

Robert J. Sheehy,

By his Attorneys

Cope Edgcomb & Butler

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2,

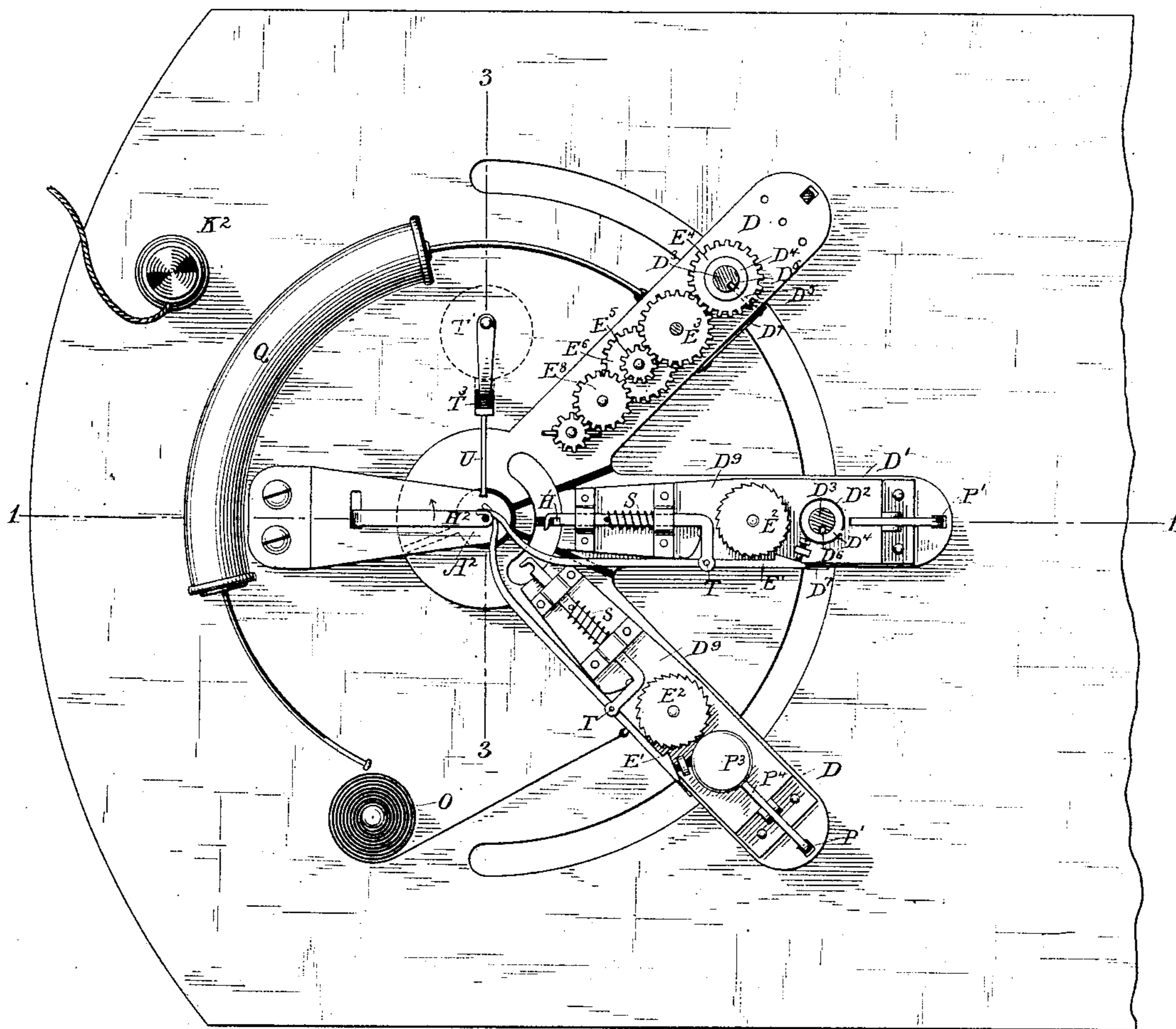
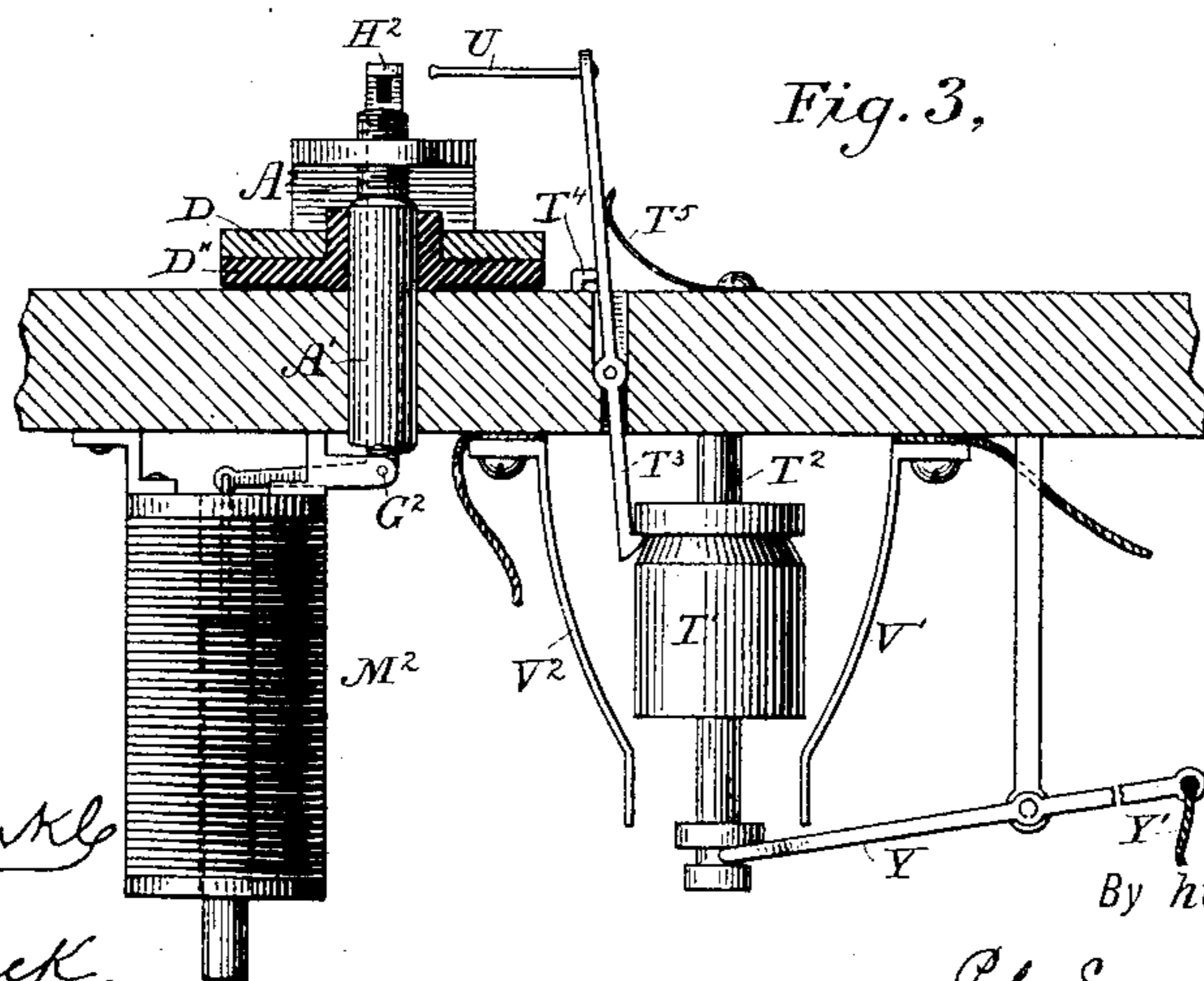


Fig. 3,



WITNESSES

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UNITED STATES PATENT OFFICE.

ROBERT J. SHEEHY, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 307,683, dated November 4, 1884.

Application filed October 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, ROBERT J. SHEEHY, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to that class of electric-arc lamps in which the so-called "electric arc" is maintained between two carbon electrodes. It particularly relates to the following features of said electric-lighting systems: first, that class of appliances commonly denominated "regulators," the office of which is to cause a uniform and maximum degree of light to be produced by establishing and thereafter continually maintaining the proper separation between the electrodes; second, a means of providing fresh electrodes whenever a pair of electrodes are consumed, and of thus continuing the action of the light through any desired length of time, and also of bringing said fresh electrodes into the proper position in the light mechanism—as, for example, the center of a globe or the focus of a reflector; third, a means of withdrawing the light from the circuit in the event of the development of an abnormal resistance.

The mechanical features of my invention may be described in outline as follows: A central revolving shaft is provided near its lower end with suitable devices for carrying a number of negative electrodes, and at its upper end with corresponding appliances for carrying a similar number of positive electrodes and certain elements of the regulating mechanism. This central vertical shaft tends to revolve upon its axis under the influence of a force which is automatically brought into action whenever the consumption of a set of electrodes is completed. This permits the revolution of the shaft under the action of said force, and thereby brings another set of electrodes into the position formerly occupied by the set consumed. The regulating mechanism employed is operated, in the usual or any desired manner, by means of stationary electro-magnets situated, respectively, in the main and shunt circuits. In conjunction with each one of the positive electrodes with which the lamp may be equipped I employ, first,

and, secondly, clamping mechanism whereby when any particular set of electrodes is in action the regulating mechanism of that particular set may be brought into co-operation with the said stationary system of regulating-magnets. To withdraw the lamp from the circuit when defective, I employ an automatic cut-out actuated by the electro-magnetism developed through the agency of the shunted current whenever it exceeds a predetermined strength, which abnormal shunt-current operates to withdraw the mechanism which supports a weight, so as to allow the same to descend and close a shunt-circuit spanning the electrodes and arc of the lamp, which shunt-circuit may be of small resistance, or of resistance equivalent to that of the normal arc, as desired.

My invention is clearly exhibited in the accompanying drawings, in which Figure 1 is a side elevation, partially in section, of my electric lamp. Fig. 2 is a plan view showing the radial disposition of the several sets of electrodes and such parts of the regulating mechanism as is employed in conjunction with each, and Fig. 3 shows the automatic cut-out mechanism.

To parts appearing in more than one figure the same reference-letters have been affixed in each.

A' is a vertical shaft or spindle turning in the fixed bearings A² and A³. At a point near its lower bearing it carries a series of radial arms provided with sockets B' B² B³, in which the negative electrodes—as, for example, C'—are held. The same shaft carries upon its upper end a series of corresponding radial arms, of which the arm D' is shown in section in the figure. Near the outer end of this arm an aperture, D², is provided, through which loosely passes an electrode-holder, D³. This holder, which supports the positive electrode C², traverses the nut D⁴, and ascends or descends within the same whenever said nut is revolved, the revolution of the holder itself being prevented by the pin D⁵, maintained within a vertical slot, D⁶, in the holder D³ by the pressure of the spring D⁷, which may be pressed back when it is desired to withdraw the holder. The nut itself revolves in bearings at D⁸ in the cap D⁹ and rests upon the collar D¹⁰. It will therefore be understood

that any revolution of the nut in one direction will cause said carbon-holder to be elevated, while a like motion in the opposite direction will permit it to descend. The advance movement of the positive electrodes is effected by the constant force of gravity, and for this purpose I prefer to make the holder D^3 of sufficient weight to cause the revolution of the nut and the mechanism co-operating therewith, except when checked by the action of the regulating mechanism to be presently described. Each one of the arms D , of which there may be any desired number compatible with the size of the lamp, further carries a clamping mechanism, which consists of a pawl, E' , engaging the teeth of the ratchet E^2 , carried by a shaft, every motion of which is communicated by the wheel E^3 and pinion E^4 to the nut D^4 . The withdrawal of the positive electrode may therefore be effected by propelling said pawl in one direction, while the advance movement of the electrode may be produced by permitting the retrograde movement of said pawl in the opposite direction, or by its withdrawal from the teeth of the ratchet E^2 . I further provide a train of gearing comprising the wheels and pinions E^5 , E^6 , E^8 , &c., the office of which is to prevent the too rapid movement of the movable electrode.

To the lowermost surface of the upper face-plate, F , are attached two hollow solenoids or axial electro-magnets, M' , M^2 , of ordinary construction, the armatures of which are cylindrical cores of soft iron suspended at the proper point within the axial openings of the solenoids. Each armature-core is maintained in its normal position upon the end of a right-angled or bell-crank lever pivoted to the frame-work of the lamp at the points G' and G^2 , respectively, and passing freely through the frame-work of the lamp. The extreme end of the angular lever from which the core of the main-line electro-magnet is suspended appears at the point H' , in which position it engages with the clamping mechanism of the particular set of electrodes which is in position for operation. This is clearly presented in Fig. 2. The supporting-lever of the armature of the shunt electro-magnet is also in like manner extended through the frame-work, and is provided with an extension, by which the movements of the core of said shunt electro-magnet may be communicated at the point H^2 to the hereinbefore-described pawls in such manner as to withdraw them from the teeth of their respective escapement-ratchets. Thus in the position shown in the figure the lateral movement of said extension-piece in the direction of the arrow will cause the pawl-lever to be turned upon its fulcrum T , withdrawing the pawl from its position of engagement.

The electric circuits may be traced as follows: From the positive binding-post K' the main current passes by line L' , coils of solenoid or electro-magnet M' , contact-spring L^2 , arm D' , (which will necessarily be that one of

the several arms which supports the positive electrode in action,) thence through the bearings to the positive-electrode holder D^3 , positive electrode C^2 , arc, negative electrode C' , arm B^2 , conductor L^3 , and thence through the frame of the apparatus to the negative binding-post K^2 . The circuit of the shunt electro-magnet may be traced from one binding-post to the other by conductors L' , L^4 , and L^5 . The arm D' is insulated from the frame-work of the instrument by the paper collar D^{11} , and as an additional precaution I prefer to insulate the lower part of the shaft A' from its upper end. I do this by making the shaft in two pieces, and fastening both to a sleeve of insulating material.

The mechanism by which the main shaft A' is revolved when the consumption of a set of electrodes is completed may be described as follows: The said shaft is given a continual tendency to turn in its bearings by means of a spring, O , which is, however, normally held in check by a stop-lever, P' , which enters a recess in the frame-work at P^2 , and thereby maintains the arm D' in the proper position for operation until released by the impingement of the cap P^3 (carried by the positive electrode-holder) upon the lever P^4 . This permits the revolution of the shaft A' , which brings the next succeeding set of electrodes into position for operation. This movement, which might otherwise fracture the electrodes, is retarded by means of an air-box and piston (shown at Q) or other equivalent device.

The operation of the mechanism thus far described is as follows: The two electrodes constituting the particular set which is in position for operation being normally in actual contact, the electric current passes by the routes already traced and actuates the armature of the electro-magnet M' , moving the lever II' in opposition to the force of the retractile spring S , and communicating said motion to the pawl E' , thus elevating the positive electrode and establishing the arc. This increases the resistance of the main circuit, thus increasing the proportion of the aggregate current which is diverted through the coils of the shunt-magnet M^2 , and to a greater or less extent actuating its armature to remove the pawl from its engagement. In practice, the point of equilibrium between these two opposing forces and mechanisms is at once reached, and a uniform light from the arc is instituted and thereafter continuously maintained. When the consumption of the electrodes is completed, the cap P^3 withdraws the detent P' from the recess P^2 , in the manner hereinbefore described, and permits the revolution of the shaft A' a predetermined distance under the action of the spring O , thereby bringing the next succeeding set of electrodes into the main circuit, and also into position for operation, in which position they are locked, and from which they are subsequently released in the same manner as the former set. By these appliances a uni-

form light may be maintained throughout a period of time limited only by the number of sets of electrodes which it is found convenient to place upon the lamp. The cut-out mechanism of this lamp preferably comprises a weight, T', sliding upon an axial shaft, T². This weight is maintained in an elevated position by a dog, T³, held against a stop, T⁴, by a spring, T⁵. When the resistance of the luminous arc becomes so great as to materially interfere with the successful performance of other lamps upon or within the same circuit, the dog T³ will be automatically withdrawn by means of the lever U, the latter being actuated by the excessive movement of the lever H², which is due to the abnormal increase in the strength of current traversing the circuit of the shunt electro-magnet. When thus released, the weight T' falls between the metallic springs V' V², which are respectively connected to the positive and negative binding-posts of the lamp, which are thus bridged across so as to complete a shunt-circuit either of negligible resistance or of a resistance equivalent to that of the normal arc. To re-elevate said weight I have provided a lever, Y, and cord Y'; but any other convenient substitute may be employed.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a central vertical shaft or spindle, a series of radial arms affixed thereto, a series of positive electrodes respectively carried by said radial arms, a series of clamping mechanisms each carried by one of said arms, and stationary electro-magnets for actuating said clamping mechanisms successively.

2. The combination, substantially as hereinbefore set forth, of a central vertical shaft or spindle, a motor tending to rotate said shaft, radial arms affixed to said shaft, a positive electrode carried by each of said radial arms, and descending under the action of gravity, and mechanism upon each of said radial arms actuated by the descent of the positive electrode carried upon said arm for liberating said shaft to the action of said motor.

3. The multiplex electric-arc-light regulator consisting in the combination of a series of movable sets of electrodes, a movable clamping mechanism for each set, means for bringing each set of electrodes into a given position when it is in operation, retarding mechanism attached to each set for preventing the too sudden approach or separation of its electrodes, and stationary main and shunt electro-magnets for operating said movable clamping mechanism.

4. In an electric-arc lamp, the combination, substantially as hereinbefore set forth, of a central shaft, a motor tending to rotate said shaft, radial arms or extensions thereof, a nut carried by each of said radial extensions, and a threaded shaft traversing each of said nuts, and mechanism for revolving the same to cause the elevation or depression of the corresponding shaft.

5. In an electric-arc lamp, the combination, substantially as hereinbefore set forth, of a central shaft, a radial arm or extension thereof, a nut carried by said radial extension, a threaded shaft traversing said nut and normally descending under the action of gravity, and mechanism for revolving said nut for the purpose of causing the elevation of said shaft.

6. The combination, substantially as hereinbefore set forth, of the movable electrode of an arc-lamp, a screw-nut supporting said electrode and rotated by its descending movement, a wheel rotating with said nut, a pawl or equivalent device engaging with the periphery of said wheel, and an electro-magnet vitalized by the light-producing current for impelling said pawl in the direction necessary to impart a retrograde movement to said electrode.

In testimony whereof I have hereunto subscribed my name this 5th day of October, A. D. 1882.

ROBERT J. SHEEHY.

Witnesses:

DANIEL W. EDGECOMB,
MILLER C. EARL.