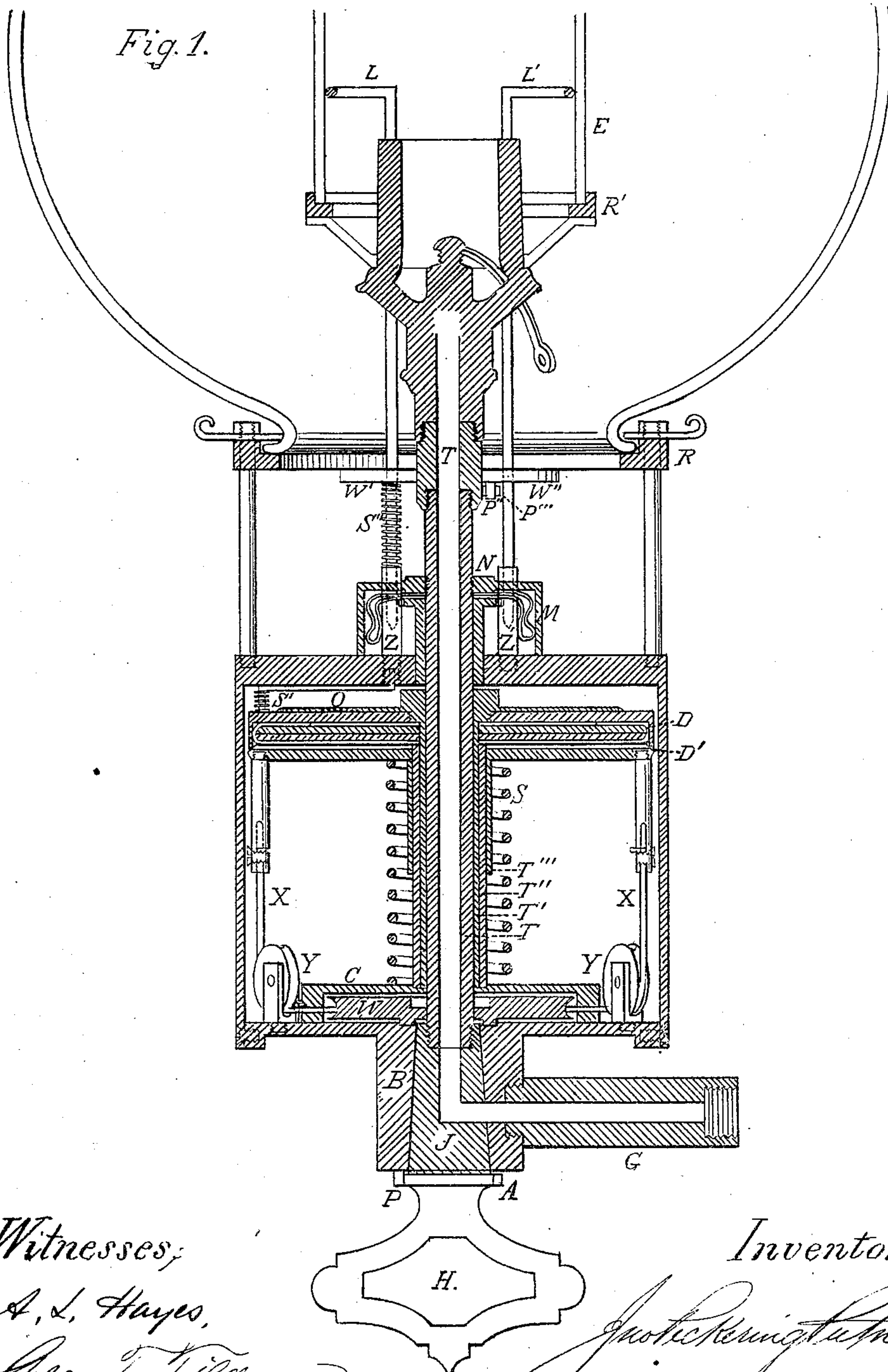


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No. 147,020.

Patented Feb. 3, 1874.



Witnesses;  
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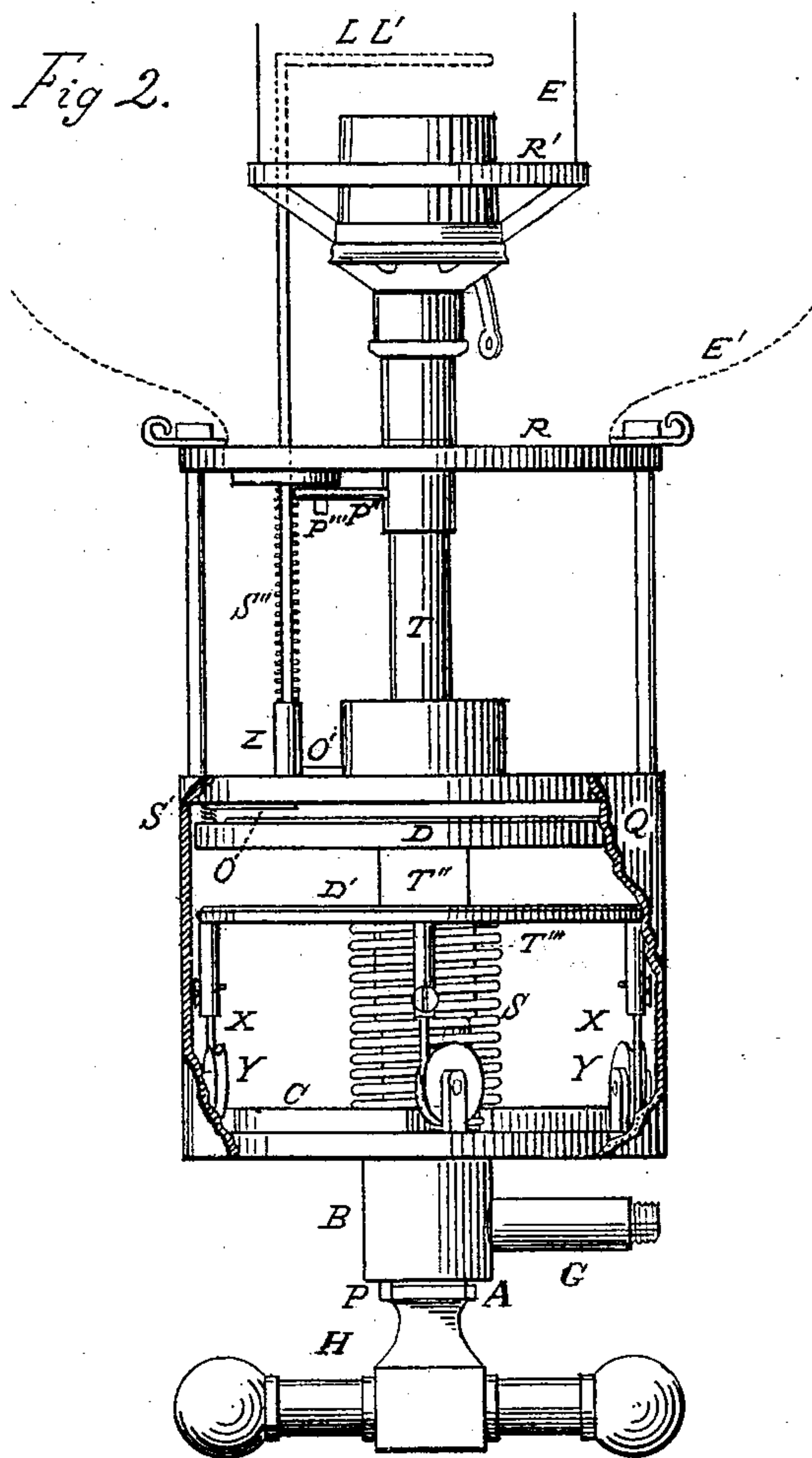
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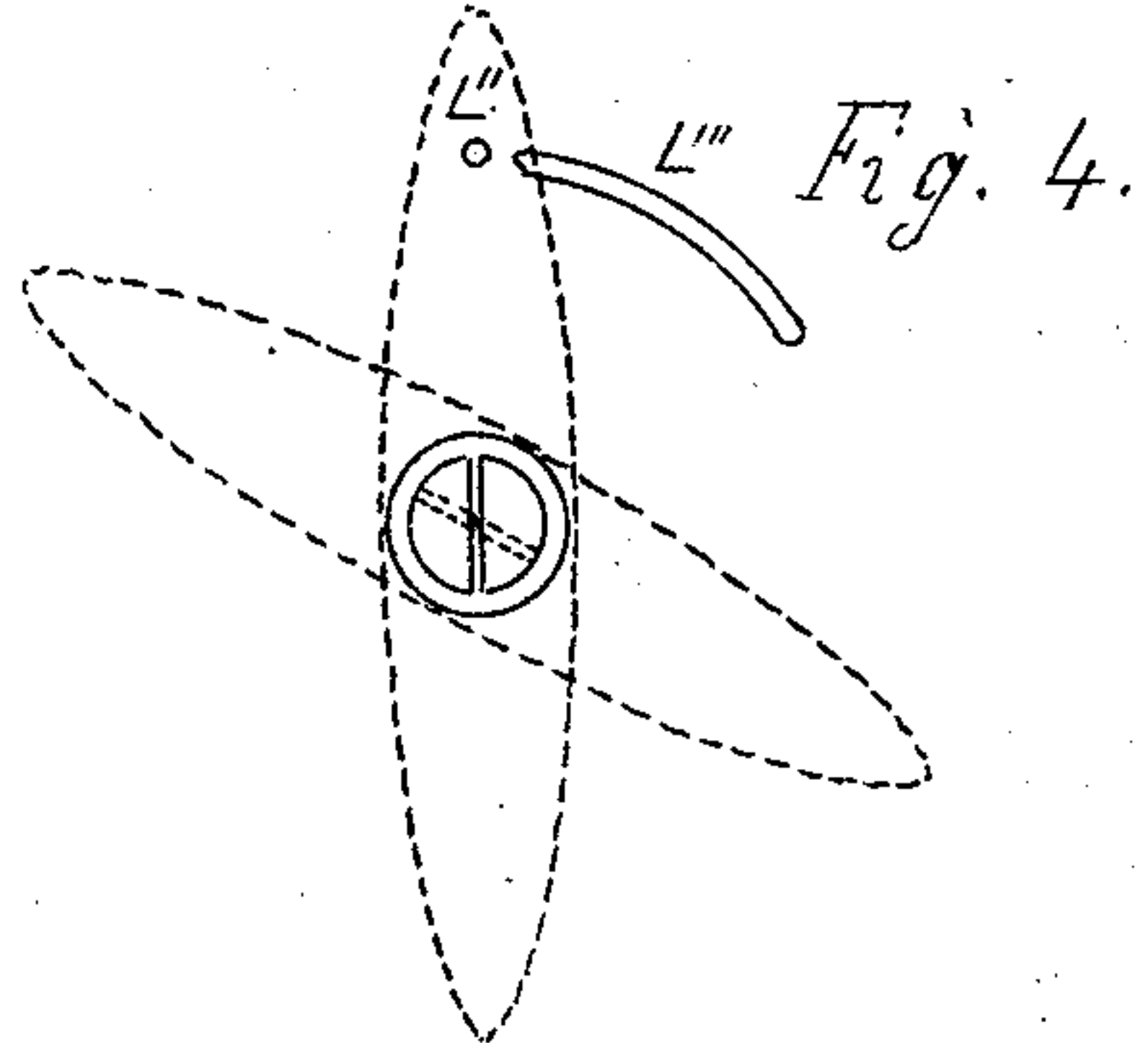
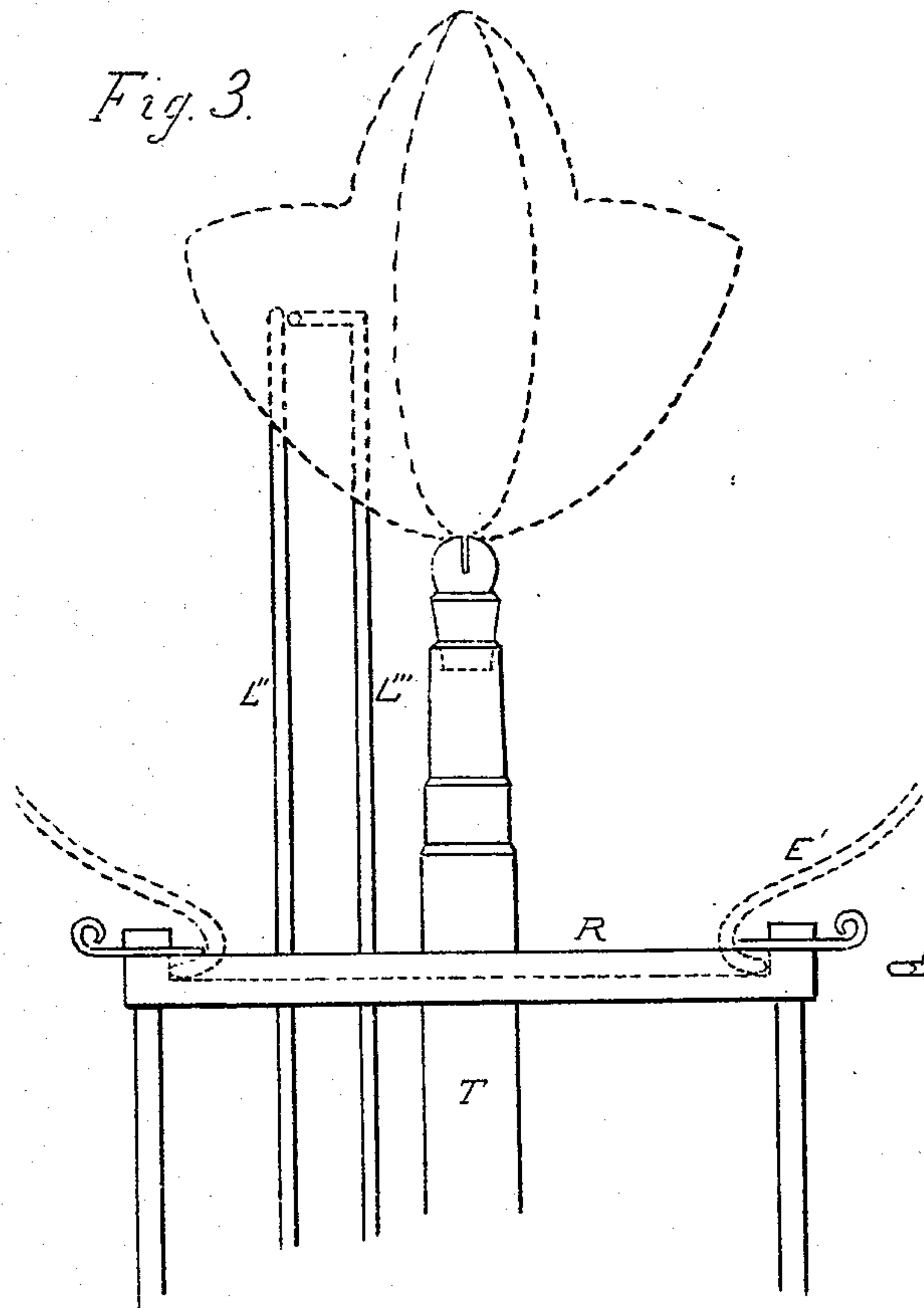
Inventor.

John C. Remington Putnam.

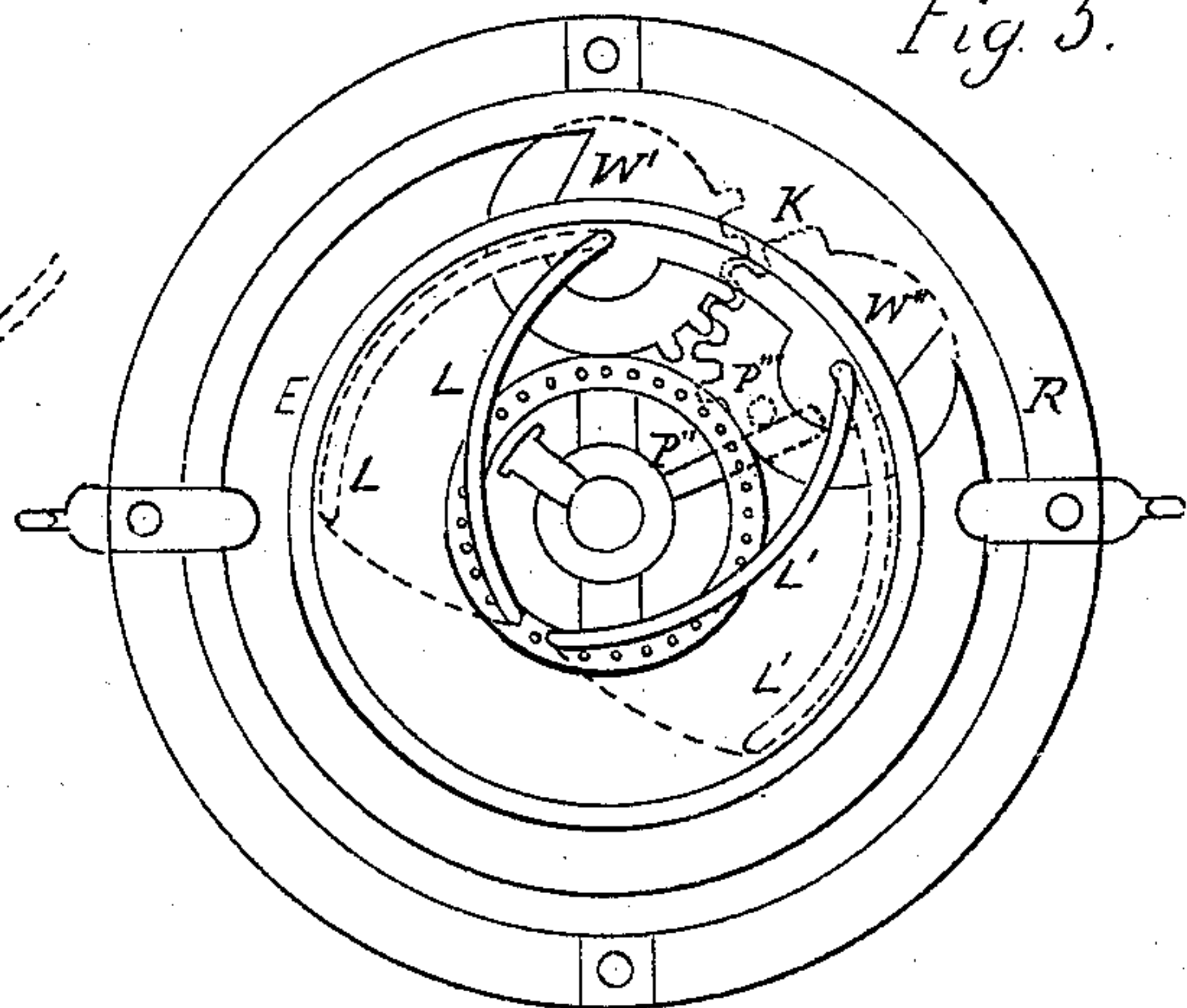


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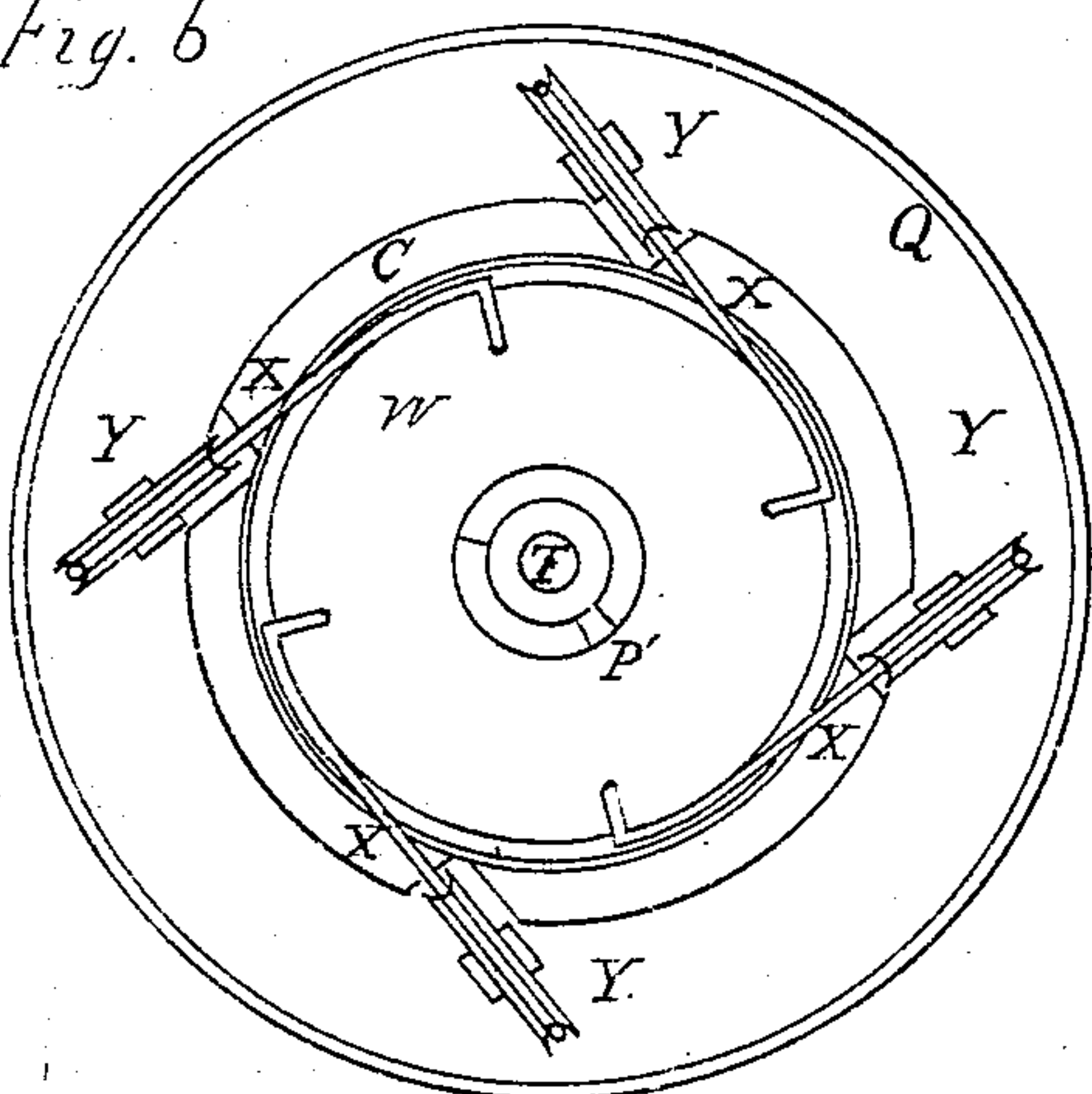
*Fig. 3.*



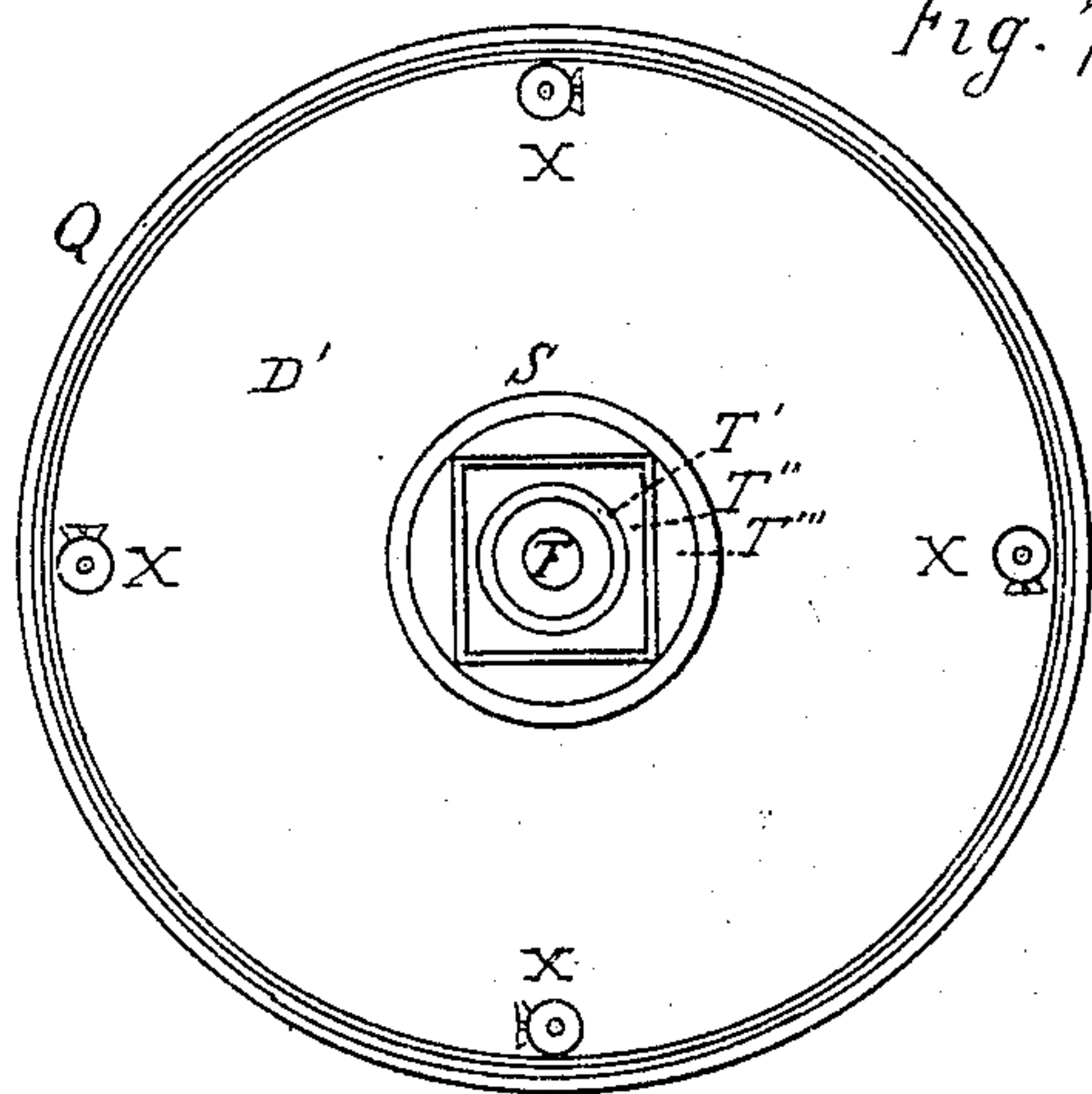
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



Witnesses,  
*A. L. Hayes.*  
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Inventor,  
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# UNITED STATES PATENT OFFICE.

JOHN P. PUTNAM, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN APPARATUS FOR LIGHTING GAS BY FRICTIONAL ELECTRICITY.

Specification forming part of Letters Patent No. 147,020, dated February 3, 1874; application filed July 5, 1873.

*To all whom it may concern:*

Be it known that I, JOHN PICKERING PUTNAM, of Boston, in the county of Suffolk, State of Massachusetts, have invented a new and useful Improvement in Apparatus for Lighting Gas by Frictional Electricity, of which the following is a specification:

This invention consists in an improved apparatus for lighting gas by frictional electricity, in which, by a single rotatory movement of the gas-cock, the gas is turned on, electricity is generated, an igniting-spark produced at the extremities of the wires conducting the electricity to the burner, and the flame removed from the wires after the gas is ignited, thereby preventing said conducting-wires from being injured by the heat. It also consists in the use of mechanism by means of which, when an argand-burner is used, the ends of the conducting-wires are made to approach each other in such a manner that the igniting-spark, which is then produced, must cross the escaping gas and ignite it, and are then removed from the flame. It also consists in the use of a hermetically-sealed case of improved form, for inclosing the generator of electricity, by which the same is perfectly protected from moisture, dirt, mechanical injury, or other disturbing causes, and its certain and permanent action insured.

The accompanying drawings, forming a part of this specification, represent my invention.

In these drawings, Figure 1, Sheet I, is a vertical section of the apparatus. Fig. 2, Sheet II, is a vertical elevation of the same, with a portion of the case which incloses the electric generator removed so as to show the machinery. These figures show the positions of the conducting-wires when an argand-burner is used. Fig. 3, Sheet III, shows a fish-tail burner and stationary conductors used therewith, the two positions of the flame—one at the moment of ignition, touching the wires, the other after ignition, and removed from the same—being shown by dotted lines. Fig. 4, Sheet III, is a plan of the above, giving a horizontal view of the position of the extremities of the conducting-wires in relation to the flame of the fish-tail burner, both during and after ignition. Fig. 5, Sheet III, is a plan of the conducting-wires when used with the argand-burner of the

machinery used to rotate the wires, and of the globe-holder and argand-chimney. The wires are represented in the two positions which they occupy both at the moment of ignition and after ignition. Fig. 6, Sheet III, is a horizontal section of the wheel W, the rotation of which separates the two plates of the electrophorus, and of the air-tight box containing the same. Fig. 7, Sheet III, is a horizontal section of the machinery connected with the plates of the electrophorus and inclosed within the air-tight case, of the cords X, of the spring S, of the sliding tube T', a view of the lower plate D', of the electrophorus, a section of the square tube T'', on which this plate slides, of the insulating-tube T', and of the rotating tube T.

In these figures similar letters refer to the same parts of the apparatus.

The invention may be considered as consisting of four parts, each of which I will now proceed to describe. They are, first, the device for turning on the gas; second, the electric generator; third, the device for hinging the extremities of the conductors together above the mouth of the burner, so as to produce the electric spark which ignites the gas, and afterward removing them from the flame, so as to prevent them from being injured by the heat; fourth, the inclosing-case which protects the electric generator.

The device for turning on the gas: In the drawings, G represents the gas-supply pipe, which terminates in a box, B, attached to the lower face of the lower plate of the hermetically-sealed case, which incloses the electric generator, and said box B forms the chamber of the gas-cock. Through this chamber passes, at right angles to the gas-supply pipe G, an upright tube, T, to the upper extremity of which is secured a burner, which may be argand, fish-tail, or of any other desired form. The lower extremity of the tube T is closed, and to it is attached a handle or knob, H, by means of which the tube can be rotated in the box B. That part of the tube which passes through the chamber B is conical in form, with the smaller diameter above, thus providing for the formation of a ground joint, J. To provide against looseness from the wear of this joint, a small space is left between the shoulder A



of the tube T and the bottom of the box B, and upon the tube T, and bearing against the upper face of the hermetically-sealed case Q, is a nut, N, by means of which the tube T can be drawn up as the joint J becomes loose by wear. This gas-cock is provided with the usual pin P, for the purpose of limiting the extent of its rotation to any desired number of degrees. Upon the side of the tube T, and at about the center of the chamber B, are two openings, side by side, or one elongated opening, through which the gas flows from the gas-supply pipe to the tube T. These openings are so situated on the circumference of the tube that the gas will flow with full force before the handle of the gas-cock has completed its full extent of rotation, and remains in full force to the completion of the said rotation.

The electric generator: I use for this purpose an electrophorus, the upper or rubbing plate of which consists of a metallic disk, D, fastened to the tube T, and rotating with it, and having its lower surface covered with kid or some other material suitable as an excitant or rubber for the electrophorus. The disk D is insulated from the tube T, which passes through its center, by a tube, T', of hard rubber, or some other suitable insulating material, which surrounds the tube T. Under the disk D, and surrounding the tube T', is another tube, T'', square on its outer surface, also made of some insulating substance, and prevented from rotating with the disk D by being fastened to the immovable box or cover C, which contains the wheel W. The resinous and non-rotating disk D' of the electrophorus slides up and down on the square tube T''. This disk is made of hard rubber, or some other suitable material, and is secured to a disk of metal, which is in metallic connection with the earth, by means of the spiral spring S, which surrounds the square tube T'', and is in contact at one end with the metallic disk, and at the other end with the top of the cover C. As the object of this spring is merely to hold the plates of the electrophorus together, and, at the same time, serve as a conductor of electricity, it may have any other desired form than spiral. The sliding of the disk D' is facilitated by the square metal tube T''', secured to the metal plate under the resinous disk, and fitting easily on the square tube T''. The resinous plate D' is drawn back from the rubbing-plate at the proper moment, after it has received the necessary friction from the excitant by the rotation of the wheel W, in the following manner: This wheel W rotates in a box, C, surrounding the tube T, on the lower plate of the air-tight case inclosing the electric generator, and is caused to rotate by the engagement of a projecting pin, P', on the tube T, with a projection on the inside of the wheel W. Attached to the circumference of the wheel are chains or cords X, of catgut or other similar material, which pass over pulleys Y, attached to the stationary plate C; and said

cords are connected to the under side of the metal part of the resinous plate. When the wheel is rotated at the end of the rotation of the handle of the gas-cock, the cords are wound up, and thereby drawn back, and the resinous plate of the electrophorus is separated from the rubbing-plate. A spark then passes from the latter, if it be put in connection with the earth.

Instead of the wheel, pulleys, and cords for causing the separation of the plates by the rotation of the tube T, a cam or other mechanical device which will accomplish the same result can be used, as this separation of the plates by the rotation of the tube is what I consider as my invention; and I do not wish to limit myself to any particular form of mechanism for so doing.

The conducting-wires and the device for approaching them to each other and withdrawing them from the flame after ignition: These wires are arranged as follows: Upon the upper face of the upper plate of the hermetically-sealed case is secured a metal socket, Z, to which is connected a wire, O, which bears upon the upper surface of the rubbing-disk D'. The end of this wire next the disk is provided with a spring, S', to insure its contact with the surface of the rubbing-plate. Instead of this spring, it is obvious that other methods of insuring metallic connection may be used. In the socket Z, and rotating in the same, is fixed one of the conducting-wires, L. A similar socket, Z', also on the upper surface of the upper plate of the hermetically-sealed case, and connected to the tube T and the earth by a wire, O', supports the other conducting-wire, L', which also rotates in the socket Z'. These wires extend to the burner, and are in such position relatively to it that when their extremities are made to approach each other the spark which passes from one conductor to the other ignites the gas. They are rotated simultaneously and in the opposite direction in the following manner: Each of these wires passes through a cog-wheel, W' W'', and is secured to it, and these cog-wheels are in gear with each other; but the space between the teeth upon one of them is filled up, so that the said wheels can only partially rotate on their return motion, and the wires thereby be prevented from coming in contact with the sides of the globe or chimney. The return motion referred to is produced in the manner hereafter to be described.

Upon one of the cog-wheels W'' is a pin, P''', against which strikes another pin, P'', upon the rotating tube T. This pin P'' is so placed that it strikes the pin P''' and turns the cog-wheel W'' just before the separation of the disks of the electrophorus, so that the wires are rotated and their ends made to approach each other a moment before the electricity is set free from the upper plate of the electrophorus. This electricity, when set free by the separation of the plates of the electrophorus,



passes from the end of the wire L to the end of the wire L', and thence to the earth, and ignites the gas issuing from the burner. The ends of the wires L L' may be tipped with platinum.

In apparatus for lighting gas by electricity, it is important that the conducting-wires should be removed from the flame after the gas is ignited, or otherwise they are so injured by the heat as to be rendered useless, and will also convey heat to the other parts of the apparatus, so as to injure it. It is necessary that the wires should be entirely removed from the flame, and not merely lowered to that part of it which has the least heat.

This removal of the conducting-wires I accomplish by means of a reverse rotation of the wires, produced by the spiral spring S'', connected at one end with one of the wires L, and at the other end to the top of the case Q. This reverse motion of the spiral spring, and consequent reverse motion of the cog-wheels, is rendered possible by the removal of the pin P''' from the pin P'', which movement is automatic, and caused by a reverse rotation of the tube T, which takes place when the handle of the gas-cock is released after the ignition of the gas, and is caused by the spring S, which, in returning to its original position, and hinging the plates of the electrophorus together, pulls upon the cords X, and, consequently, communicates a reverse rotation to the wheel W and to the tube T, engaging with it by the pin P'. This reverse rotation of the tube T may also be given by the hand.

The conducting-wires L L' are kept erect by the globe-holder R, through which they pass; or they may be secured to any other stationary attachment, being insulated at the point of contact.

When an argand-burner is used, the extremities of the conducting-wires are bent into a semicircular form, as shown in Figs. 2 and 5, which admits of their being fitted closely to the inner walls of the chimney of the burner, and their undue heating is thereby prevented; and also causes the spark to pass directly through the issuing gas at whatever moment said spark escapes from the conductors as they approach each other, as shown in the drawings.

When a fish-tail burner is used, simple stationary conducting-wires L' L'' may be substituted for the rotating wires and rotating devices heretofore described, for the reason that the removal of the wires from the flame is effected by the change in the position of the flame in reference to the wires caused by the rotation of the burner, as is shown in Figs. 3 and 4.

R is the globe-holder, which serves as a support for the wires, and may be made of any insulating material.

The hermetically-sealed case: As electrical machines of limited size are so easily affected by moisture and dirt as not to be invariably operative, and soon lose their power com-

pletely, and, moreover, owing to the material of which they are constructed, are liable to mechanical injury, it is necessary, in order to render them sure and permanent in their operation, to inclose them in a hermetically-sealed and air-tight case or chamber. I therefore inclose the electric generator used in my apparatus in a hermetically-sealed case, Q, which is constructed wholly of an insulating material, or lined with the same. By thus protecting the electric-generator from the external air, the apparatus is rendered certain and permanent in its operation, which has never been the case with the apparatus for lighting gas by frictional electricity heretofore constructed, and I believe this improvement to be new with me.

In the drawings this case Q is represented as cylindrical in form; but it may be cubical, or of any desired shape.

The two openings in the box where the tube T passes through are made air-tight by ground joints. Additional protection is afforded by rubber bags M, fastened at one end to the tube, and at the other end to the case Q, and sufficiently large to allow of the rotation of the tube. Rubber washers may also be used to make a tight joint.

The sides and all of the top of this case, except where the tube T passes through, where a metallic collar is provided, are constructed of an insulating material, or lined with the same, and the two openings in the case where the tube passes are rendered air-tight by conical ground joints. The two joints are ground at the same time, so that they form practically one long joint. By this use of conical ground joints, I am enabled to obtain a practically hermetically-sealed chamber—a result which has not heretofore been accomplished in electrical gas-lighting apparatus, for the reason that a conical ground joint is not possible, unless the separation of the plates of the electrophorus is effected by the rotation of the handle without giving a downward motion to the same. The conical ground joint will always be tight, as it will adjust itself in proportion to wear.

In the drawings, the case is represented as cylindrical; but it may be cubical, or of some other shape, and it is not necessary to have the sides wholly of an insulating material, a ring of insulating material being sufficient.

To give an additional protection to the joint, a rubber bag, n, fastened at one end to the tube, and at the other to the case, and sufficiently large to permit the rotation of the tube, may be used. This hermetically-sealed case affords such perfect protection to the electric generator that a spark is produced even when the case Q is immersed in water.

The operation of this apparatus is as follows: On turning the handle H of the gas-cock, the tube T is rotated and the gas is turned on. At the same time the rubber of the electrophorus is rotated with the tube T, and electricity generated on the resinous plate, and when the tube has



been turned to such a position that the gas flows with full force, the pin P' upon the tube T engages with the wheel W, and thereby causes the withdrawal of the lower plate of the electrophorus and the liberation of the induced electricity in the upper plate. At the same time the pin P''' on the tube T engages with pin P'' on one of the cog-wheels W'', rotates the same, and thereby causes the extremities of the conductors to approach each other, so that an electric spark passes from one conductor to the other across the mouth of the burner, and ignites the escaping gas.

On the removal of the hand of the operator from the handle, the spring below the lower plate of the electrophorus returns to its normal position, returning the plates of the electrophorus to each other, and causing the removal of the conductors from the flame, as before explained.

The gas is shut off and the plate of the electrophorus brought into contact by the further motion of the handle.

The apparatus may be connected with a single burner, or to a chandelier containing many burners, so that by one motion of the band all the said burners may be simultaneously lighted.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus for lighting gas by friction-

al electricity, the combination of the following elements, viz.: The gas-pipe G, the rotating tube T, cock J, electrophorus, and conducting-wires L L', arranged and operating substantially as and for the purpose set forth.

2. The combination of the hermetically-closed case Q and the rotating tube T, passing through said case, and terminated at its lower end by a conical gas-cock, J, substantially as and for the purpose set forth.

3. The combination of the rotating tube T, projecting pin P''', cog-wheel W'', provided with the pin P'', or its equivalent, cog-wheel W', conducting-wires L L', sockets Z Z', and spring S'', substantially as and for the purpose set forth.

4. The conducting-wires L L', having their ends curved to conform to the shape of the chimney, all parts of said arms being removed an equal distance from the flame, these outward movements being limited by said chimney, substantially as shown and described.

5. The combination of the rotating gas-tube T, insulating-tube T', rotating disk D, square tube T'', disk D', square tube T''', pin P', wheel W, pulleys Y Y, cover C, and cords X X, substantially as described.

JNO. PICKERING PUTNAM.

Witnesses:

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GEO. T. TILDEN.