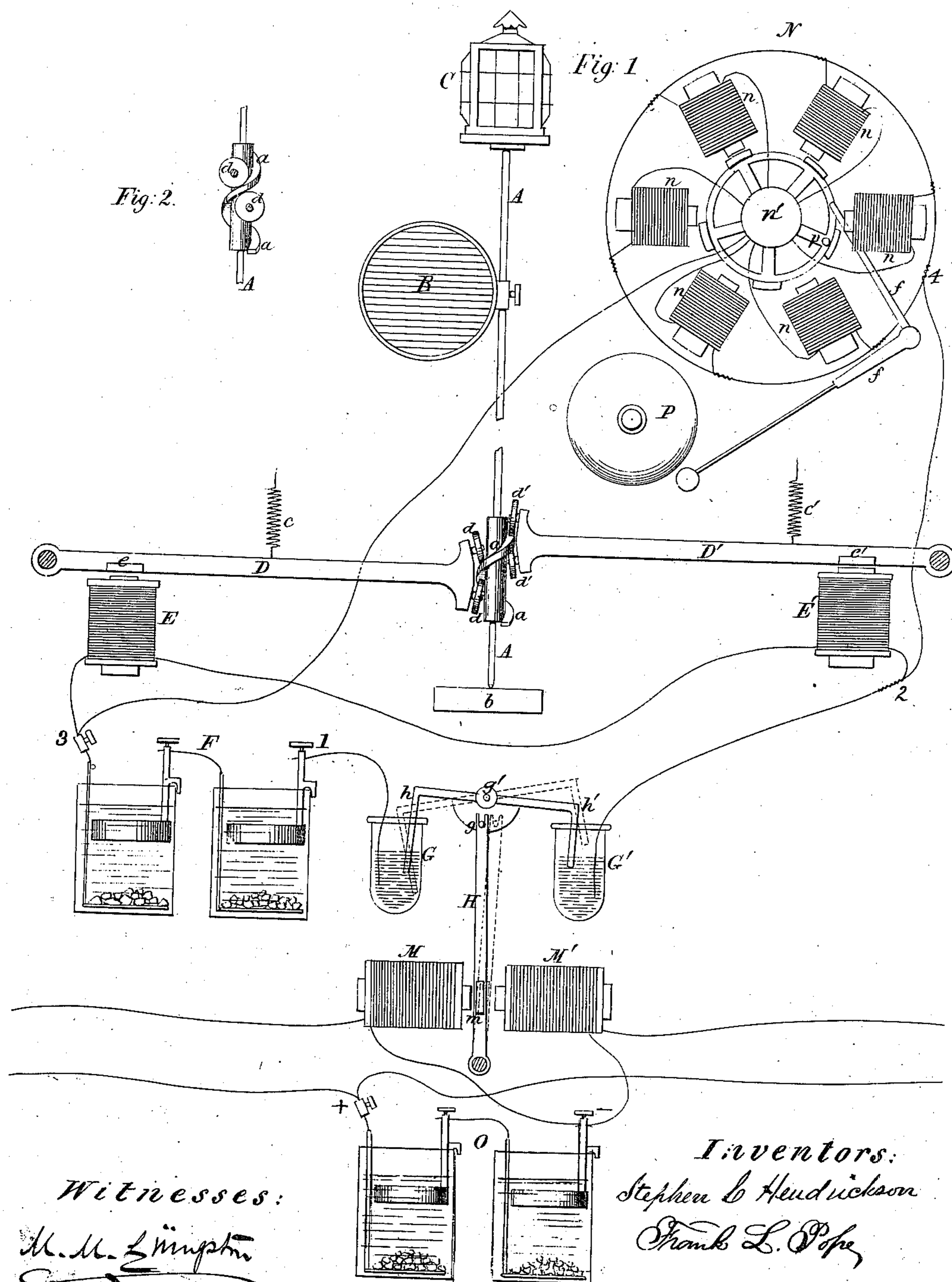


3 Sheets--Sheet 1.

HENDRICKSON & POPE.
 Improvement in Electric Signaling Apparatus for Railroads.
 No. 129,408. Patented July 16, 1872.

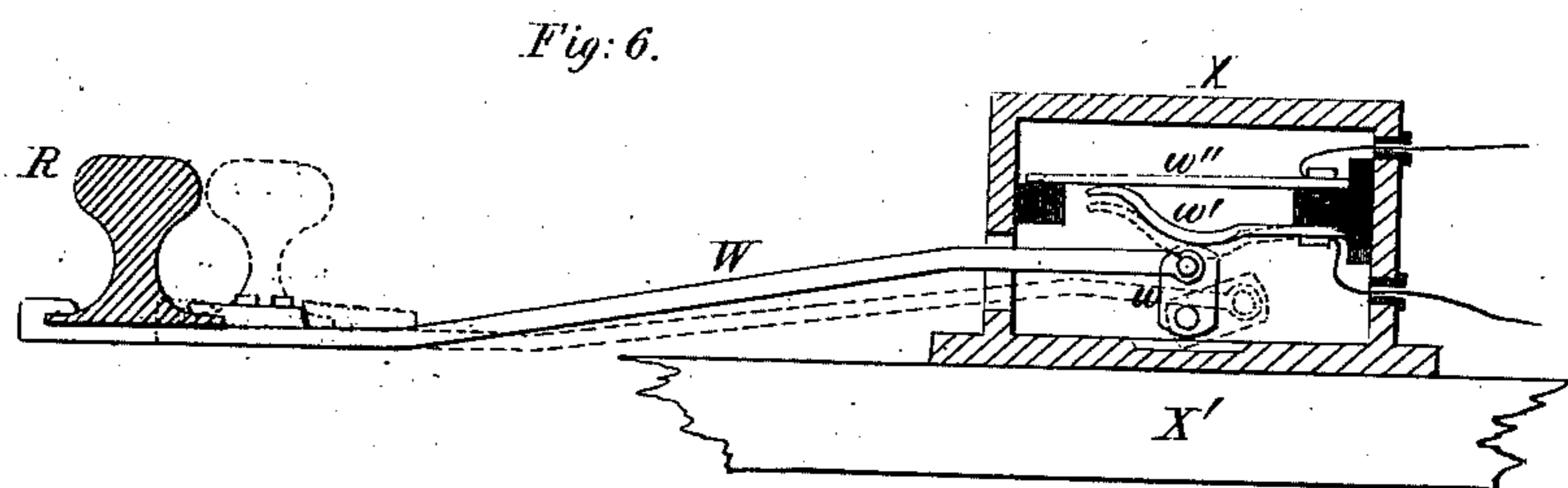
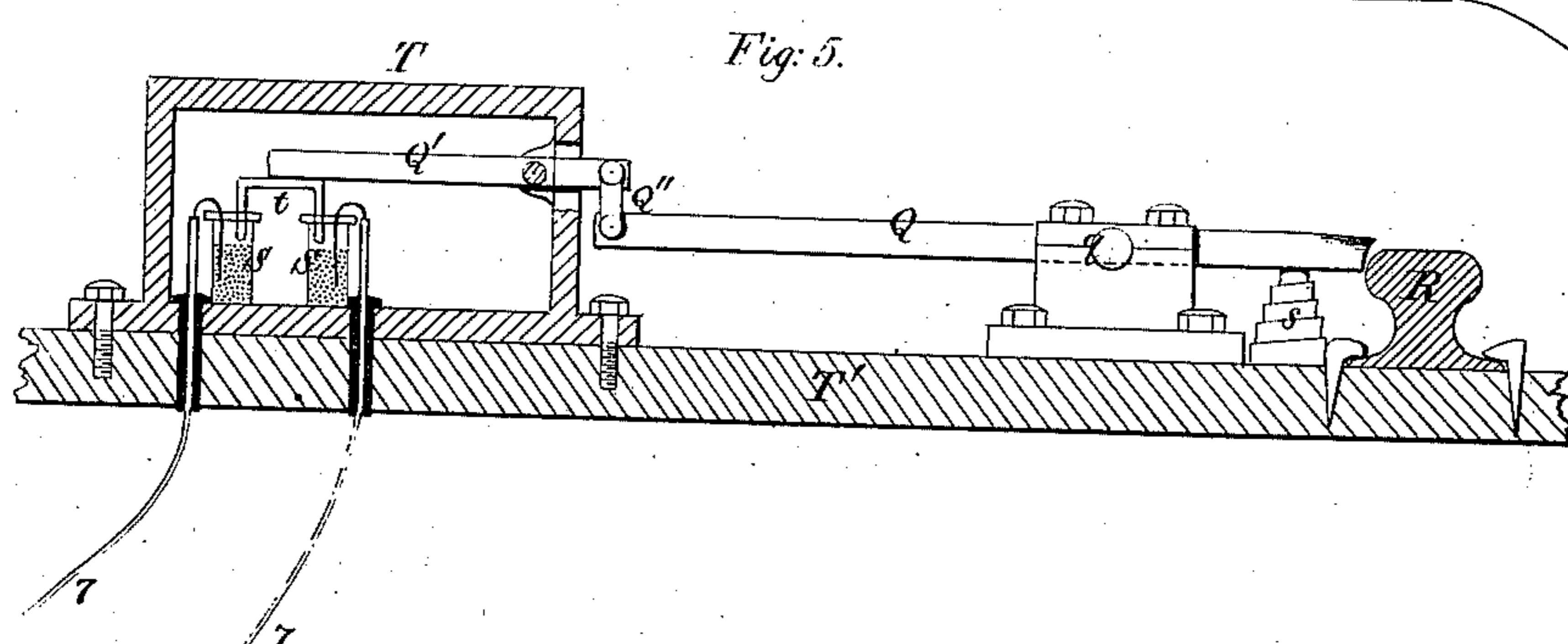
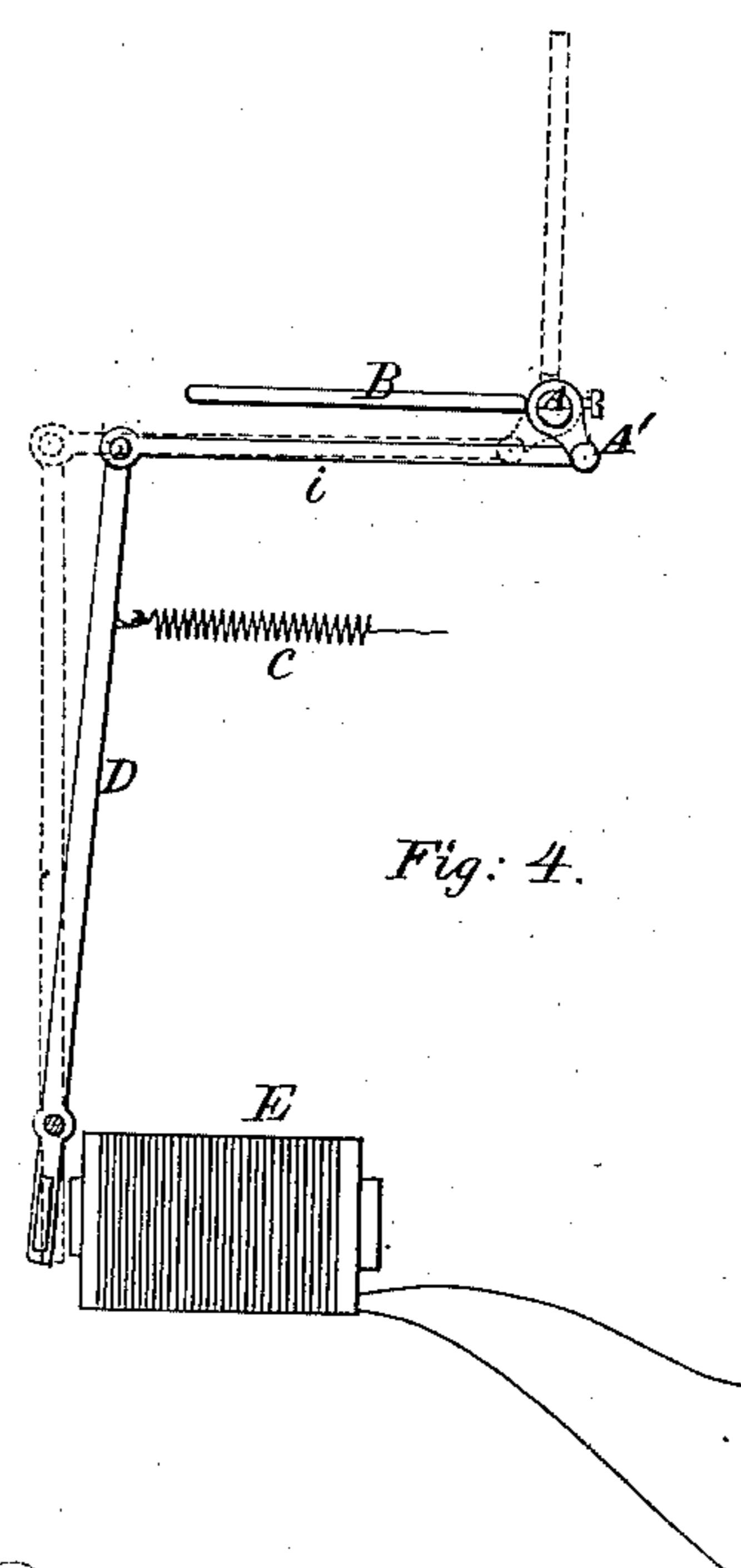
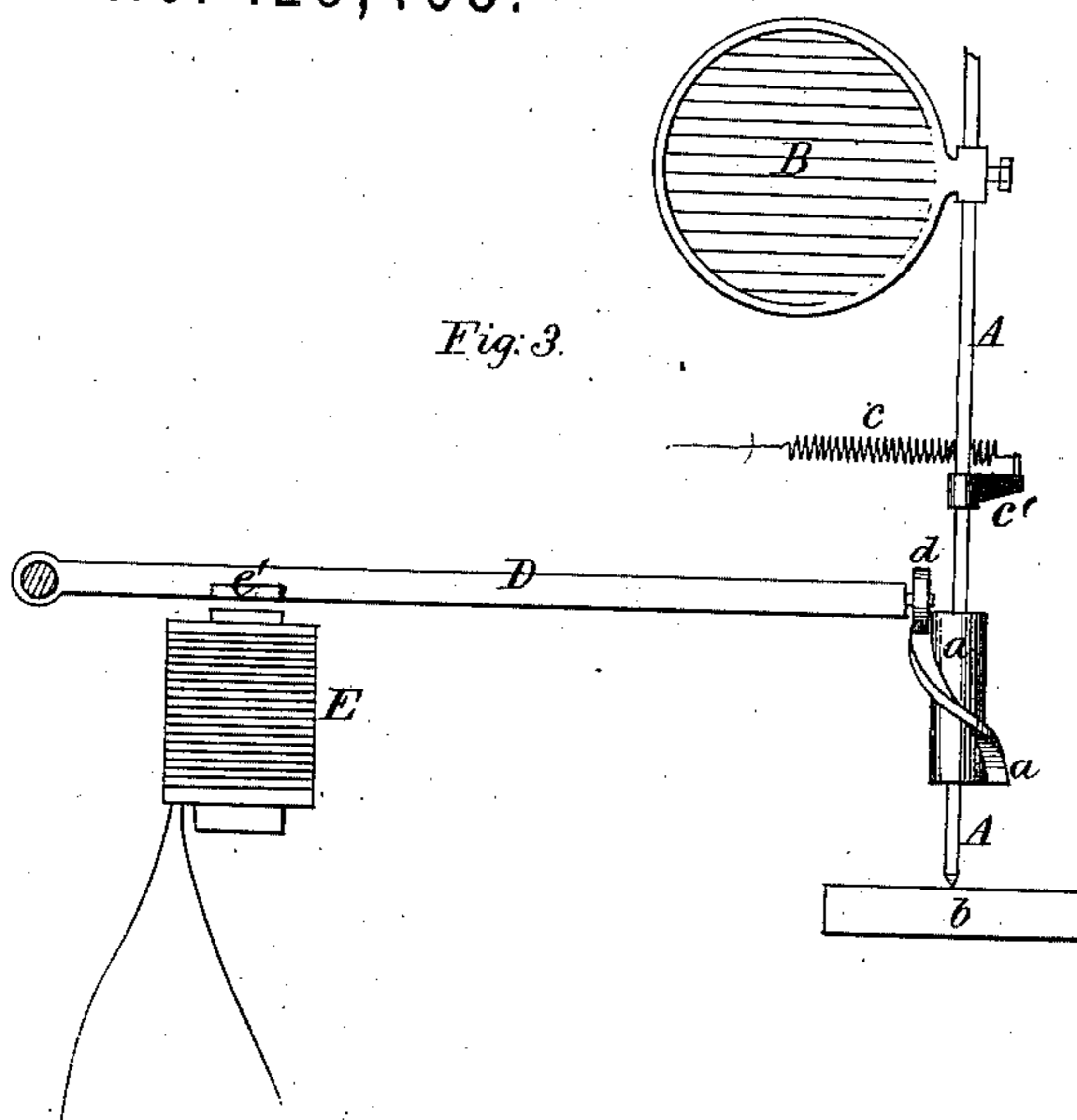


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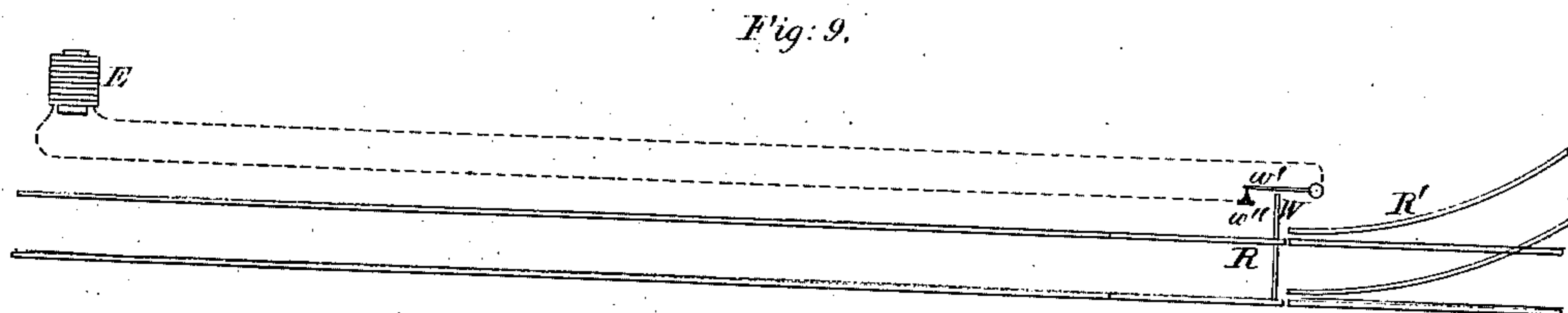
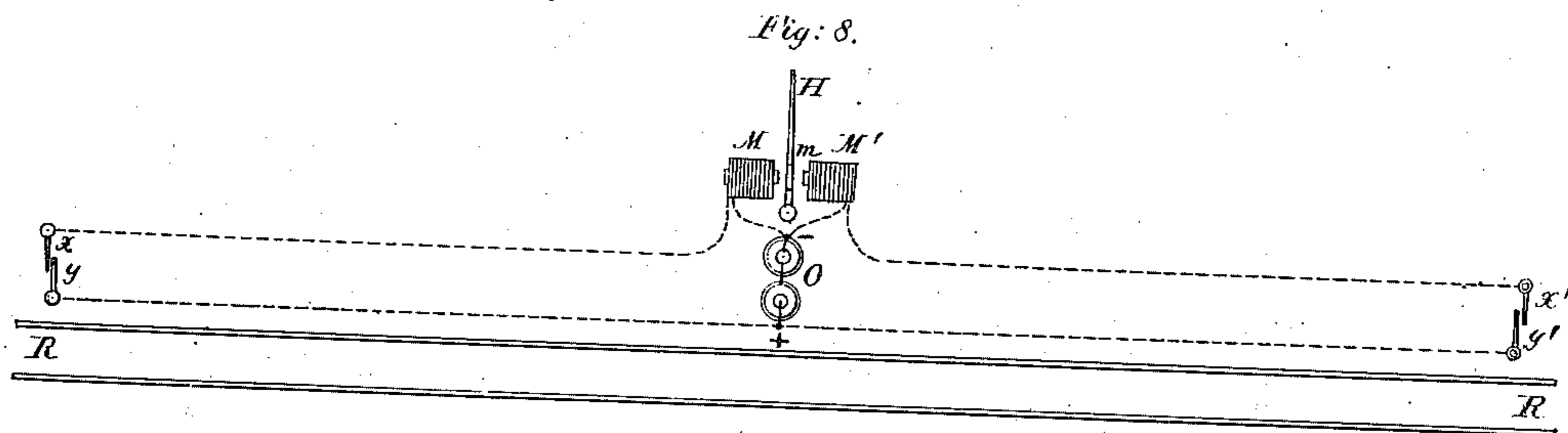
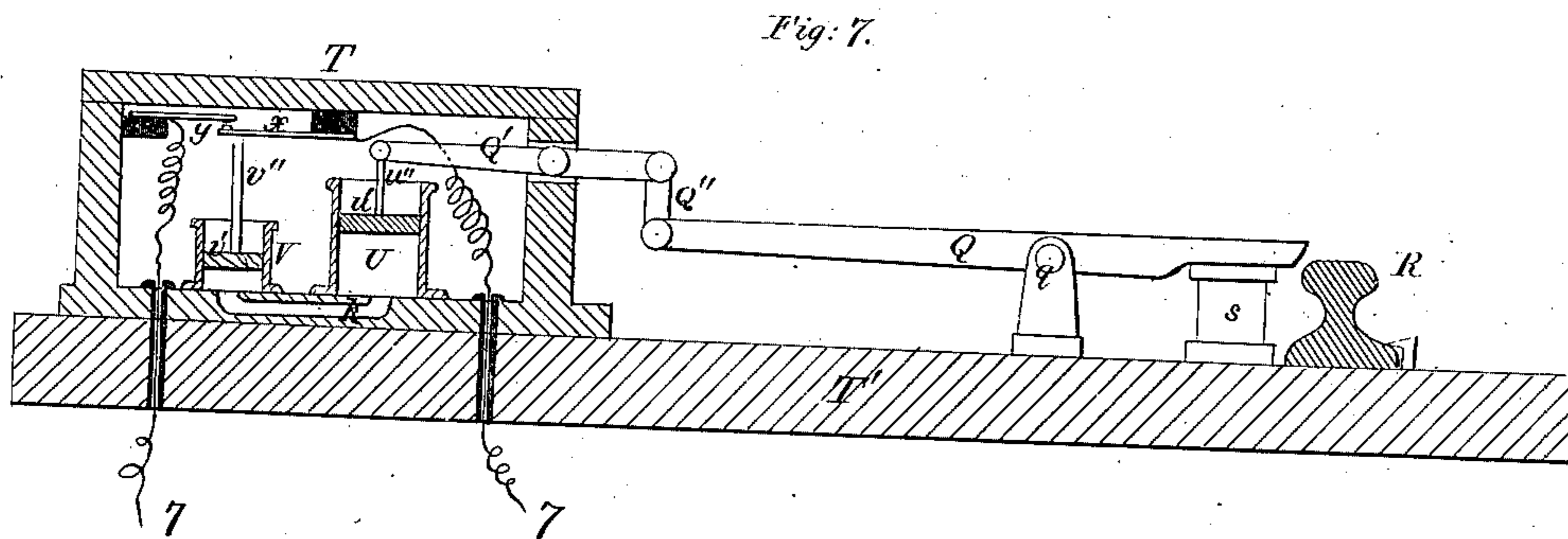
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UNITED STATES PATENT OFFICE.

STEPHEN C. HENDRICKSON, OF BROOKLYN, E. D., NEW YORK, AND FRANK L. POPE, OF ELIZABETH, NEW JERSEY.

IMPROVEMENT IN ELECTRIC SIGNALING APPARATUS FOR RAILROADS.

Specification forming part of Letters Patent No. 129,408, dated July 16, 1872.

To all whom it may concern:

Be it known that we, STEPHEN C. HENDRICKSON, of Brooklyn, E. D., in the county of Kings and State of New York, and FRANK L. POPE, of Elizabeth, in the county of Union and State of New Jersey, have invented a new and Improved Electric Signaling Apparatus; and we hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a view of the apparatus for exhibiting signals and sounding alarms, showing the manner in which the said signals and alarms are arranged and operated by the electric current. Fig. 2 is a detached view of the apparatus by means of which the vertical shaft carrying the signal is caused to revolve. Figs. 3 and 4 illustrate modifications in the method of mechanically connecting the armature of the electro-magnet with the vertical rotating shaft carrying the signals. Fig. 5 shows an arrangement for closing an electric circuit which is operated automatically by the passage of a locomotive or train upon a railway. Fig. 6 shows a mode of closing and breaking an electric circuit, which is operated by a suitable attachment to the movable rail of a switch or draw-bridge. Fig. 7 shows a modification in the method of accomplishing the result referred to in Fig. 6. Fig. 8 is a skeleton diagram, showing the mode of arranging the connections for operating the signals automatically by the passage of a locomotive or train. Fig. 9 is a skeleton diagram, showing the mode of arranging the connections for operating the signals in connection with a switch, or draw-bridge, or laterally movable rails.

The nature of this invention consists in an improved arrangement of visual or semaphoric railway-signals operated at a distance by means of an electric current, said current being brought into action either automatically by the passage of a locomotive or train operating a suitable circuit-closer, or in other cases by attaching a circuit-closer to the movable rails of a switch or draw-bridge. The invention further consists in combining such semaphoric signal or signals with a bell operated by a suitable revolving electro-motor, and also in

certain improved appliances for closing and breaking said electro-circuit.

In Fig. 1, A is a vertical upright shaft or spindle placed upon a suitable support or base, *b*, in such a manner as to revolve freely about its axis. The upper end of the spindle supports a lantern, C, which is, preferably, of rectangular shape, and which is constructed with colored glasses, so that when turned through one-fourth of a revolution it exhibits a light of a different color from the one shown when in its normal position. B is a metallic hoop covered with suitably-colored cloth, and secured to the spindle A, forming a conspicuous signal when in the proper position. A spiral screw-thread *a*, Figs. 1 and 2, is arranged upon the lower part of the spindle A, so as to make about one and one-half turns around it. This forms a track for the rollers *d d*, (see Figs. 1 and 2,) which are attached in the manner clearly shown in said figures to the extremity of the lever D, upon which is placed the armature *e* of the electro-magnet E. In the said figures two sets of rollers are shown, together with two levers, D and D', and two electro-magnets, E and E', acting in conjunction with each other upon the same screw-thread *a* and spindle A. This arrangement we consider preferable, although, if desired, the apparatus may be operated with a single electro-magnet lever and rollers.

The combination of the lever D, rollers *d d*, and spiral track *a* with the vertical spindle A is an improvement upon the device shown in Hendrickson's Patent No. 115,610, of June 6, 1871, as the friction of the moving parts is greatly reduced, and the apparatus is thereby made to operate with more certainty and with a battery of smaller power.

It is obvious that the attractive force of the electro-magnets E and E', when exerted upon the armatures *e* and *e'*, will act to depress the levers D and D'. The pressure of the rollers *d* and *d'* against the spindle A causes it to move through one-fourth of a complete revolution, carrying with it the signal B and lantern C, which will now stand at right angles to their former positions. When the attraction of the electro-magnets ceases the retractile force of the springs *c c'* will cause the whole apparatus to resume its original position.

The manner in which the electric current, which operates the electro-magnets E and E', is brought into action will now be explained.

O, Figs. 1 and 8, is a galvanic battery of any suitable construction, from which proceed two distinct circuits, one in each direction along the line of the railway, to the point from whence it is desired to operate the signal, and including in its return to the battery the respective relay-magnets M and M'. This will be understood more particularly by reference to Fig. 8, in which these circuits are shown in dotted lines parallel with the rails R R. The manner in which the circuit-closers xy are automatically operated by the passage of a locomotive or train will hereafter be shown.

The two relay-magnets M and M' exert their attraction in opposite directions upon the same armature, m , fixed upon the lever H. The lever H acts upon a pin, g' , fixed on a segment pivoted at g' , carrying an angularly-bent wire, whose two extremities, h and h' , project downward into two vessels, G and G', partially filled either with mercury, metallic filings, or metal in a finely-divided state. The arm h' is so arranged that when the relay M is in action it will dip into the metal in the vessel G and form an electrical connection, as shown in the figure; but if the relay M' is in action, the arm h' will assume the position shown in the dotted lines and be entirely withdrawn from the metal in G', thus breaking the electrical connection. The arm h is so adjusted as to be constantly in contact with the metal in the vessel G, and the connection unbroken, whatever its position may be. The electric circuit passing through the vessels G and G' leaves the local battery F at 1, and passes through the point 2 and the electro-magnets E and E', returning to the other pole of the battery at 3. The closing of this circuit in G' will therefore change the electro-magnets E and E' and operate the signals B and C in the manner before explained. A branch circuit from the point 2 leads to the revolving electro-motor N, which is composed of a number of electro-magnets, $nnnnnn$, arranged circularly around a wheel, n' , which revolves rapidly by means of the successive action of the magnets nn , &c., upon the armatures attached to its periphery. This device is old and well known and requires no further explanation. A pin, p , strikes the extremity of the bent lever ff at each revolution of the wheel n , and causes the alarm-bell P to ring continuously as long as the circuit is closed at G'.

By an inspection of Fig. 8 it will be seen that a train passing along the track from left to right, and closing the circuit at xy by means of appliances which will be hereinafter described, will cause the relay-magnet M to become charged, which will exhibit the signals B and C and cause the bell P to ring during the time the train is passing to the point at which the circuit-closer $x'y'$ is situated, when the relay-magnet M' will be brought into ac-

tion and the local circuit in G' broken, when the signals B and C will return to their former position and the bell P cease ringing.

Fig. 5 shows the manner in which the circuit-closer is operated by the passage of a locomotive or train. A strong metallic lever, Q, is pivoted at q , its short end being nearly in contact with the outer edge of the rail R and projecting slightly above it, being supported in that position by a strong spring, S, which may be of India rubber, steel, or other suitable material. The opposite end of the lever Q is attached to a second lever, Q', by means of the link Q". This latter lever carries a fork, t . When the wheel passes over the rail R it depresses the short arm of the lever Q, and this motion is transmitted by the system of levers just described, causing the fork t to dip into the vessels S S, containing mercury or other suitable conducting material, and the electrical connection is thus formed between the wires 7 7. The vessels S S are inclosed and protected by a suitable metallic box, T.

Fig. 7 shows a modification in the method of accomplishing this result. Here the lever Q' is attached to a piston, u' , by means of a piston-rod, u'' . The piston u' works air-tight in a cylinder, U, connecting, by means of a passage, K, with a smaller cylinder, V, also fitted with an air-tight piston, v' , provided with a stem, v'' . The impact of the wheel upon the lever Q forces down the piston u' , and the pneumatic pressure generated thereby in the cylinder U is transmitted through the passage K and presses the piston v' forcibly upward. The stem v'' is thus caused to press the springs x and y into contact and close the circuit between the wires 7 7, as before.

Fig. 9 is a diagram, showing the application of the signal to a switch. R is the movable rail, which, when brought into correspondence with the rail of the side track R', opens the circuit between w' and w'' by means of mechanism hereafter to be more particularly explained. This acts upon the electro-magnet E at any required distance, which operates the signaling apparatus, as shown in Figs. 1, 3, and 4. Fig. 6 is a diagram showing the manner in which the circuit-closer is arranged with a switch. R is the rail, which is connected by the rod W to the cam w . When the latter is in its normal position, as shown in the figure, the springs w' and w'' are pressed together and the circuit is closed; but if the rail R be moved to the position shown by the dotted lines, the cam w will be thrown to the right and the springs w' and w'' will separate and interrupt the circuit, as above shown. Fig. 3 shows a mode of arranging the lever D so as to act upon the spindle A with a single roller, d . The retractile spring c is arranged, in this instance, so as to act upon an arm, c' , attached to the spindle A, instead of being attached to D, as shown in Fig. 1. Fig. 4 shows a plan view of the spindle A and signal B, showing a manner of operating it from the lever D by

means of a short crank or arm, A', attached to the spindle, and connected with the lever D by a rod, i.

When the apparatus is used in connection with a switch or draw-bridge it is usually preferable to operate the electro-magnets E and E' with a direct current from the circuit-closer, without the intervention of relays. The battery may be placed in any part of the circuit which may be found most convenient in practice. In order to arrest the spark which is occasioned by the breaking of the circuit upon the surface of the mercury or metallic filings, the surface may be covered with glycerine in suitable quantity.

We will here remark that we are not aware that a revolving electro-motor for actuating the hammer or clapper of the alarm-bell of an electric signaling apparatus has ever before been employed, and as there are revolving electro-motors of various different constructions well known to the public, we deem it expedient to remark here that we wish to cover the combination with an electric signaling apparatus and an alarm-bell of a revolving electric-motor of any suitable construction.

We are aware of United States Letters Patent No. 76,748, in which two electro-magnets are arranged to act upon the same armature in a telegraphic relay; but in this case the two electro-magnets are included in the same circuit and operated simultaneously, while in our device the two electro-magnets are in distinct circuits and are brought into action alternately. In the former case a permanently-magnetized armature must, of necessity, be employed, while in the latter the armature must be of unmagnetized soft iron.

We do not claim specifically the combination, with the rail of a railroad track, of a lever provided with a weight or spring, and arranged to close an electric circuit, as this device is shown in the English patent of Edward Tyer, (No. 52, January 10, 1854,) and also in the

United States patent of Thomas S. Hall, May 17, 1870, (No. 103,174;) neither do we claim, in general, the closing or breaking of an electric circuit by means of an attachment to the movable rail of a railway track, as this is described in the English patent of A. H. Perry, (No. 809,) March 28, 1863, and also in the United States patent of T. S. Hall, February 26, 1867, (No. 62,414.)

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of the electro-magnet E, armature e, lever D, and rollers d d, one or both, with the spiral track a, vertical spindle A, signal B or C, either or both, substantially in the manner and for the purpose specified.

2. The combination, with the rail R, of the compound lever Q Q', the fork t, and vessels S S, containing mercury or other suitable material, in the manner and for the purpose specified.

3. The combination of the rail R, rod W, cam w, and circuit-closing springs w' w'', substantially as and for the purpose specified.

4. The combination of the lever Q', cylinders U V, pistons u' v', and springs x y, substantially as and for the purpose specified.

5. The combination, with an electric signaling apparatus, of a revolving electro-motor for operating the hammer of an alarm-bell, substantially as specified.

6. The combination of the electro-magnets M N, armature m, and lever H, when the magnets M N are in separate and independent circuits, and arranged to be brought into action alternately, for opening and closing a local circuit operating a signal in a railway signaling apparatus, substantially as herein specified.

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