

(No Model.)

4 Sheets—Sheet 2.

W. B. FARRAR.

MACHINE FOR REGULATING TIME PIECES.

No. 379,511.

Patented Mar. 13, 1888.

Fig. 2.

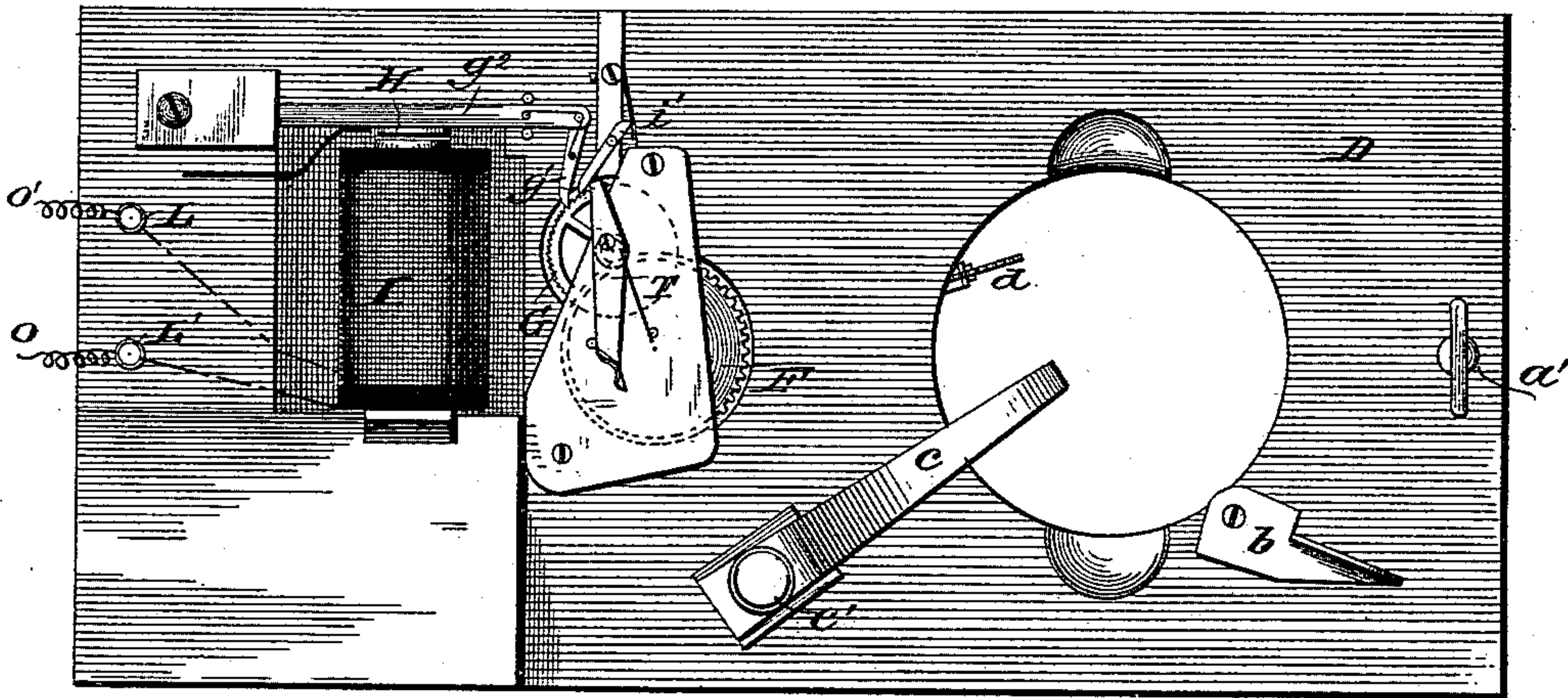
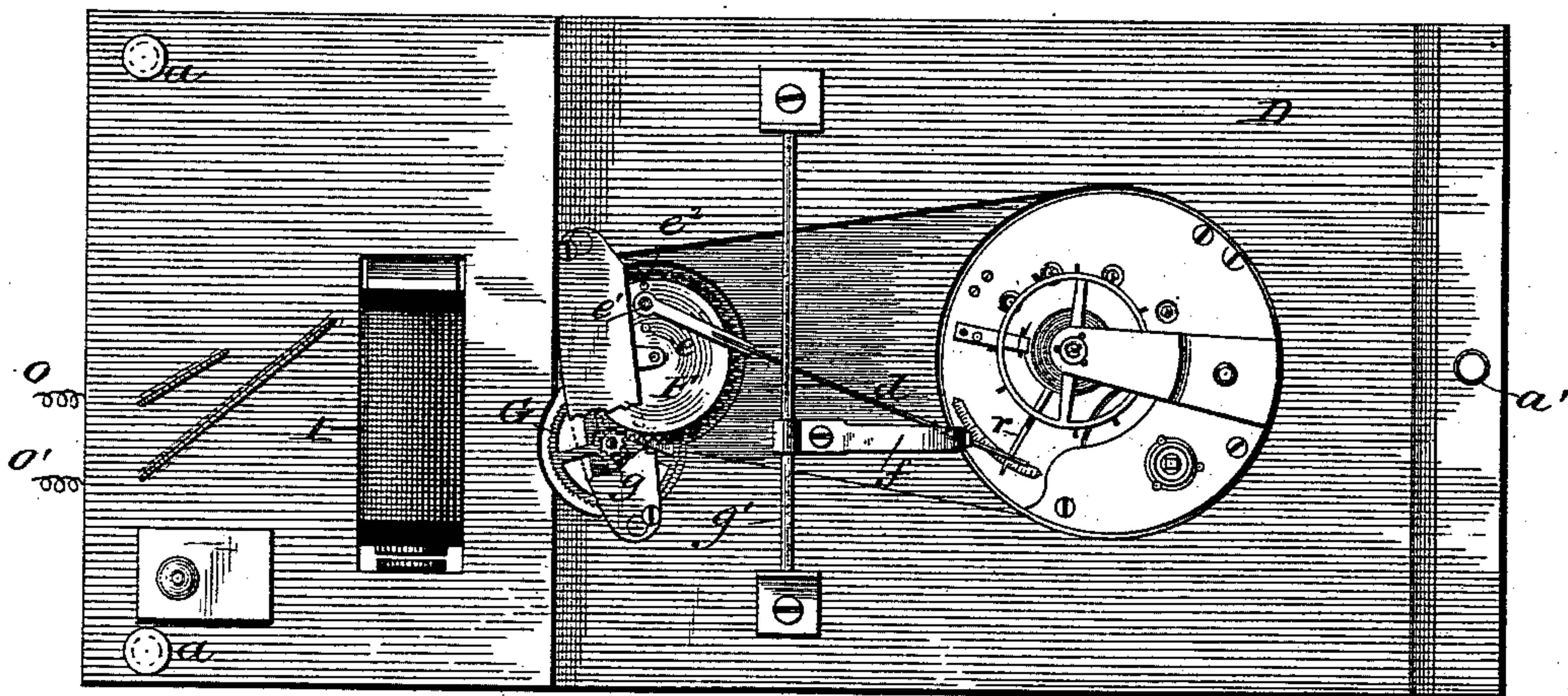


Fig. 3.



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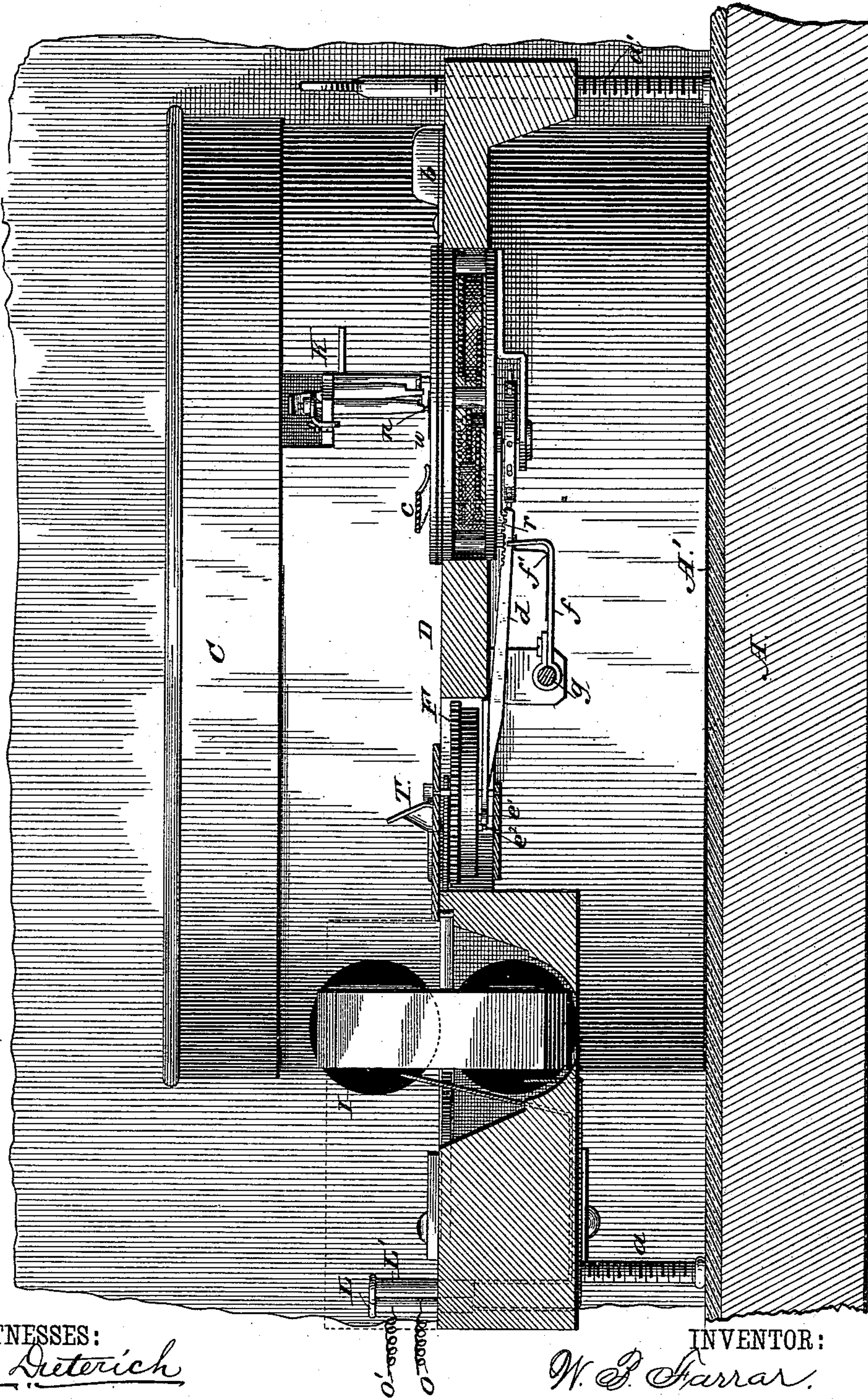
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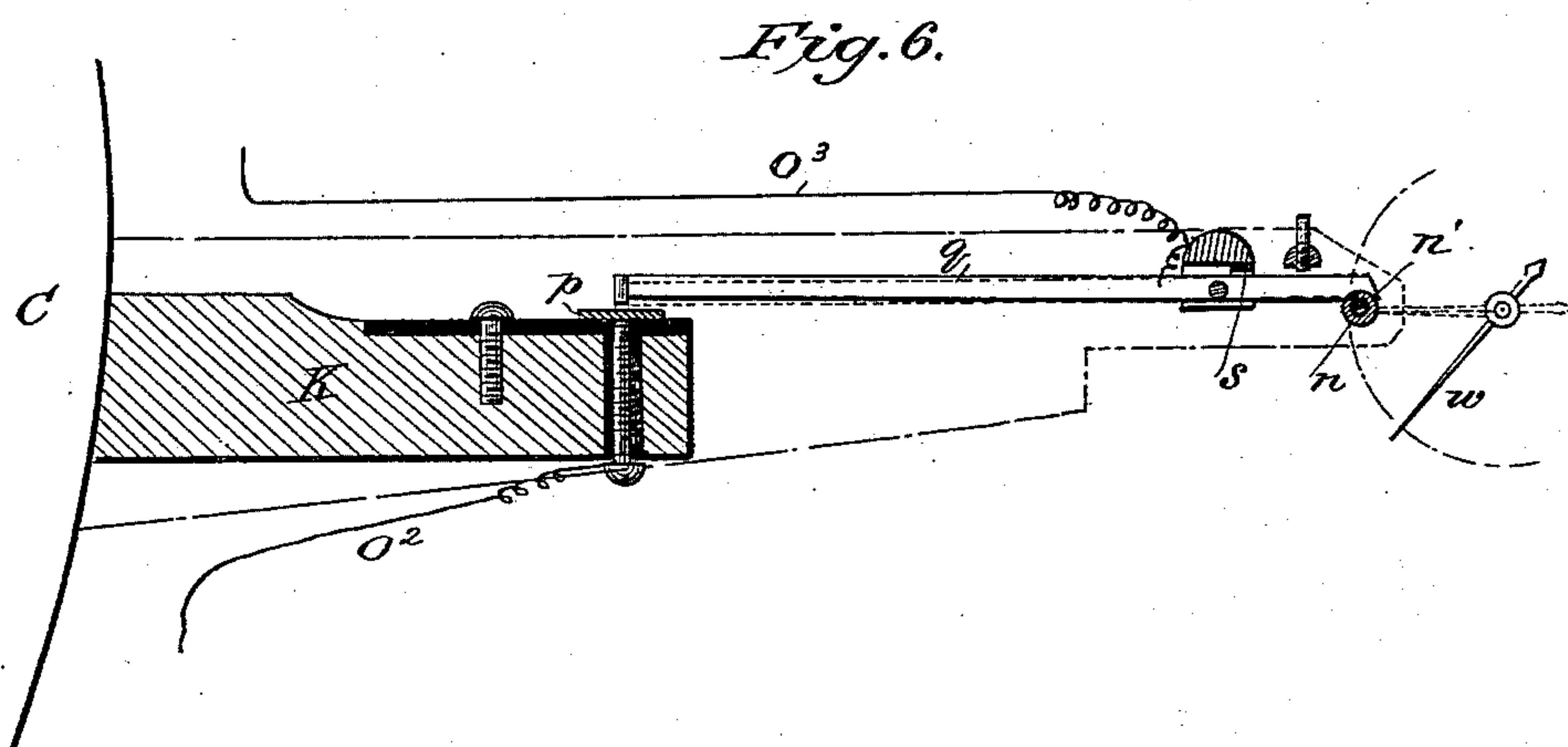
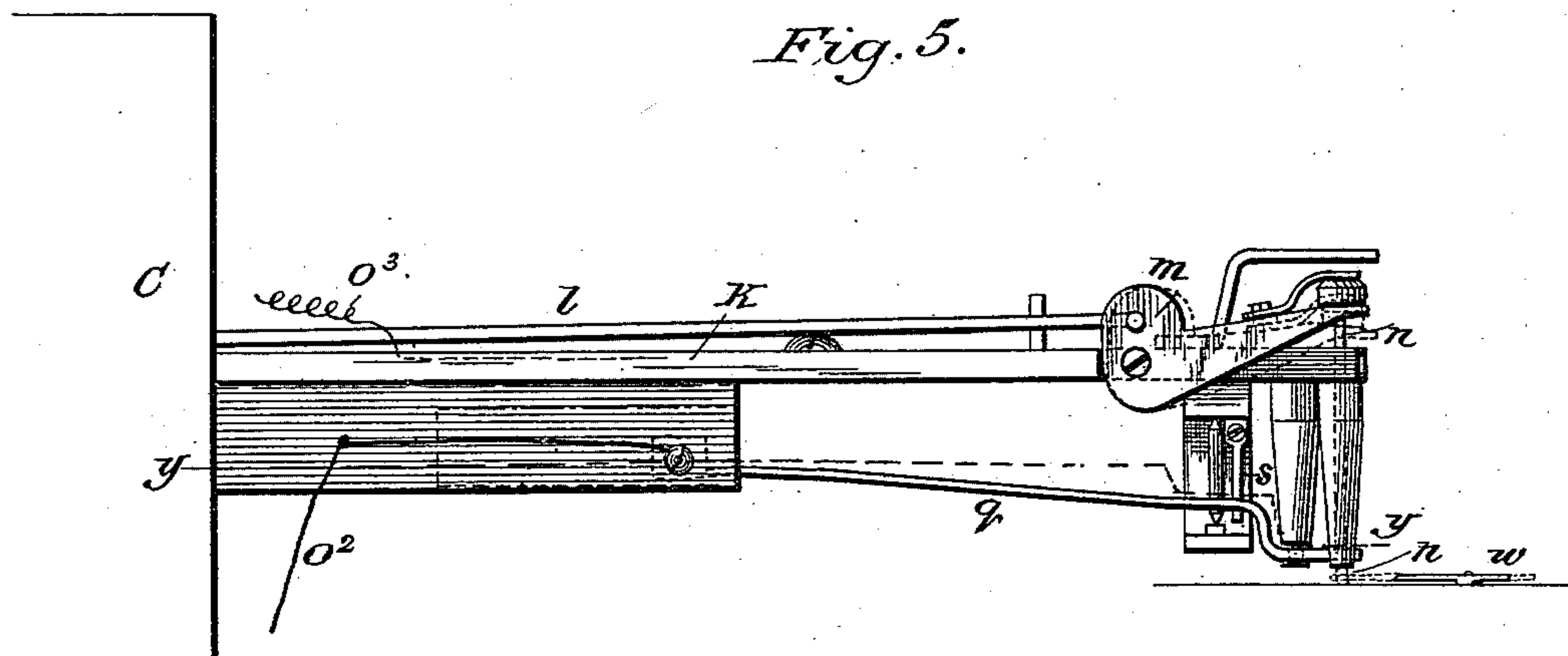
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UNITED STATES PATENT OFFICE.

WILLIAM B. FARRAR, OF GREENSBOROUGH, NORTH CAROLINA.

MACHINE FOR REGULATING TIME-PIECES.

SPECIFICATION forming part of Letters Patent No. 379,511, dated March 13, 1888.

Application filed November 2, 1887. Serial No. 254,051. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. FARRAR, of Greensborough, in the county of Guilford and State of North Carolina, have invented a new and useful Improvement in Machines for Regulating Time-Pieces, of which the following is a specification.

Heretofore it has been customary in regulating watches and time-pieces to compare the same after certain definite periods with a standard time-piece, and after observing the gain or loss in time to adjust the regulator by hand to cause the watch to run faster or slower, as may be required. This method is not only slow and tedious, but, being purely a matter of guess-work, is uncertain.

The object of my invention is to provide a machine which shall without attention automatically perform this regulation in a short space of time and with accuracy.

To this end it consists in such construction and arrangement of parts as will cause the differential movement between the seconds-hand of the standard regulating-clock and theseconds-hand of the watch under treatment to start into action mechanism which mechanically adjusts the regulator of the watch to make it run slower, and continues at every revolution of the seconds-hand to actuate this mechanism until the watch and the regulating-clock run in perfect synchronism. The means which I employ for establishing the necessary coaction of the regulating-clock and the watch to be regulated consist mainly of an electro-magnet and battery-circuit in combination with other mechanism, which I will now proceed to fully describe with reference to the drawings, in which—

Figure 1 is a plan view of the entire machine with parts broken away. Fig. 2 is a top plan view of the watch stand or holder, the watch-movement being removed. Fig. 3 is an underneath plan of the same with the watch-movement in place. Fig. 4 is an enlarged cross-section through the line *xx* of Fig. 1. Fig. 5 is a side view of the mechanism for stopping the seconds-hand of the watch, the view looking in the direction of the arrow in Fig. 1. Fig. 6 is a horizontal section through line *yy*, Fig. 5.

In the drawings, Fig. 1, A represents a base, upon which are mounted a box for a galvanic

battery, B, the regulating-clock C, and a movable stand, D, for holding the watch to be regulated, which latter is shown at E.

I will first describe the stand that holds the watch and its attached parts, and then show how the standard regulating-clock acts upon the watch. This stand or holder is formed of a flat piece of wood, hard rubber, or other material sustained upon three leveling-screws, *aa a'*, Figs. 3 and 4, which may be turned up or down to bring the watch-face to a true horizontal plane. Through the table-surface of the stand is formed a circular hole, in which is seated the watch-movement with its face up, and its works, including the regulator, exposed on the lower side through the hole. To permit these parts to be observed easily, the portion of the base beneath the watch holder or stand is inlaid with a mirror, *A'*, Figs. 1 and 4, which reflects to the eye of the operator the view presented by the under side of the stand and enables him to conveniently observe the progress of the work. To hold the watch-movement firmly in its seat while being treated, a spring-clasp, *c*, with set-screw *c'*, Figs. 1 and 2, is made to hold the movement down, while a pivoted cam, *b*, with thumb-flange, is made to bind against its edge to hold it firmly in the seat against lateral movement. In order to accommodate different sizes of watches, the hole or seat in the stand may be made large and different sizes of rings or bushings placed on the same to receive different sizes of watches, or an adjustable section may be arranged on the table and adjusted up to the watch by a set-screw.

On the under side of the stand or holder is an adjusting-bar, *d*, Figs. 3 and 4, which has at one end a series of notches, Fig. 4, any one of which is adapted to straddle the regulator *r* of the watch. This bar is at its other end jointed to one of the several pins, *e e' e''*, Fig. 3, on the gear-wheel F, and by the rotary motion of this gear-wheel a longitudinal pull is given to the adjusting-bar *d*, that serves to move the regulator. (See Fig. 3.) This adjusting-bar is applied laterally across the regulator, and is held in place by a movable guide-arm, *f*, on a rock-shaft, *g*, which guide-arm is notched at its end to receive the adjusting-bar *d*, and in said notch is arranged a spring, *f'*, to avoid any cramping or binding of the ad-

justing-bar that would interfere with its free movement. Into the teeth of the gear-wheel F there meshes a small pinion, *g*, Fig. 3, on the same shaft with a large ratchet-wheel, G, Fig. 2, having its periphery divided into very fineteeth. Into the teeth of this ratchet-wheel there engages a spring pawl, *g'*, carried by a lever, *g''*, to which lever is also attached an armature, H, playing upon the poles of an electro-magnet, I. When this magnet attracts the armature, the pawl *g'* is made to move the ratchet-wheel G one notch or more, the ratchet-wheel being prevented from moving back by a detent, *i*. As the ratchet-wheel is thus moved, its pinion *g* turns the wheel F, and this, through one of the pins *e e' e''*, pulls or pushes the adjusting-bar and moves the regulator *r*. I will now describe how the difference in time between the watch to be regulated and the regulating-clock is made to effect this adjustment of the regulator *r*.

The regulating-clock C may be of any approved construction adjusted to keep perfect time. On the same shaft *j*, Fig. 1, which carries its seconds-hand, is rigidly fixed a wiper-cam, *k*, which in its revolution bears against and deflects the arm of an elbow-lever, J, which elbow-lever flies back (immediately after the cam passes it) from the tension of the spring *j''*. These parts are so relatively adjusted that the elbow-lever flies back just as the seconds-hand points to the number 60 on the seconds-hand dial, indicating the completion of one minute. The other arm of the elbow-lever is loosely connected to a slide-rod, *l*, that extends along the top of a horizontal arm, K, projecting from the regulator-clock, to a position over the watch-holder and above the mirror. This slide-rod *l* is at its outer end jointed to a delicate elbow-lever, *m*, Fig. 5, pivoted to the arm K, so as to act in a vertical plane. The horizontal or outer end of this elbow-lever is loosely connected to the head of a freely-moving vertical needle, *n*, which plays through a tubular guide, *n'*. This needle is dropped down, by the action of the cam *k* on the elbow-lever J and slide-rod *l*, just a short time before the seconds-hand of the regulator-clock reaches 60, and said needle is quickly raised just as said hand reaches 60, and the wiper-cam *k* passes off the elbow-lever J.

L L' are two terminals of the electro-magnet, one of which, L, connects, by wire *o* and binding-post L³, with one pole of battery B, and the other of which, L', connects, through wire *o'*, binding-post L², and wires *o'' o'''*, with the other pole of the battery. Between the wires *o''* and *o'''* there is, however, a circuit-breaker (see Figs. 5 and 6) mounted upon the horizontal arm K, which circuit-breaker is operated by the seconds-hand *w* of the watch to be regulated whenever the said watch runs faster than the regulator-clock. A platinum plate, *p*, on this arm forms one contact-point, and a platinum-tipped lever, *q*, forms the other contact-point, which are normally held away

from each other by a spring, *s*, the lever being pivoted to act in a horizontal plane. These two points (plate *p* and lever *q*) are thoroughly insulated from each other, so that when the lever is off the plate the circuit through the electro-magnet is broken, and when the lever is on the plate the circuit is completed through that contact.

The operation of the device is as follows: For the purposes of my invention, the regulator of the watch is first moved to cause the watch to notably run fast, as my device is intended to regulate it by constantly adjusting the regulator toward the slow point, so as to continually slow up the watch until it runs in perfect synchronism with the regulator. The watch now is placed in the opening in the stand, Fig. 2, and is firmly clamped in place by the clasp and thumb-cam, as in Fig. 1. The stand is next moved until the dial of the seconds-hand of the watch is directly under needle *n* of the regulator-clock arm, and when the 60 mark of the dial is exactly under the needle the stand and watch are slowly raised until the dial is brought up close to the needle, so that the needle when down will be struck by the seconds-hand of the watch. Now it is obvious that if the watch is running fast its seconds-hand will get round to 60 before the needle is lifted, because the needle does not fly up until the minute-hand of the regulator-clock reaches 60 on its dial, and I make this pressure of the seconds-hand of the watch in advance of the true minute) to deflect the lever *q* (see dotted lines, Fig. 6) and close the electrical circuit through the magnets, to gradually adjust the regulator slower, and this I accomplish by the needle *n*, which when down is struck by the seconds-hand of the watch and slightly deflected in its tubular guide, and is made in turn to bear against the outer end of the lever *q* and close contact at its inner end. As often, therefore, as the seconds-hand of the watch reaches its 60 mark in advance of the full minute recorded by the regulator-clock, just so often does it find the needle *n* down, and by striking it and deflecting lever *q* closes an electric circuit through the magnet, which, through the armature, pawl, and gear-wheels, moves the adjusting-bar *d* and turns the regulator *r* of the watch toward the slow point. This action is continually repeated every minute as long as any difference in time exists between the watch and the regulator-clock, and this difference, it will be seen, is gradually diminished until the seconds-hand of the watch reaches its 60 mark at the very instant that the regulator records its minute and the needle flies up, after which the two run in the same time.

It is obvious that the ratchet-wheel which controls the amount of movement that is given to the regulator *r* of the watch may be enlarged and the teeth made of such fineness as to give infinitely a more delicate adjustment to the regulator than it is possible to give it by hand. The great merit of this invention

is therefore to be found in the extreme delicacy and accuracy of the adjustment, and the short time that is required to do this, the watch being readjusted every minute. This is done, too, automatically by the machine, and without any other attention than the mere fixing of the watch in position.

I employ, by preference, an electro-magnet and battery-circuit to perform the mechanical adjustment of the regulator of the watch; but any other motive power—such as a spring, weight, or air-pressure—could be made to do the work, the essential and important part of my invention being the tripping mechanism, whereby the difference in time of the two hands is made to start into action adjusting mechanism for moving the regulator of the watch.

Instead of applying the invention to the seconds-hand of the regulator-clock, it might be applied to the minute-hand.

T, Fig. 2, is a thumb-lever by which the pawl and detent *g' i* may be thrown out of the ratchet in adjusting the gears and the bar *d* to the regulator of the watch.

Having thus described my invention, what I claim as new is—

1. An automatic machine for regulating time-pieces, consisting of a regulating-clock having an arm supporting an adjustable needle, connecting mechanism for adjusting the needle by the revolution of one of the shafts of said clock, a tripping device operated by the said needle, and an actuating mechanism connected to the regulator of the watch and connected to and set in motion by the tripping mechanism, substantially as and for the purpose described.

2. An automatic machine for regulating time-pieces, consisting of a regulating-clock having an arm supporting an adjustable needle, connecting mechanism for adjusting the needle by the revolution of one of the shafts of the clock, an electric circuit and circuit-breaker operated by the needle, and an electro-magnet and actuating-gears connected to the regulator of the watch to adjust it, substantially as and for the purpose described.

3. In a regulating-machine for time-pieces,

the combination of the stand or watch-holder and a supporting-base, having a mirror or reflecting-surface permanently attached thereto and forming a table for the watch-holder, the said reflecting-table being attached to and forming a part of the regulating mechanism, substantially as and for the purpose described.

4. In a regulating-machine for time-pieces, the combination of a regulating-clock with supporting-arm and an adjustable needle connected and operated by the clock, a base, a detached stand or watch-holder provided with actuating mechanism for adjusting the regulator of the watch, and one or more leveling-screws for adapting the stand to the regulating-clock, substantially as and for the purpose described.

5. The combination, with the regulating-clock and its needle-arm, of the needle *n*, the elbow-lever *m*, the slide-rod *l*, the elbow-lever *J*, the spring *j*, and the wiper-cam *k*, substantially as and for the purpose described.

6. The combination, with the regulating-clock and its needle-arm, of the needle *n*, the elbow-lever *m*, the slide-rod *l*, elbow-lever *J*, the spring *j*, wiper-cam *k*, the circuit-breaker *p q*, operated by the needle, a battery, watch-holder, and electro-magnetic adjusting mechanism mounted upon the latter and adapted to move the regulator of the watch, substantially as and for the purpose described.

7. The stand or watch-holder having an opening with clamping devices for the watch, an electro-magnet, armature, and pawl, ratchet-wheel, gear-wheel with crank-pins, and adjusting-bar *d*, for moving the regulator of the watch, substantially as and for the purpose described.

8. The combination, with the watch-holder and actuating-gears for the regulator, of the adjusting-bar *d*, having teeth on one side fitting over the regulator, and a rack-shaft and guide-arm for the adjusting-bar for connecting and disconnecting the regulator and its adjusting devices, substantially as and for the purpose described.

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Witnesses:

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W. E. ALLEN.