3 Sheets--Sheet 1.

L. EATON.

Regulating Chronometers, Watches, &c.

No. 163,981. Patented June 1, 1875.

Fig. 1.

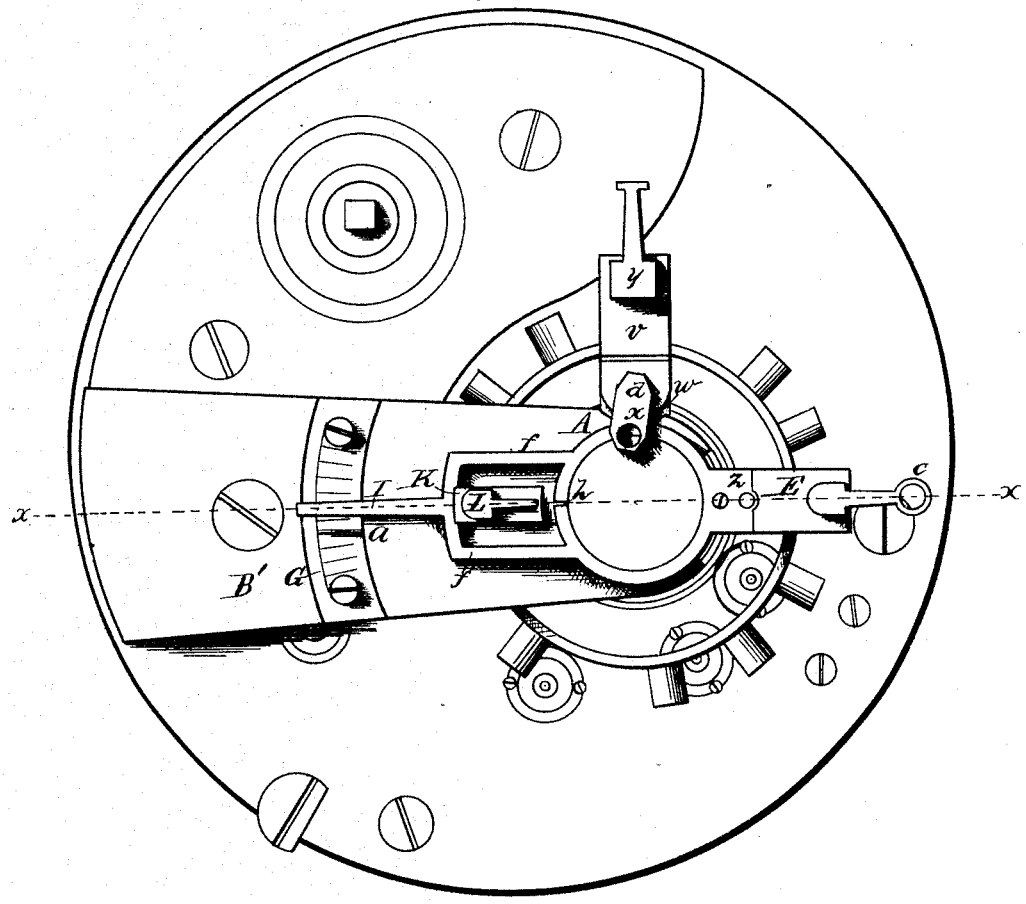
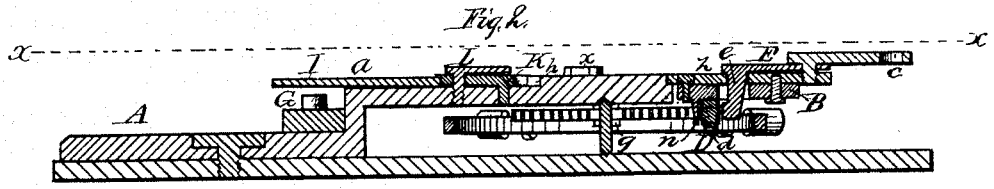


Fig. k.



Witnesses;
Jas. F. Duhamel.
Thomas. Byrne.

Inventor;
Leander Eaton.
Per H. C. Abbot.
Attorney.

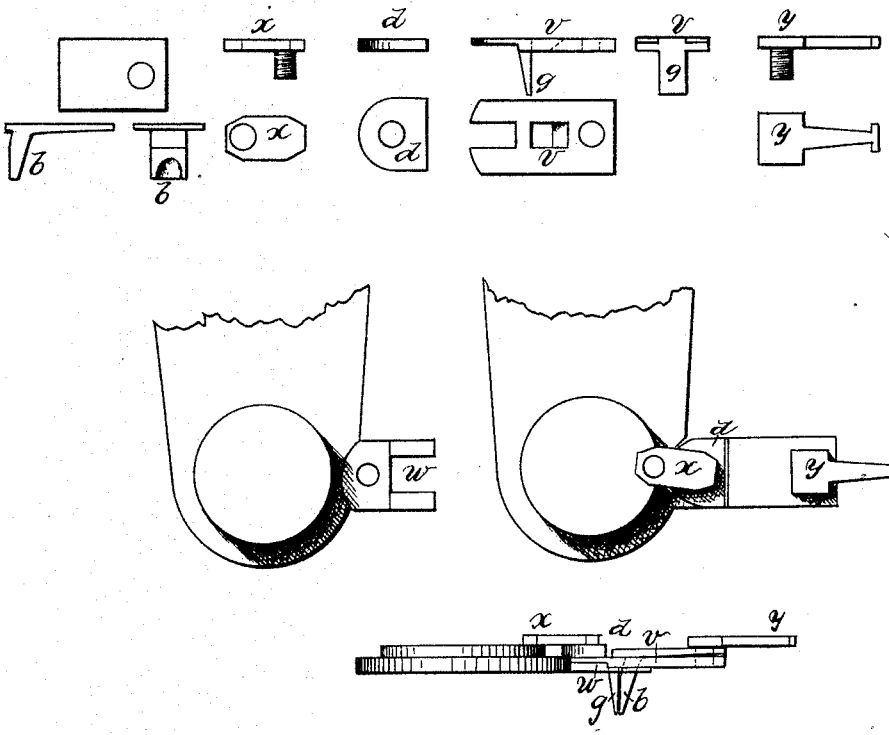
3 Sheets--Sheet 2.

L. EATON.

Regulating Chronometers, Watches, &c.

No. 163,981. Patented June 1, 1875.

Fig. 3.



Witnesses;

Jas. F. Duhamel.

Thomas. Byrne.

Inventor;

Leander Eaton.

Per A. S. Abbott

Attorney.

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

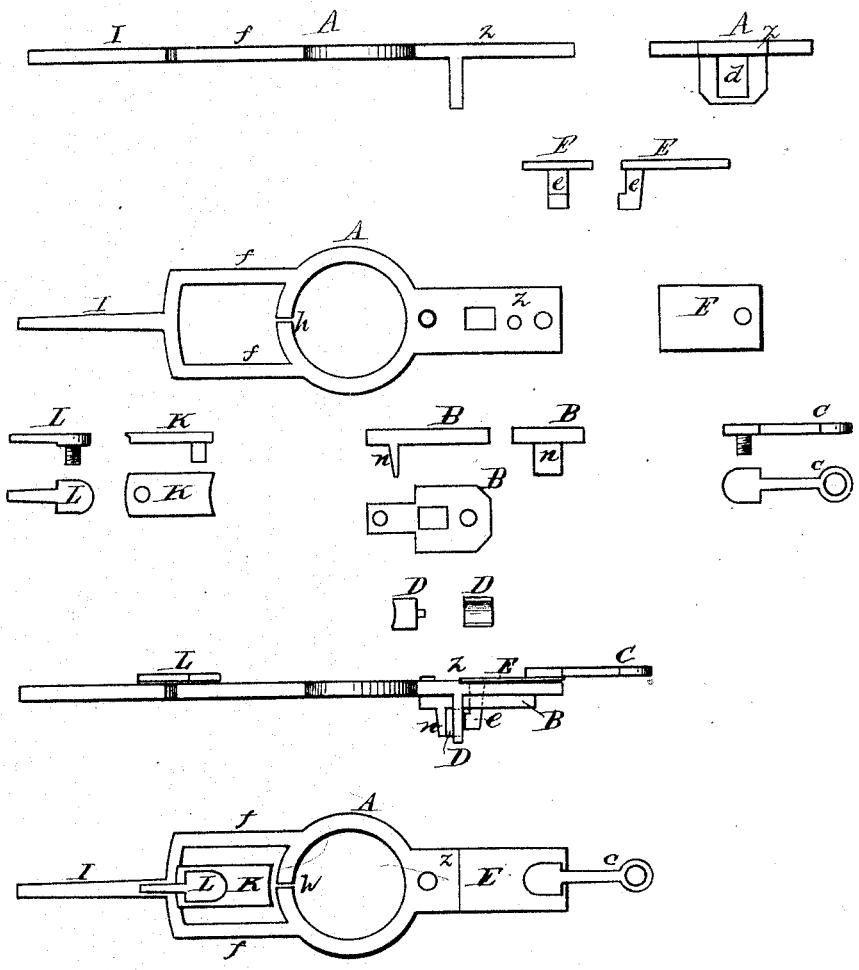
3 Sheets--Sheet 3.

L. EATON.

Regulating Chronometers, Watches, &c.

No. 163,981. Patented June 1, 1875.

Fig 4.



Witnesses;
Jas. J. Duhamel.
Thomas Byrne.

Inventor;
Leander Eaton
Per H. J. Abbott
Attorney.

UNITED STATES PATENT OFFICE.

LEANDER EATON, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN REGULATING CHRONOMETERS, WATCHES, &c.

Specification forming part of Letters Patent No. **163,981**, dated June 1, 1875; application filed March 8, 1875.

To all whom it may concern:

Be it known that I, LEANDER EATON, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Watches; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The nature of my invention consists in the construction and arrangement of a device for regulating chronometers, watches, and clocks, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings which form a part of this specification, and in which—

Figure 1 is a plan view, showing my invention in position on a watch. Fig. 2 is a sectional view taken on the line *x x*. Fig. 3 shows the hair-spring holder in detail. Fig. 4 shows the regulator-frame and hair-spring lock in detail.

A represents the regulator-frame, which is provided with two arms, *f f*, one on either side of the cut *h*. These arms preserve the rigidity of the frame while allowing the cut *h* to open when being sprung upon the bridge.

One end, *z*, of the regulator-frame is provided with the hair-spring lock, which consists of a plate, B, provided with the jaw *n*, said plate being secured to the under side of the regulator-frame by a screw at either end. D is a bolt passed through an opening, *d*, in the end *z* of the regulator-frame, and is held in position by a projecting jaw, *e*, on the lever E. The bolt D is provided with a rounded point upon one side, and it is made concave on the opposite side, having a narrow bearing upon the extreme edges.

When the hair-spring is in position it is held firmly between the jaw *n* of the plate B and the narrow bearing of the bolt D.

The rounded point of the bolt D bears upon the projecting jaw *e* of the lever E, and, being freely movable upon it, it adjusts itself perfectly to the hair-spring. The lever E is held and operated by means of a lever, *c*.

The index *a*, of the regulator A, is provided with a sight, I, which is placed upon the time-table G. A frame, H, is placed upon the time-table G, and is secured to it by screws, which pass through either end and into the bridge B′. Upon the frame and over the sight I is placed a washer, K, on which is pivoted a lever, L, for fastening the index to the time-table.

The adjustable hair-spring holder consists of a sliding plate, *v*, provided with a jaw, *q*, which plate is placed on the projecting part *w* of the bridge and fastened to it by means of a washer, *d*, and lever *x*. Through the plate *v* is passed a movable jaw, *b*, held in position by a lever, *y*. The hair-spring is held in position between the jaw *q* and the movable jaw *b*.

By the construction of the regulator-frame A, as described, each move of the regulator will always be true to the movement indicated by the index.

The hair-spring lock takes hold of the hair-spring with the gripe of a vise while working, giving the hair-spring always one permanent and firm base of action. There is no trembling or changing of base of action of the hair-spring, thereby causing it to establish an exact proportional relation on the time-table between time and distance, thus measuring time mathematically when locked, and measuring like any other watch—that is, irregularly—when unlocked. The point of accurate measurement of time can thus always be found on the time-table.

Another advantage of the lock is that the hair-spring is held firmly in place, and is prevented from being thrown out of position, as frequently occurs in the regulator now in use.

The index *a* can be locked, as described, to the bridge during the locking or unlocking of the hair-spring.

The adjustable hair-spring holder is used as an auxiliary to the regulator in obtaining the proper adjustment of the hair-spring for mathematical measurement of time, the advantage being in its ready and easy adaptation to any position; whether it be desired to change it to the right or left, forward or back, to or from the center. It takes hold of the hair-spring without bending or turning it, and always holds it at right angles to the center

pinion of the balance-wheel. It is also a quicker and easier method of obtaining a perfect adjustment, and facilitates the labor of getting the watch in beat.

In the operation of regulating a watch with this device the hair-spring lock is first unlocked by means of the lever *c*. The index is then unlocked by means of the lever L, and then moved the required distance and locked by the washer K and lever L, so as to be held firmly in place that it cannot slip during the subsequent locking of the hair-spring.

In the ordinary regulator the hair-spring is held firmly in the hair-spring stud, and vibrates freely between two pins attached to an adjustable arm, which is moved back and forth in a circle, at will, alternately striking each pin. When the spring is impinged upon either pin the movement of the watch is faster than during the vibration of the spring. It will be seen that a watch must alternately run faster and slower than the correct time. Practice has shown that the regulation of the movement of a watch by these means is simply guess-work, and requires several weeks of close observation to secure accurate time. In my invention the hair-spring is attached at both ends (though by different means, yet upon the principle of an ordinary regulator.) Instead of the two pins upon an arm I use a locking device, which holds the spring fast and gives a fixed base of action, rendering it possible to make an accurate calculation, and in accordance therewith to adjust and regulate the movement. Each watch, or rather each hair-spring, requires a separate calculation for regulating the same. For instance, if the index is placed at one end of the time-table, and it is found that the watch gains thirty (30) seconds per hour, and it is then placed at the other end of the time-table, and it is found that the watch loses twenty (20) seconds per hour, we have a total difference between the two extremes of fifty (50) seconds. It will then be manifest that thirty-fiftieths of the time-table will represent the fast time, and twenty-fiftieths represent the slow time. Suppose the time-table to be divided into twenty parts, twelve of these parts will represent fast, and eight will represent slow, time. Now, move the index twelve parts from the fast end of the time-table, lock the hair-spring, and the regulation of the movement is instant and correct.

It will be noticed that in the construction of my regulator I employ no screw-heads in fastening any of the movable parts to the regulator-frame, but I use screws with levers to hold the various parts, thereby preventing all displacement or injury to the bridge.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a regulator for watches, a hair-spring lock for holding or locking the hair-spring to give it a single, permanent, and firm base of action, for the purposes herein set forth.

2. In a watch-regulator, the levers for fastening the movable or adjustable parts thereof, for the purposes herein set forth.

3. In a watch-regulator, the combination of a lock with the index of the regulator for the purposes herein set forth.

4. The regulator-frame A, constructed as described, with the arms *f f* and cut *h*, substantially as and for the purposes herein set forth.

5. The hair-spring lock consisting of the plate B with jaw *n*, bolt D, lever E with jaw *e*, and lever *c*, all constructed as described, and attached to the regulator-frame A, substantially as and for the purposes herein set forth.

6. The adjustable hair-spring holder, consisting of the plate *v* with jaw *g*, movable jaw *b*, and levers *x y*, all constructed substantially as and for the purposes herein set forth.

7. The combination of the regulator-frame, hair-spring lock, adjustable hair-spring holder, and the sight I, all substantially as and for the purposes herein set forth.

LEANDER EATON.

Witnesses:
C. K. BABCOCK,
E. H. WHITNEY.