2 Sheets—Sheet 1.

F. H. VOIGT.

CHRONOMETER ESCAPEMENT FOR WATCHES.

No. 180,290. Patented July 25, 1876.

FIG. 1.

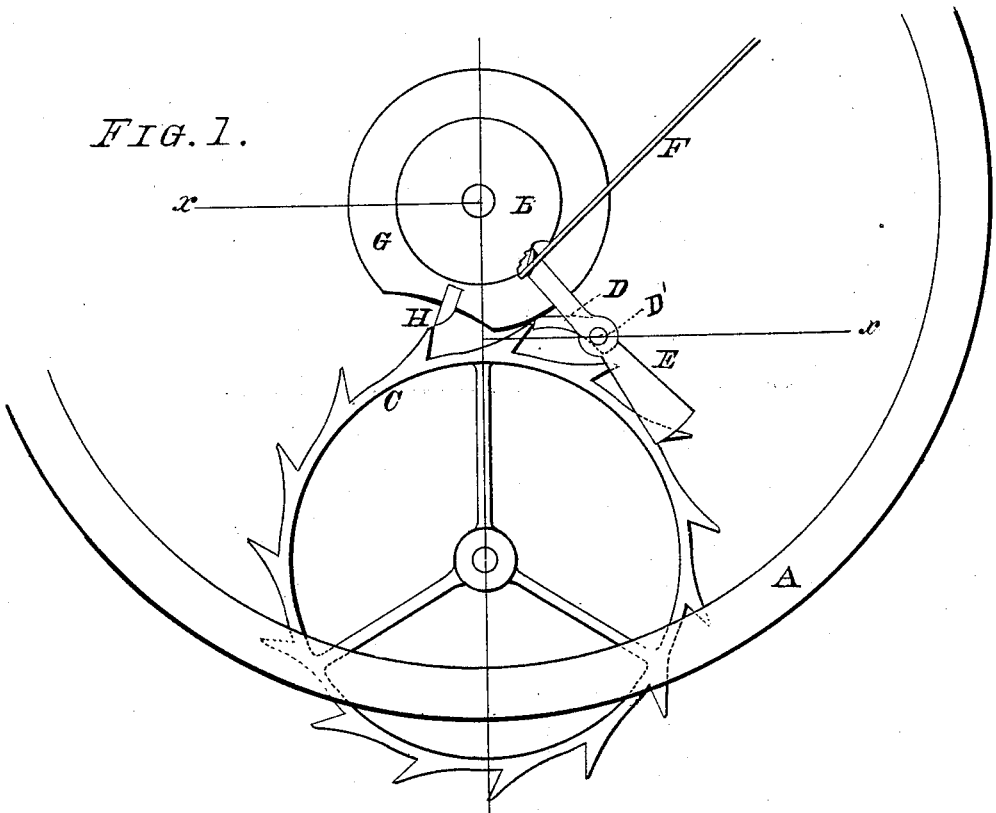
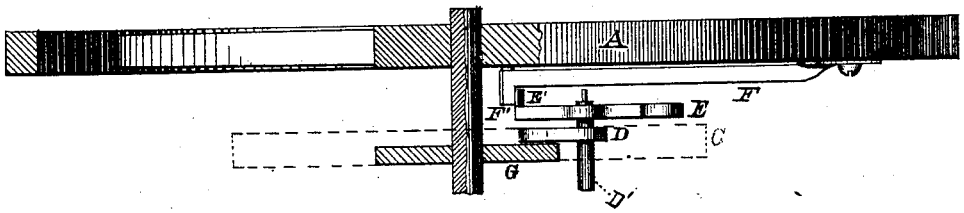


FIG. 2.



WITNESSES:

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2 Sheets—Sheet 2.

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CHRONOMETER ESCAPEMENT FOR WATCHES.

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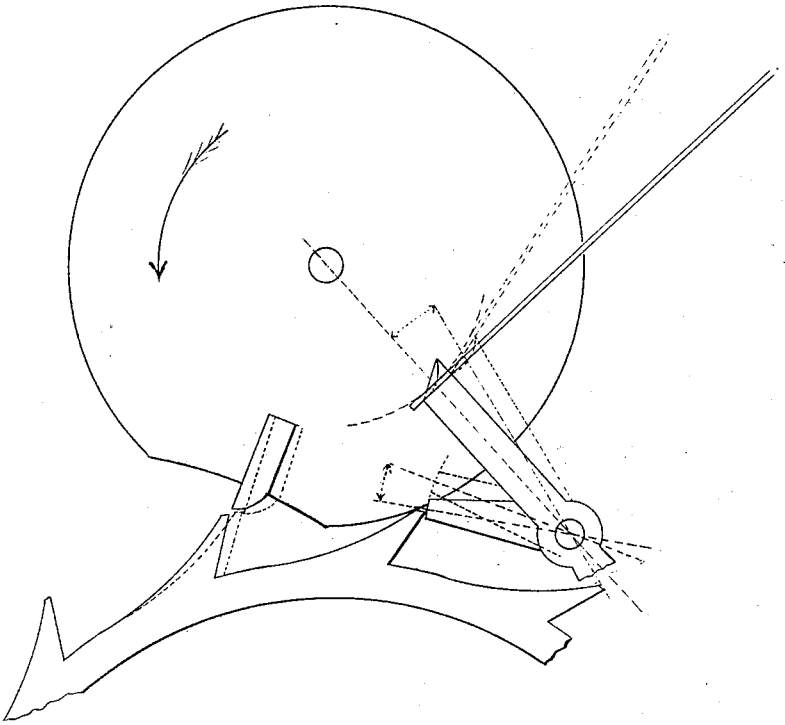
FIG. 3.



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UNITED STATES PATENT OFFICE.

F. HERRMAN VOIGT, OF BUFFALO, NEW YORK.

IMPROVEMENT IN CHRONOMETER-ESCAPEMENTS FOR WATCHES.

Specification forming part of Letters Patent No. **180,290**, dated July 25, 1876; application filed May 18, 1876.

To all whom it may concern:

Be it known that I, F. HERRMAN VOIGT, of Buffalo, in the county of Erie and State of New York, have invented an Improved Chronometer-Escapement for Watches, &c.; and I do hereby declare that the following description, taken in connection with the accompanying sheets of drawings, forms a full, clear, and exact specification, wherein are set forth the nature and object of my present invention, and the best modes in which it is carried into effect.

The object of my invention is the production of a chronometer-escapement for watches and clocks that shall, first, be less liable to derangement than those now in use; second, disengage the detent with a quicker motion, and, thereby, third, absorb less of the centrifugal force and momentum of the balance, and thus, fourth, cause a more perfect and steadier working of the watch, &c., in which it is used; fifth, it shall not be easily "set" by sudden and severe shocks; and, sixth, it shall start with the slightest vibration of the balance.

To this end my invention consists in the arrangement, with the balance-wheel, of a disengaging-spring for the chronometer-lever, constructed in such manner that it will engage with said chronometer when traveling with the balance in one direction, and thus to cause the detent-lever to liberate the escape-wheel, and, when traveling in the opposite direction, to avoid said chronometer-lever. It furthermore consists in the arrangement of parts and details of construction, as will hereinafter more fully appear, and be pointed out in the claims.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I shall proceed to describe its construction and operation, and thereby refer to the hereinbefore-mentioned drawings, in which—

Figure 1 is a plan of the escapement. Fig. 2 is a sectional elevation in line X X of Fig. 1. Fig. 3 is a plan of the disengaging or chronometer-lever and detent-lever, indicating their various positions.

Like letters of reference indicate corresponding parts in all the figures, which, in regard to size, are greatly exaggerated.

A is the balance of a chronometer or other watch movement. It may be constructed of any of the most improved designs, with compensation and other arrangements. B is its hub. C is the escape-wheel. D is the detent-lever, secured to the staff D′, together with the chronometer-lever E, or made in one piece with the same. F is a very elastic blade-spring, secured to the rim of the balance A with one end, and extending to within a short distance of the balance-staff with its opposite extremity. This extremity of the spring F is provided with a downwardly-projecting hook or pin, F′, which engages at certain intervals with an upwardly-projecting cam-shaped pivot on the forward end of the chronometer-lever. G is the table, provided with the usual table-jewel H.

The spring F is made of any metal having a high degree of elasticity—gold, platinum, or the alloys thereof, being preferable. It should be made very thin, and as light as possible, to allow its deflection with the smallest amount of resistance.

The escape-wheel C has teeth double the height usually found on such wheels, so as to enable the detent-lever to swing above the table G.

Instead of the downwardly-projecting teeth, pins may be inserted into the face of this wheel to accomplish the object in view.

The operation of my improved chronometer-escapement is as follows, to wit: Assuming the watch being wound up and ready for action, the parts of the escapement to which my invention appertains are in the position illustrated in Fig. 3, where the slightest movement of the balance in the direction of the arrow will cause the chronometer-lever to operate the detent-lever in such manner as to release that tooth of the escape-wheel which has been resting thereon. In its forward movement the next succeeding tooth will encounter the table-jewel, and, striking it, give sufficient impulse to the balance to continue its forward movement until it has spent its force in tensioning the hair-spring placed on the balance-

staff. This hair-spring will then cause a reverse movement of the balance, nearly equal to that of the entire forward movement, and until the hair spring has been strained in the opposite direction sufficiently to cause the balance to again resume its forward movement, where the disengagement of the detent and the striking of the table-jewel will be repeated, and the watch thereby continue its motion.

The engagement and disengagement of the chronometer-lever E is effected by the spring F in the following manner: Soon after the balance commences its forward movement, the projection of the spring F comes in contact with the cam E′ of the chronometer-lever E, and causes this lever to turn around its axis until said projection or cam E′ has been placed in such position that its forward end coincides with the curve described by the outer edge of the projection F′. In this position said projection will disengage from the chronometer-lever, and leave the same intact until it has passed the cam, when the said chronometer-lever will instantly resume its normal position on account of a hair-spring placed on the chronometer-lever staff. When the balance returns, the projection F′ will again encounter the cam E′, but this cam being convex on its back, and on account of its position, will cause said spring to deviate from its former course and to pass behind the cam E′, leaving the chronometer-lever intact during its passage over said cam. After having passed the cam, the spring returns to its normal position to again engage the same in its forward movement, as hereinbefore described.

It is evident that, as soon as the escape-wheel has been liberated by the detent, it will continue to revolve until it is again arrested by said detent. This lever is actuated by the chronometer-lever and the hair-spring on its staff in such manner that it will immediately return to its normal position after it has released one tooth of the escape-wheel, and early enough to arrest the next succeeding tooth. In this manner the watch is kept continually moving.

It will be observed that the staff of the chronometer-lever E is placed in close proximity to the table G, in fact so close that the tooth of the escape-wheel, giving the impulse to the balance, will at once come in contact with the detent. By this arrangement, in combination with the deviating spring F, I am enabled to reduce the angle of unlocking to such an extent that a slight movement only of the two engaging parts is necessary to disengage, and whereby I obtain very important results, viz: that of absorbing but very little of the circumferential force or momentum of the balance, and of starting the watch-movement with even the very slightest vibration of the balance. This latter result is the all-important one in chronometer-escapements, because it also reduces the chances of "setting" to a minimum; in fact, a movement provided with my improvements, if run off, will start itself after being wound up, the slight vibrations of the balance while handling the watch being more than sufficient to start the same, while for the same reason no shocks, however severe, can cause it to set or stop.

In the older and more recent styles of chronometers the balance and chronometer lever are compelled to travel backward a certain distance beyond their angle of locking and unlocking in order to pass each other in the return stroke. This causes additional friction, and particularly an increase in fact of the angle of locking and unlocking. In movements where the two levers performing this locking and unlocking are non-yielding there is a further serious drawback, viz: that of deteriorating the teeth of the escape-wheel or breaking the pivots or jewels in case the movement has run down, and the escape-wheel and detent-lever or similar contrivances have stopped in such position that said detent would ride upon the tooth of the escape-wheel. If, now, the balance were vibrated, (as will naturally take place, it being the very first thing a watch-owner does if he finds his watch not running,) one of said levers would come in contact with the detent-lever; but on account of that riding upon the tooth of the escape-wheel cannot pass nor move the same, and thus serious derangements are the natural results. This drawback is entirely overcome in my movement by the arrangement of the spring F and cam E′, which causes the said spring to deviate, no matter what position the chronometer may be occupying at the time.

In order to prevent my spring F from deflecting backwardly, I provide the hub of the balance with a steady-pin just behind the projection F′, against which the spring rests during the whole movement of the balance, except while the said projection passes the cam E′ in its back motion. Instead of such a pin I may insert a pin into the balance-staff, or slide a collar over the same, as a support for said spring. So, also, to prevent the detent from engaging farther than necessary, I provide the chronometer-staff with a suitable staff-stop or similar means to obtain the desired result. The engaging-surface of this detent is a curve described from the center of the staff, and it does, therefore, not draw in unlocking.

It is obvious that the chronometer-lever E may be jeweled by inserting a properly-shaped ruby in its end as a substitute for the cam E′, and that the detent may be made entirely or partly of a ruby, in order to avoid abrasion by friction. So, also, may the projection F′ of the spring F be made of a ruby properly attached to said spring; or it, as well as all the other pivots, pins, &c., may be made of iridium, which, at the present state of the art, can successfully be shaped into such parts.

The nature of all the elements entering into the construction of my improved chronometer-escapement is such that they can easily be multiplied by suitable machinery, that they are not more expensive to manufacture than any other first-class chronometer-escapements, and that my improved escapement may be substituted for others in old watches, &c.; in fact, it may be made entire by almost any good watchmaker, possessing ordinary facilities for repairing watches.

The position of the spring F, in relation to the chronometer-lever, is such that when the balance is at rest it will be at right angles to a line drawn through the centers of the said balance and the chronometer-lever staff. It may be made to deviate somewhat from that position without seriously affecting the proper working; but it will be best to arrange it as heretofore described.

I am well aware that mechanical devices may be substituted for the spring and cam, such as sliding projections in the hub or staff of the balance, or a sliding cam and stationary pin, all of which would accomplish the desired result, and are mechanical equivalents of my said spring and cam.

Having thus fully described my invention, I desire to secure to me by Letters Patent of the United States—

1. The combination, with the chronometer-lever E, of the spring F or its equivalent, for operating said chronometer, substantially as described, for the purpose stated.

2. The combination, with the balance A, of the spring F and the chronometer-lever E, said spring and chronometer being provided with means, substantially as described, for engagement and disengagement, as stated.

3. The combination, with the spring F, having the projection F′, or their equivalent, of the chronometer-lever E, provided with the cam E′ or its equivalent, said spring being arranged to engage the chronometer in its forward movement, and to avoid the same in its return stroke, substantially as described, for the use and purpose mentioned.

In testimony whereof I hereto set my hand in the presence of two subscribing witnesses.

F. H. VOIGT.

Witnesses:
MICHAEL J. STARK,
FRANK HIRSCH.