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Patented Oct. 7, 1902.

F. H. VOIGT.
ESCAPEMENT FOR TIMEPIECES.

(Application filed Dec. 4, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

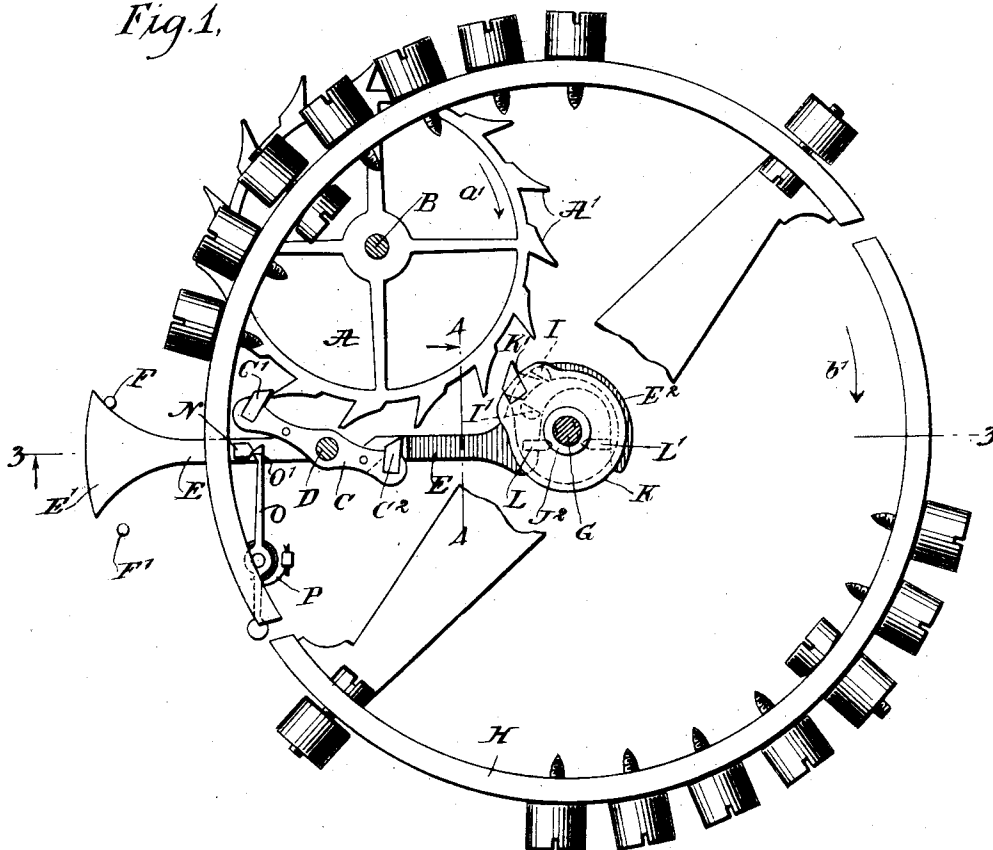
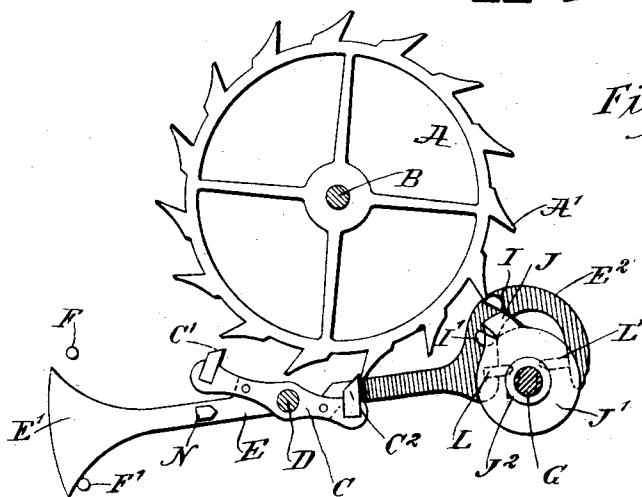


Fig. 2.



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2 Sheets—Sheet 2.

Fig. 3.

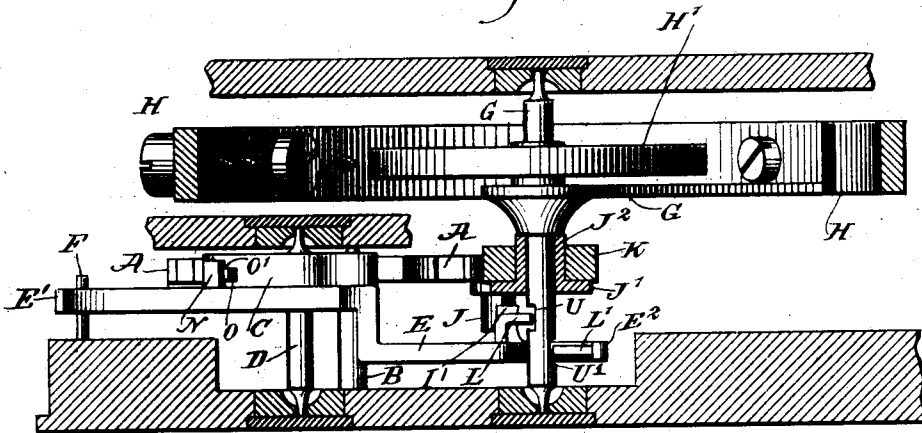


Fig. 4.

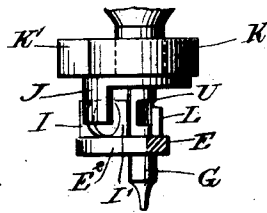


Fig. 5.

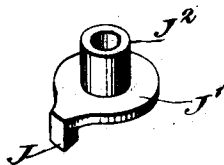
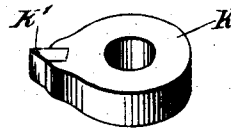


Fig. 6.



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FREDERICK HERMANN VOIGT, OF PHILADELPHIA, PENNSYLVANIA.

ESCAPEMENT FOR TIMEPIECES.

SPECIFICATION forming part of Letters Patent No. 710,823, dated October 7, 1902.

Application filed December 4, 1901. Serial No. 84,657. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HERMANN VOIGT, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Escapement for Watches, Clocks, and other Timepieces, of which the following is a full, clear, and exact description.

10 The object of the invention is to provide certain new and useful improvements in escapements for watches, clocks, and other timepieces, whereby the action of the escapement is rendered more positive and the friction of the working parts is reduced to a minimum to insure long accurate life of the escape-ment.

15 The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

20 A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

25 Figure 1 is an enlarged plan view of the improvement, part of the balance-wheel being broken out. Fig. 2 is a plan view of the escape-wheel, the pallet, the lever, and the disengaging-collet in a different position from the one shown in Fig. 1. Fig. 3 is a sectional side elevation of the improvement on the line 3 3 of Fig. 1. Fig. 4 is an enlarged side elevation of part of the balance-staff, the impulse-pallet, the disengaging-collet, and the lever. Fig. 5 is a perspective view of the disengaging-collet, and Fig. 6 is a similar view of the impulse-pallet.

30 The escape-wheel A is mounted on a pinion-staff B, and its teeth A' are adapted to engage at the proper intervals with pallet-jewels C' and C² of a pallet C, mounted on a staff D, which forms the fulcrum of a lever E, so that the latter and the pallet C are oscillated in unison, the swinging movement of the lever being limited by fixed banking-pins F F', adapted to be alternately engaged by the outer end E' of the said lever E. The inner end E² of the lever E is segmental or curved to partly encircle a staff G, carrying a balance-wheel H, and on the said curved end E²

are arranged outer and inner upright prongs I and I', adapted to be alternately engaged by a projection J, depending from a disengaging-collet J', having its hub J² secured to the staff G, the collet J' carrying an impulse-collet K, having its face K' adapted to be engaged by the teeth A' of the escape-wheel A. On the curved end E² of the lever E are also arranged guard-pins L L', extending in different horizontal planes and operating in conjunction with upper and lower cuts U and U', formed in the balance-wheel staff G, the guard-pin L being made knee-shaped, as plainly indicated in Fig. 3. On the lever E at a distance outward from the staff D is arranged a banking-jewel N, having two bevels at its inner end adapted to be alternately engaged by corresponding bevels on the head O' of a banking-lever O, pressed on by a spring P to cause the head O' to force the lever E to a final position against either of the banking-pins F or F'.

35 The operation is as follows: The escape-wheel A turns intermittently in the direction of the arrow a'. When the several parts are in the position shown in Figs. 1 and 3, then the escape-wheel A is at rest, with one tooth A' abutting against the jewel C', and the balance-wheel H oscillates backward in the direction of the arrow b' by the reaction of its hair-spring H'. During this movement of the balance-wheel H the projection J of the disengaging-collet J' presses with one side against the inner face of the outer prong I to impart a swinging motion to the lever E and reverse the position of the pallet C and its pallet-jewels C' and C². The projection J moves out of contact with the prong I shortly after the prong has received its impulse by the projection, as will be readily understood by reference to Fig. 2. When the pallet C moves into the position shown in Fig. 2, the tooth of the escape-wheel A is liberated from the jewel C' to allow the escape-wheel to proceed on its travel in the direction of the arrow a' until another tooth A' moves in contact with the jewel C² to again interrupt the forward movement of the escape-wheel. The balance-wheel H continues on farther in its backward movement until its usual swing of a little more than a half-revolution is finished, and as soon as the tooth A', which rests on the

pallet-face C^2 , is liberated an impulse is given, as the face of the impulse-collet K has now just entered into the path of a tooth A' . As soon as this takes place a tooth A' comes to rest on the pallet-jewel C' . The lever E when swinging in either direction receives a supplemental impulse by the spring-pressed banking-lever O operating with its head O' against the banking-jewel N, so that the lever is positively moved into and temporarily locked in a final extreme position against either banking-pin F or F'. It is understood that when the head O' of the banking-lever O slides down either inclined face of the banking-jewel N it pushes on the lever E, and thereby forces one of the prongs I or I' against the projection J. Thus the banking-lever O serves a twofold purpose—to give a supplementary impulse to the lever E and to hold the lever against its banking-pins. It is understood that the pallet-jewels C' C^2 arrest the escape-wheel A in its course at intervals, and a main impulse is given by the escape-wheel to the face of the impulse-collet to cause the balance-wheel H to revolve in the inverse direction of the arrow b' to disengage the several parts, as above mentioned. In case of an extreme vibration of the balance an overswing is prevented by the projection J contacting with either prong I or I', as when the balance is started from its point of rest or starting-point the projection enters the prongs and engages one face of either, and by causing the balance to revolve nearly a whole turn to either one side through shocks or other causes the opposite prong to the one that has been engaged in the last contact is placed in the path of the projection, and consequently the latter will contact with its outer edge, thereby stopping the balance from a further course, when it will return by the tension of its hair-spring. In such an extreme position of the balance the guard-pin L' will stand before the path of the cut U', thereby allowing the lever a free path, and in a severe shock, the same not being guarded by the rounding of the staff, could be thrown to the other side, which would cause the time-piece to stop. To prevent this action, the second guard-pin is provided, which at that moment or position will not be in the path of a cut, thereby preventing a disorder. By placing the prongs I I' in an offset or out-of-center position relative to the plane of the lever E the projection J when acting on the prongs, as described, produces a double-quick action, as the projection J and the corresponding prong I or I' move out of contact shortly before the lever has reached the corresponding banking-pin F or F', and as the lever is operated in such a small motion of the balance-wheel all danger that the cuts in the staff will be turned too much out of the way to allow the guard-pins to pass freely is avoided. Any disturbance of the lever E caused by severe shocks produces but a slight friction

by the guard-pins L L' relative to the balance-staff G, as the circumference of the latter is small. It is understood that the outer pin L' is the main or safety pin and moves contrary to the balance-staff, while the other pin only comes in action on an extreme vibration.

The escapement described is to be classed as a free escapement, as the escape-wheel delivers an impulse direct to the balance and in every second motion. An overswing is prevented by the projection J, which meets with the edges of the prongs I I' at the extreme point and prevents a further swinging of the balance and also prevents the balance-wheel from disengaging twice during one revolution. As the lever E is unlocked and swings in a short motion from one side to the other the contacting projection J and corresponding prong I or I' separate very quickly, and the lever perfects its oscillation or sweep in a comparatively small angle, the angle corresponding to the thickness of the balance-staff G. By having the lever E oscillate in such a small angle the banking-lever O becomes very effective for moving the lever to a final position against the banking-pins F F', as the bevels on the head O' in sliding on the bevels of the banking-jewel N by the action of the hair-spring P impart the desired auxiliary final impulse to the lever E. The banking-jewel N and the pallet-faces of the pallet C are located the same distance from the center of the staff D, and hence the amount of degrees of locking by the head O' in its final position is equal to that on the pallet-faces C' or C^2 , which is important in regard to frictional points, it being understood that friction is a great drawback in escapements in regard to accurate time measuring. In this escapement the lever E is arranged to perform its motion in an arc not more than the diameter of an ordinary balance-staff, thereby reducing friction, and otherwise the banking arrangement becomes very effective in regard of a substitute for inclined pallet-faces, whereby I am enabled to set the pallet-faces in straight or circular line, thereby avoiding a recoil of the escape-wheel, and consequently utilize more impulse-space, which is evident, as in a recoiling-escapement an allowance must be made for the recoiling tooth, making it necessary of setting the respective centers of balance-staff and escape-wheel farther apart in order to avoid hitting a tooth during the passage of the impulse-pallet while recoiling, and setting the centers farther apart will consequently diminish the space of contact, which is harmful to the correct motion of the balance.

I do not limit myself to the particular construction and arrangement of the various parts as herein shown and described, as the same may be varied and equivalent devices substituted without departing from the spirit of my invention.

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

1. In an escapement, a balance-staff, a collet, a lever for controlling the collet provided with a projection, said lever having a segmental end partly encircling the balance-staff and provided with upright prongs having faces adapted to engage with a projection carried by the collet, as and for the purpose set forth.

2. In an escapement, a balance-staff, a collet, a lever for controlling the collet provided with a projection, said lever having a segmental end partly encircling the balance-staff and provided with upright prongs and guard-pins, said prongs having faces adapted to engage with a projection carried by the collet for the purpose of operating the pallet in either direction and unlocking the escape-wheel, as set forth.

3. In an escapement, a lever having two upright prongs arranged out of the center line of the plane of the lever and having their inner faces running in an offset line, a disengaging-collet mounted on the balance-staff and provided with a projection having faces running concentric to the circular line of the balance-staff, and an impulse-collet having a face engaged by the teeth of the escape-wheel, as set forth.

4. In an escapement, an escape-wheel, an impulse-collet adapted to engage the escape-wheel and carrying a projection, a lever carrying pallets for engaging the escape-wheel, and provided with prongs adapted to be engaged by the projection carried by the impulse-collet, and means for preventing over-swing of said lever, as set forth.

5. An escape-wheel, a lever thereon having two prongs set in proximity, the outer prong being slightly forward of the other and arranged out of the center line of the plane of the lever, two opposite guard-pins, one pin being raised above the plane of the lever, a banking-lever, a banking-jewel with two inclined faces engaged by the beveled head of the banking-lever, a pallet having faces engaged by the teeth of the escape-wheel, a balance-staff, and a disengaging-collet thereon provided with a projection raised from its plane and adapted to contact with the prongs of the lever, as set forth.

6. An escape-wheel, a lever having one of its extremities partly encircling the balance-staff and provided with guard-pins, a pallet mounted on the staff of said lever and having engaging faces adapted to engage the teeth of the escape-wheel at intervals, and a bal-

ance-staff having two cuts in opposite directions, one above the other, and adapted as a passage for the guard-pins, as set forth.

7. In a device of the character described, an escape-wheel, a lever provided with two prongs, a balance-staff, and an impulse-collet thereon having a face adapted to contact with the teeth of the escape-wheel at every second motion and carrying a projection adapted to engage with the prongs of the lever, as set forth.

8. In an escapement, an escape-wheel, an impulse-collet adapted to engage the escape-wheel and provided with a projection, a lever carrying pallets for engaging the escape-wheel and provided with prongs adapted to be engaged by the projection carried by the impulse-collet, means for preventing overswing of said lever, and means for imparting a final swing to said lever and locking it in place, as set forth.

9. A lever, having one of its extremities partly encircling the balance-staff, said circular part being provided with two upright prongs set in proximity and having their inner faces running in an offset line of the lever, and with two guard-pins, one being raised above the plane of the lever, both pins being adapted to pass the cuts in the balance-staff and having for their purpose to guard the lever from overbanking, as set forth.

10. An escapement having a balance-staff having recesses in opposite sides and a lever provided with a segmental end and carrying two oppositely-projecting guard-pins for engaging the recesses of the balance-staff, as set forth.

11. In an escapement the combination of the escape-wheel, the balance-wheel staff having recesses in opposite sides thereof and in different vertical planes, an impulse-collet on the staff and provided with a face for engaging the escape-wheel, and carrying a projection, and a lever carrying pallets for engaging the escape-wheel, said lever having a segmental end partly encircling the balance-wheel staff and provided with prongs adapted to be engaged by the projection carried by the impulse-collet and with guard-pins adapted to enter the recesses of the balance-wheel staff, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK HERMANN VOIGT.

Witnesses:

DAVID GOODREAD,
J. JOSEPH STRATTON.