Jan. 6, 1942. V. VIRTANEN 2,269,045

CLOCK AND WATCH

Filed Dec. 7, 1940

Fig. 1

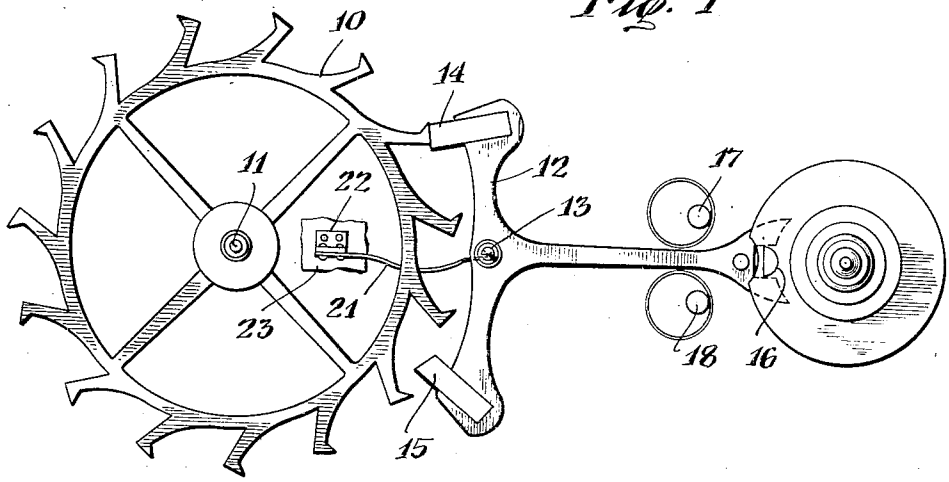


Fig. 2

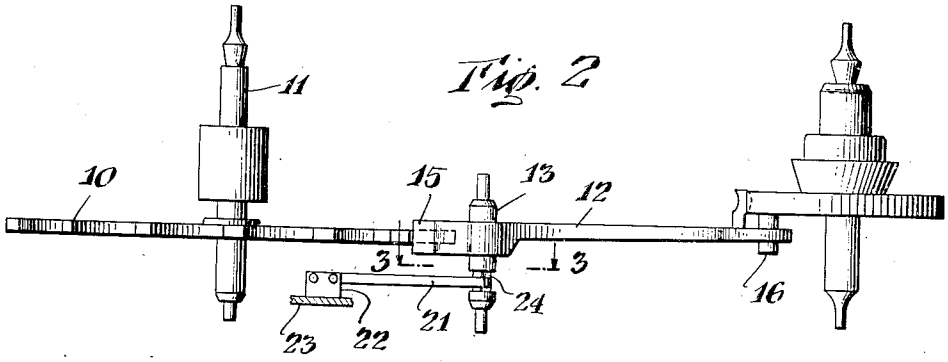


Fig. 4

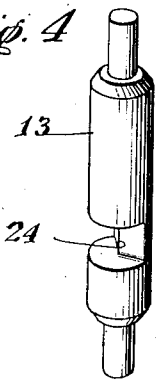


Fig. 3

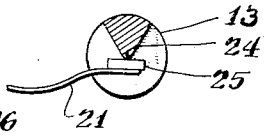


Fig. 5



Fig. 6



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CLOCK AND WATCH

Valdemar Virtanen, Morristown, N. J.

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4 Claims. (Cl. 58—122)

This invention relates generally to clocks and watches, and has particular reference to improvements in instruments of that general character which have escapement mechanisms controlling and regulating the release of a motive force applied by weights or springs to a gear train for moving the hands or corresponding parts of a time indicator.

The main object of the invention is to increase the time keeping accuracy of clocks and watches of the class mentioned. The escapement mechanism of such time pieces has been the subject matter or study and design for hundreds of years and a number of changes in the shapes and relations of parts have been made with a view to increasing the accuracy of movement and consequent accuracy of the time indication. Nevertheless variations from accurate time keeping still exist generally and are due in large part to uncontrolled and undesirable movements in the parts of the escapement arising mainly because of improper release of the escape wheel by the pallet. Applicant has reduced such irregularities to a minimum by steadying the pallet in its movement, thereby giving better control over the escape wheel and, as the escape wheel regulates the release and transmission of power, the time keeping accuracy is correspondingly improved. By steadying the pallet as contemplated by the invention, a well constructed and adjusted watch which had a variation of five seconds in twenty-four hours showed a variation of only one second, while clocks and watches which, because of their lack of precision in workmanship and adjustment, had much greater variations from accurate operation were improved by the invention to such an extent as to make them keep time as well or better than corresponding instruments where the quality of workmanship and adjustment was much greater and the cost correspondingly higher.

The invention may be embodied in clock and watch movements now in use or as at present manufactured without radical changes in existing designs. That is to say, the invention can be applied in repairing and adjusting clocks and watches which are now in use and manufacturers will not have to re-design or alter the construction of their product to any important extent in embodying the invention.

The invention consists in a novel combination and relation of parts in a clock or watch movement, embodiments of which are hereinafter described with reference to the drawing accompanying and forming a part of this application, the novel features being pointed out in the claims appended hereto.

In said drawing:

Fig. 1 is a plan view of a well-known watch escapement with the invention applied thereto. The parts are greatly enlarged in Fig. 1 and are shown as they would appear in looking down on Fig. 2.

Fig. 2 shows the same parts as Fig. 1 and is a view of those parts as they would appear if looking upward from the bottom of Fig. 1.

Fig. 3 illustrates a pallet arbor which has been reduced in cross-section according to the invention.

Fig. 4 is a side elevation of the pallet arbor which is shown partly in section in Fig. 3.

Figs. 5 and 6 show, respectively, modifications of the invention.

The constructions shown in the drawing are illustrative only because, as will be more clearly apparent later on, the invention can be applied to any clock or watch which has an escapement pallet or equivalent part. Referring to Fig. 1, the escape wheel **10** is, as before stated, part of a well-known escapement mechanism and is carried by an arbor **11** supported at its ends for free rotation in jewels or other bearings in the frames or other stationary supports for the mechanism. Cooperating with the teeth of the escape wheel **10** is an escapement pallet **12** attached to an arbor **13** pivoted at its ends in a framework or supports for the mechanism. In the particular movement shown, pallet stones **14** and **15** of a durable anti-friction material cooperate directly with the teeth of the escape wheel. At its other end of the part has a fork slot cooperating with a jewel pin **16** of the roller part of the escapement and the movements of the pallet are limited in a well-known manner by banking elements **17** and **18**. In the particular escapement illustrated, the pallet arbor **13** has an oscillating movement which is small in angular extent, being sufficient only to intercept one tooth on the escape wheel as another is released. As the flat end of an escapement tooth passes the pallet stone **14**, the pallet is given an impulse which is in the direction of the pallet arbor. In all clocks and watches having an escapement, the escapement wheel and the pallet cooperate to give a corresponding impulse to the pallet. This mechanism, no matter how well designed, causes variations in the movement of the escape wheel which, while in themselves of no great magnitude, are cumulative in their effect upon the train of the movement. In order to minimize the irregularities mentioned,

the invention contemplates steadying the oscillations of the pallet and its arbor. This is accomplished by having a spring in light frictional engagement with the arbor of the pallet, the spring thereby acting as a damper or steadying device for the pallet arbor movements. The spring 21, shown in Figs. 1 and 2, is a flat spring which may be no heavier than the hair spring of the particular movement, although the tension on the spring is more important than the cross sectional area of the spring. One end of the spring is secured to a bracket 22 which is secured to any convenient stationary part 23 of the movement. This support for the spring will vary according to the construction of the movement or rather the location of the frame or support to which the spring is attached.

The arbor 13 shown in Figs. 1 and 2 is enlarged or has sleeves holding the pallet in place, and if the spring were simply to engage the exterior of the enlarged part, the angular movement of the arbor would give a leverage against the spring which might, to some extent, offset the advantages of the invention. In such cases it is preferred to reduce the diameter of one of the sleeves or the enlarged part of the pallet arbor so as to provide what is for convenience referred to as a knife edge 24 parallel to and, preferably, close to the axis of rotation of the pallet arbor. The height of the knife edge should be a little greater than the radius of the arbor, that is, the axis of the arbor should pass through the knife edge somewhere near the apex or angle of the knife edge. The exact height of the knife edge is not important, so long as the leverage against the spring is reduced to the degree necessary. The free end of the spring 21 may rest directly upon the apex or angle of the knife edge as the angular movement of the edge is of small magnitude, but it is preferred to secure to the free end of the spring 21 a piece of anti-friction material 25 for contact with the knife edge. Any suitable material may be used, although the material used for the pallet stones 14 and 15 is suitable for the purpose. The mounting of the spring 21 on its stationary support is such as to hold the spring under tension and apply that tension to the pallet arbor. This serves to cushion the movements of the pallet and steady the pallet arbor in its bearings so that uncontrolled and disadvantageous movements of the pallet and escape wheel are greatly reduced.

In constructions where the pallet arbor is simply a spindle the free end of the spring may rest directly against the periphery of the spindle 26 as shown in Fig. 6 or the spring may carry a piece of anti-friction material 25 in contact with the spindle as shown in Fig. 5.

In describing the construction illustrated in Figs. 1 to 4 inclusive, the term "knife edge" has been used but it is, of course, obvious that instead of a sharply defined edge a rounded surface generated on a short radius from the axis of the arbor may readily be employed. In fact, the constructions illustrated in the drawing are more or less diagrammatic for the purpose of illustration and explanation of the invention. For example, one simple modification might be the use of a round wire spring of suitable tension in place of the flat spring 21*a* illustrated in Fig. 5 or 21*b* illustrated in Fig. 6. The particular form and construction of the spring is not essential, it being necessary merely for the spring to apply a reliable and uniform light damping pressure to the pallet arbor.

The invention is capable of various other changes in the construction, shape and relation of parts according to the environment in which it is placed, and it is not the desire to be limited to any specific construction, except to the extent indicated in the claims which follow.

What is claimed is:

1. A watch or clock movement comprising an escape wheel, a pallet and pallet arbor, said arbor having a portion of reduced diameter for cooperation with a spring for steadying the movements of the arbor and pallet, a spring for the purpose stated, and mounting means for the spring constructed in such manner as to hold the spring at a right angle to the length of the arbor and under constant tension against the reduced portion of the arbor.

2. A watch or clock movement comprising an escape wheel, a pallet and pallet arbor, said arbor having a portion of reduced diameter for cooperation with a spring for steadying the operating movements of the arbor, a spring for the purpose stated having an anti-friction surface engaging said portion of reduced diameter, and mounting means for the spring constructed in such manner as to hold the spring under constant tension with said anti-friction surface engaged against the reduced portion of the arbor.

3. A clock or watch movement having an escape wheel, a pallet cooperating with the escape wheel and a pallet arbor, said arbor having a portion of its length constructed to provide a knife edge parallel to the longitudinal axis of the arbor, a spring engaging the knife edge, and means for holding the spring under tension against the knife edge.

4. A clock or watch movement having an escape wheel and a pallet cooperating with the escape wheel, an arbor for the pallet, said arbor having a portion of its length constructed to provide a knife edge parallel to the longitudinal axis of the arbor, a spring carrying an anti-friction member and supporting means for the spring constructed to hold the spring under tension with the anti-friction member in engagement with the knife edge.

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