

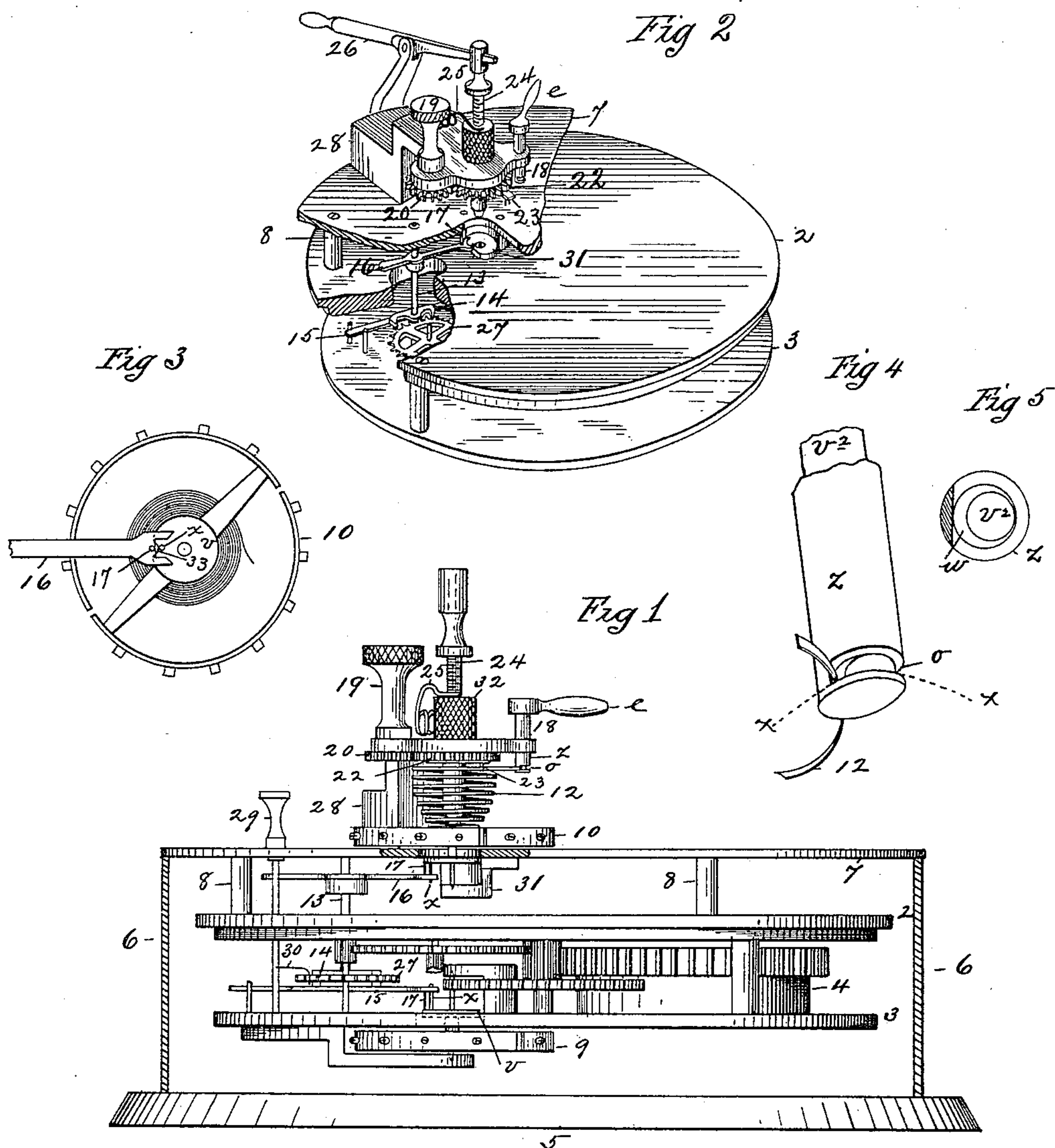
(No Model.)

A. L. KELLER.

HAIR SPRING ADJUSTER.

No. 362,750.

Patented May 10, 1887.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

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## HAIR-SPRING ADJUSTER.

SPECIFICATION forming part of Letters Patent No. 362,750, dated May 10, 1887.

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*To all whom it may concern:*

Be it known that I, A. LINCOLN KELLER, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Hair-Spring Adjusters, of which the following is a specification.

This invention relates to the manufacture of watches; and it pertains particularly to an improved standard hair-spring adjuster to be employed for the purpose of so adjusting the hair-spring of each watch-balance before the latter is placed in a watch-movement that said balance will, when placed in a watch, without further adjustment, move with proper beat and time corresponding to the standard-balance to whose movements it has been previously adjusted; and the invention consists in the peculiar construction and arrangement of said hair-spring-adjusting devices, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of so much of a watch-movement as is required to operate the balance thereof, having applied thereto my improved hair-spring-adjusting devices, said figure showing a watch-balance and a hair-spring attached thereto in the position which they occupy when the hair-spring is being adjusted. Fig. 2 is a perspective view of the adjusting devices proper connected to the plates on which they are supported, portions of the latter being broken away to more clearly show said devices. Fig. 3 is a plan view of the under side of a watch-balance and one end of the vibrating arm of the adjuster. Fig. 4 is an enlarged perspective view of the hair-spring clamp, (the upper end thereof being shown broken off,) a piece of a hair-spring being shown connected thereto. Fig. 5 is a transverse section of the lower end of said clamp on line *x x*, Fig. 4.

In the drawings, 2 is the upper and 3 the lower plate, between which the balance-moving train of the adjuster is placed. The said train consists of an ordinary mainspring-drum, 4, containing a suitable mainspring, and having the usual geared connection, as shown in Fig. 1, with the arbor of the escapement-wheel 27.

The above-referred to geared train, together with the pallet 14 and its arbor 13, having connected therewith the standard-balance 9, are substantially the same as are found in ordinary watch-movements, with the exception that the said pallet-arbor 13 projects above or through an opening in the plate 2, and one end thereof has a bearing in the top plate of the machine 7, and between said top plate and plate 2 there is fixed on said pallet-arbor 13 a lever, 16, having one end bifurcated, as shown in Figs. 2 and 3, and having fixed therein in a line perpendicular to its vibratory movements a guard-pin, 17, near the opening between its bifurcated parts.

15 is the pallet or pallet-hook lever, and is likewise fixed on said arbor 13, and one end thereof is of the usual bifurcated form and engages with a pin, *x*, on the disk *v*, which is fixed, in the usual manner and for the usual purpose, on the arbor of the standard-balance wheel 9, and hence the vibrations of the said two levers 15 and 16 on the pallet-arbor 13 correspond exactly and derive their movements from the standard-balance 9, which is adjusted to beat without variation.

A step-support, 31, is attached to the inner side of the top plate, 7, and extends under an opening through said plate, as shown in Figs. 1 and 2, said support having a step therein to receive one end of the arbor of a balance having a hair-spring on it which is to be adjusted, as hereinafter described. A block, 28, is secured on the upper side of said top plate, 7, having an overhanging arm, in which is supported a movable center stud, 24, whose lower end is in a line with the said step in the support 31. A stop-block, 32, is screwed onto said stud 24, and serves to adjust the latter so that when its point engages with the end of a balance-wheel arbor it comes to just the right position against the end of the latter. A spring, 25, attached to the block 28 by one end, has its opposite end bearing on the block 32, whereby the stud 24 has its point held against the end of a balance-wheel arbor, on which it is placed. Fig. 3 shows the balance-wheel 10 held in the above-described position between the step-support 31 and the point of the stud 24, in which position said balance-wheel is free to have the usual reciprocating rotary motion.



The said stud 24, when made as shown in Fig. 1, may be operated directly with the fingers to move it endwise for the purpose of adjusting it against the end of the balance-wheel arbor; but it is preferable to attach the lever 26 thereto, as shown in Fig. 2, said lever affording more convenience for delicately operating said stud.

A gear, 22, is attached to the under side of the said overhanging arm of the block 28, and has a rotary motion thereon concentric with the axis of the stud 24, and said gear has attached to its under side a projecting arm having therein two guide or regulating pins, 23. A stud, 19, capable of being rotated by the fingers, is properly hung in said overhanging arm on block 28, and projects through said arm, and has fixed on its lower end a pinion, 20, which engages with said gear 22, whereby the said arm, on which are the guide-pins 23, is given a circular swinging motion to bring said pins to a bearing at different points on one of the convolutions of the hair-spring 12 when the latter is in position in the adjuster as shown in Fig. 1.

To provide means for rigidly holding the end of the hair-spring 12 while it is being adjusted, as below described, the hair-spring vise 18 is provided. The said vise consists (see Figs. 4 and 5) of a hollow stud,  $z$ , fixed in said overhanging arm on block 28, as shown, having near its lower end a transverse slot,  $o$ . A plug,  $v^2$ , having a cam,  $w$ , near its lower end, capable of being swung against the inner side of the stud  $z$ , is placed in the latter, and has a handle,  $e$ , on its upper end, by which it is turned in said stud. To secure the end of the hair-spring 12 in said vise, the plug  $v^2$  is turned to leave a sufficient space between said cam  $w$  and the adjoining inner side of the hollow stud  $z$  in which to place the end of the hair-spring, as shown in Fig. 4, and then, by turning said plug to bring the said cam against the spring, the latter is secured to the vise. The said guard-pins 17, with which the levers 15 and 16 are provided, as aforesaid, occupy such positions on said levers that they have a movement within a crescent-shaped recess, 33, in the edge of the disk  $v$  on the balance-wheel, (see Fig. 3,) the purpose of said guard-pins being to detain the vibration of said levers in case the two balances 9 and 10 (the latter being the one whose hair-spring is being adjusted) do not beat in perfect unison. Furthermore, a balance and hair spring which is being adjusted on the machine whose beats or motions do not coincide with that of the standard-balance 9 will have its irregular beats indicated by the striking of the pin  $x$  against the arms of the bifurcated end of the lever 16.

The machine stands on a suitable base, 5, and is connected therewith by suitable supports, 6.

The manner of operating my improvements to adjust the hair-springs of watches to cause

the balances to which they are attached to beat coincidingly with a standard-balance, as aforesaid, is as follows: A balance, 10, is placed on the machine with one end of its arbor in said step in the support 31, and the stud 24 is lifted and dropped to bear on the opposite end of said arbor. The end of the hair-spring 12 is then drawn up, bringing the hair-spring to the position shown in Fig. 1, where it passes between the guide-pins 23, and its end is secured in the vise 18, as above described. While the said balance is being placed in the machine the said geared train, which actuates the standard-balance 9, is stopped by turning a stud, 29, to swing an arm, 30, thereon into engagement with the escapement-wheel 27. The said balance to be adjusted having been properly placed, as aforesaid, the stud 29 is turned to release the train, which at once takes up its ordinary movements, and causing the standard-balance 9 to beat as usual and impart coinciding movements to the balance 10, provided the proper beating of the latter be not interfered with for want of proper adjustment of the hair-spring 12. The indication that such adjustment is required consists in the irregular beating of the balance-wheel 10, whereby the pin  $x$  thereon is caused to strike parts of the lever 16, as aforesaid. At this point in the operation of adjusting, the stud 19 is rotated by the fingers to swing the guide-pins 23 to different positions on the convolution of the hair-spring which is engaged between them, and the proper position of said pins being found thereby, whereby the strength of said hair-spring—or, in other words, its tension—is brought to correspond with that on the standard-balance 9, the latter and the balance 10 commence to beat in unison, thereby showing that the hair-spring of the latter balance has been brought to such proper adjustment as will cause the balance to which it is attached to beat in proper time when put into a watch. Said adjustment having been determined, the hair-spring is bent at the point of its engagement with the guide-pins 23, and on being taken out of the machine it is cut off at that point and by the latter secured in the watch.

In adjusting hair-springs as above described, should the balance 10 be fast or slow, it will be due to an imperfect action of the hair-spring. If the balance be fast, it will beat quicker than the balance 9, and if slow it will beat reversely, and consequently the guard-pins 17 on the levers 15 and 16 prevent the balance-wheel 10 from making full vibrations or beats until the two balances are brought to coinciding action.

What I claim as my invention is—

1. A hair-spring adjuster consisting of a standard-balance wheel and hair-spring having a geared engagement with a driving-train through a pallet and escapement connection, substantially as described, combined with a step and a center stud to engage the ends of



the arbor of a balance-wheel, having a spring thereon to be adjusted, a lever, 16, fixed on the arbor of said pallet, having a bifurcated end and a guard-pin thereon to engage with said  
5 last-named balance, a vise holding the end of said spring, a gear, 22, having regulating-pins 23, engaging with the latter, attached thereto, and a stud, 19, capable of being rotated, having an engagement with said gear 22, substantially as set forth.  
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2. The combination, with the standard-balance 9 and its driving-train, substantially as described, of the extended pallet-arbor 13, having the lever 16 thereon, a hair-spring vise,  
15 18, a gear having an arm thereon carrying the

regulating-pins 23, the stud 19, having a pinion thereon engaging with said gear, and the movable center stud, 24, substantially as set forth.

3. The hair-spring vise 18, consisting of the 20 hollow stud  $z$ , having a transverse slot therein, and the plug  $v^2$ , capable of being rotated in said stud, having a cam,  $w$ , thereon to engage with the inner side of the latter, combined and operating substantially as set forth. 25

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