J. KINEHAN. 2 Sheets—Sheet 1.

Gage for Adjusting the Hair-Springs of Watch-Balances.

No. 200,732. Patented Feb. 26, 1878.

Fig. 1.

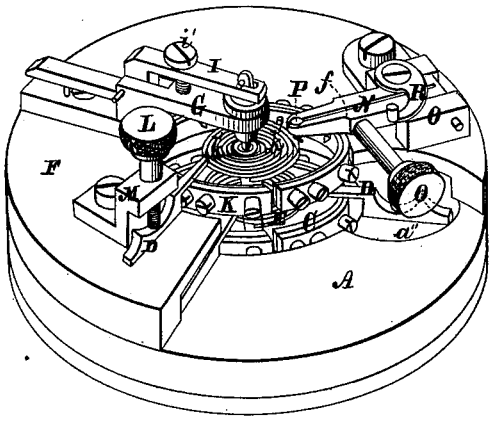
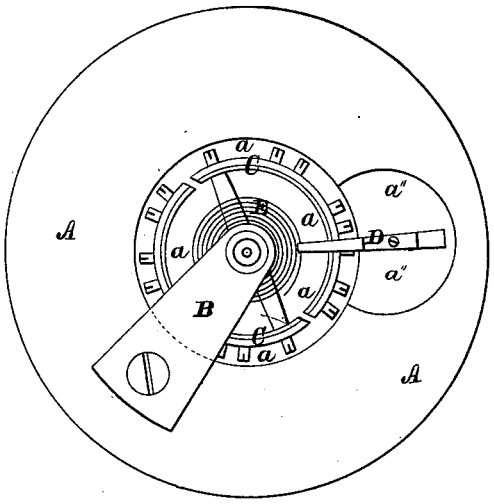


Fig. 2.



WITNESSES:
Jas. C. Hutchinson.
Henry C. Hazard.

INVENTOR.
James Kinehan, by
Prindle & Co, his Attys

2 Sheets—Sheet 2.

J. KINEHAN.

Gage for Adjusting the Hair-Springs of Watch-Balances.

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Fig. 3.

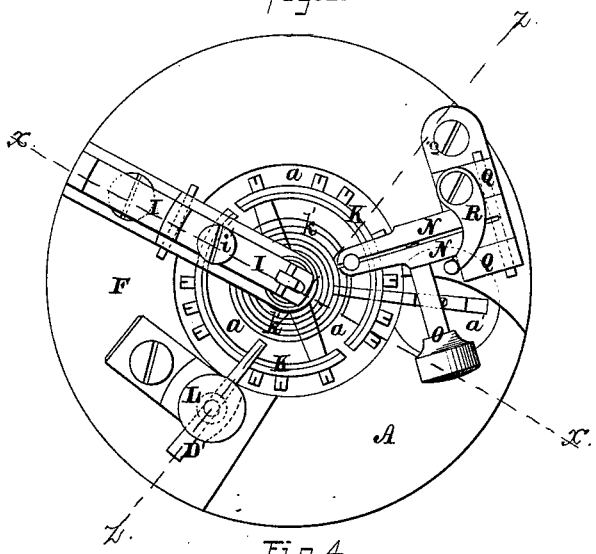


Fig. 4.

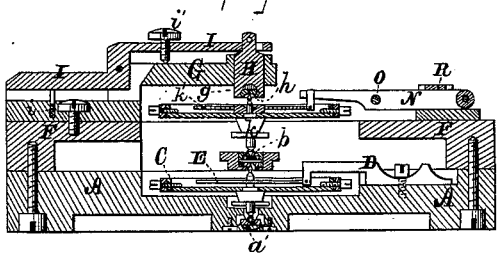
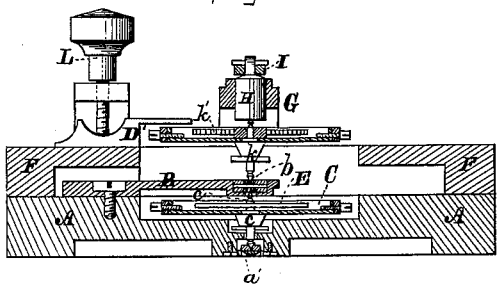


Fig. 5.



WITNESSES:

Jas. E. Hutchinson.

Henry C. Hazard.

INVENTOR.

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UNITED STATES PATENT OFFICE.

JAMES KINEHAN, OF SPRINGFIELD, ILLINOIS.

IMPROVEMENT IN GAGES FOR ADJUSTING THE HAIR-SPRINGS OF WATCH-BALANCES.

Specification forming part of Letters Patent No. **200,732**, dated February 26, 1878; application filed December 17, 1877.

To all whom it may concern:

Be it known that I, JAMES KINEHAN, of Springfield, in the county of Sangamon, and in the State of Illinois, have invented certain new and useful Improvements in Vibrators and Gages for Adjusting the Hair-Spring of a Watch-Balance; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—

Figure 1 is a perspective view of my device as arranged for use. Fig. 2 is a plan view of the lower portion of the same, which contains the permanent or gage balance. Fig. 3 is a like view of the upper portion of said device, containing the balance to be adjusted. Fig. 4 is a vertical section of the same upon line *x x* of Fig. 3, and Fig. 5 is a like view of said device upon line *z z* of said figure.

Letters of like name and kind refer to like parts in each of the figures.

In the adjustment of the balance of watches it has heretofore been necessary to place the same within the movement, and to determine the proper length of the hair-spring by the accuracy with which the movement kept time, the necessary tests required for such purpose being, in most instances, very tedious, and requiring a considerable amount of time.

To obviate such difficulty and enable the adjustment of the hair-spring to be easily and quickly made before the balance is placed within the movement is the design of my invention; which consists, principally, in a gage for timing the vibrations of a balance, which contains a permanently-pivoted gage-balance, and mechanism by which the balance to be adjusted can be pivoted directly over said gage-balance, and its hair-spring adjusted to and secured in position, so as to cause the former to vibrate uniformly with the latter, substantially as and for the purpose hereinafter specified.

It consists, further, in the means employed for securing in position different forms of hair-spring studs, substantially as is hereinafter set forth.

It consists, finally, in the device as a whole, its several parts being constructed and combined to operate in the manner and for the purpose substantially as hereinafter shown and described.

In the annexed drawing, A represents a plate, which is preferably circular in form, and at its center is provided with a circular recess, *a*, that is somewhat larger in diameter than the like dimensions of a watch-balance, and has such depth as to enable the latter to be contained therein. Within the lower side, at the center of the recess *a*, is provided a jeweled pivot-opening, *a'*, that is adapted to receive one of the pivots of a balance-staff, while upon the upper side of the plate A is secured a bridge-piece or cock, B, which extends over said recess *a*, and at a point coincident with said pivot-opening *a'* is provided with a similar jeweled opening, *b*. The bridge-piece B is removable, for the purpose of inserting a balance-wheel, C, within the recess *a*, after which said bridge-piece is replaced, and the pivots of the staff *c* of said balance are contained within the openings *a'* and *b*.

A hair-spring stud or holder, D, is secured within a recess, *a''*, at one side of the recess *a*, and projects inward sufficiently to enable it to receive the outer end of the hair-spring E of the balance C. The hair-spring E is carefully adjusted to length until the vibrations of the balance C are isochronal, after which said balance operates as a gage, to which other balances are adjusted as follows:

Secured to or upon the upper side of the plate A is a second plate, F, which, as seen in Fig. 1, corresponds to the external form and diameter of the former, and is provided with a central opening, *f*, that corresponds to and coincides with the recess *a* of said plate A, while within its lower side said plate F is recessed out, so as to afford room for the bridge-piece B and hair-spring stud D. One side of said plate F is cut away, as shown, in order that the balance C may be more easily seen, and for other reasons hereinafter given.

Secured upon the upper side of the plate F is a bridge-piece, G, which extends inward over the center of the recess *a*, and at its inner end is provided with a round vertical opening, *g*, that receives and contains a correspondingly-shaped block, H, which projects above and below said bridge-piece, and within its lower end is provided with a jeweled pivot-opening, *h*.

To the upper side of the bridge G is pivoted a lever, I, which corresponds to the general vertical shape of said bridge-piece, and is

pivoted to the same at or near the longitudinal center.

The inner end of the lever I is loosely connected to or with the upper end of the block H, so that by depressing or raising the outer end of said lever its inner end and said block will be correspondingly depressed or elevated. A spring, *i*, placed beneath the outer end of said lever, causes its inner end to incline downward, while a set-screw, *i'*, passing downward through said lever, between said inner end and its pivotal bearing, bears against the bridge-piece G, and limits the downward movement of said end.

The pivot-opening *b* of the bridge-piece B is made double, so that the pivot of a balance-staff may rest within its upper side, such arrangement enabling a second balance, K, to be placed within the gage, the pivots of its staff *k* being contained within said opening *b* and the pivot-opening *h* of the block H.

The balance K is placed in or removed from position through the space afforded by cutting away the side of the plate F, while its pivots are admitted to their bearings by depressing the outer end of the lever I until sufficient space is left between the lower end of the block H and the bridge-piece B.

After the staff *k* is in place, the lever I is permitted to resume its normal position, and the set-screw *i'* is adjusted so as to move the block H toward or from the bridge-piece B, and give to said staff the desired end motion.

If the balances to be timed have the same form of hair-spring stud as that employed for holding the hair-spring of the permanent balance, said stud D' is secured in position upon the upper side of the plate F by means of a screw, L, which passes downward through a lug, M, that is attached to or upon said plate; but if the pin form of stud is employed, the following-described means are used for holding such stud:

A steel bar, N, having the form shown in Fig. 3, is slitted from one end nearly to its opposite end, and its divided portion is drawn together by means of a screw, O, that passes through one section, and has its threaded end contained within a threaded opening in the opposite section, the arrangement being such as to cause the parts of the slitted end of said bar to be drawn together whenever said screw is turned inward, and to be permitted to separate as said screw is turned outward.

Near the slitted end of the bar N each of its parts is provided, within its inner face, with a half-round recess, which, in connection with the similar recess in the opposite part, receives the pin, hair-spring stud P, which stud is securely clamped in place by turning inward upon the screw O.

The bar N is secured upon the upper face of the plate F, and projects inward sufficiently to cause the hair-spring stud P to occupy the desired position; but for convenience in inserting or removing the balance K, said bar rests within a grooved block, Q, and is pivoted at its rear end, so as to enable it to be turned upward and outward.

When turned inward and downward to position, the bar N is locked in place by means of a lever, R, which is pivoted at one end to or upon the upper side of the block *n*, in such position as to enable it to be turned horizontally over or away from said bar.

The device is now complete, and is used as follows: The balance to be timed is placed in position, and its hair-spring stud secured by one of the means shown, after which the gage is turned suddenly in the hand, so as to cause both balances to vibrate in the same direction, and the differences of vibration noted.

The hair-spring *k'* of the balance K is now let out or taken up, as may be required, and its end again pinned within its stud P, after which the balances are again caused to vibrate as before, the operations named being continued until said balances will vibrate in unison, when said balance K, with its hair-spring and hair-spring stud, may be removed and placed in the movement to which it belongs, the adjustment of its said hair-spring being perfect.

This gage will effect an important saving in the time required for adjusting watches, and will enable greater accuracy to be attained than would otherwise be practicable.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. A gage for timing the vibrations of a balance, which contains a permanently-pivoted gage-balance, and mechanism for pivoting directly over the same the balance to be adjusted, and for securing in position the hair-spring stud of the latter, substantially as and for the purpose specified.

2. In combination with the bridge-piece B, secured upon the plate A and provided with the pivot-opening *b*, the bridge-piece G, pivot-block H, pivoted lever I, spring *i*, and set-screw *i'*, substantially as and for the purpose shown.

3. The hereinbefore-described device, in which the plates A and F, bridge-pieces B and G, balance-wheel C, staff *c*, hair-spring stud D, hair-spring E, pivot-block H, lever I, spring *i*, set-screw *i'*, screw L, lug M, slitted bar N, screw O, grooved block Q, and locking-lever R are constructed and combined in the manner and for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of December, 1877.

JAMES KINEHAN.

Witnesses:
CHARLES E. WHEELER,
THEOF. WILLIAMS.