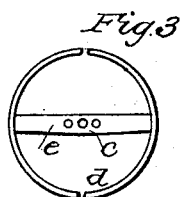
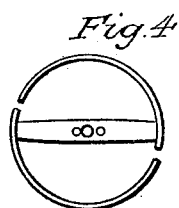
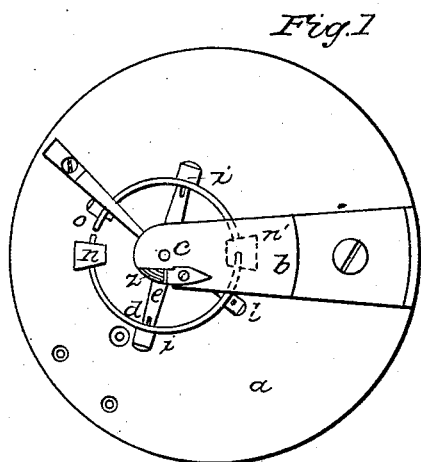
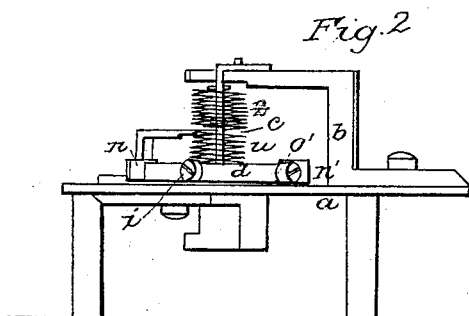


BLISS & CREIGHTON.

Chronometer.

No. 4,135.

Patented Aug. 4, 1845.



Witnesses
N. Bliss
M. Serrell

Inventor
John Bliss
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UNITED STATES PATENT OFFICE.

JOHN BLISS AND FREDERICK CREIGHTON, OF NEW YORK, N. Y.

IMPROVEMENT IN THE COMPENSATION-BALANCE OF TIME-KEEPERS.

Specification forming part of Letters Patent No. 4,135, dated August 4, 1845.

To all whom it may concern:

Be it known that we, JOHN BLISS and FREDERICK CREIGHTON, of the city, county, and State of New York, watch and chronometer makers, have invented and made and applied to use certain new and useful improvements in the mode of fitting what are technically known as the "compensation-balances" of watches, chronometers, and other time-keepers, our said improvements being first intended to obtain a more fractional and equal expansion or other change in the balance itself, and, second, to apply more effective means for regulating the vibrations of the balance when in use; and we do hereby declare that the said improvements and the means we employ to effect the said objects are fully and substantially set forth and shown in the following description and in the drawings annexed to and making part of this specification, wherein—

Figure 1 is a plan, and Fig. 2 an elevation, of a balance fitted with our improvements as in place for use. Fig. 3 is a plan of the balance without the weights and adjusting-screws, shown as we use. Fig. 4 is a plan representing a balance made as heretofore, and, except in this last figure, (4,) the same marks of reference apply to the like in the several figures.

a is the potance-plate, *b* the cock, *c* the balance-staff, of a watch or chronometer, all made to carry the balance, as usual. The balance *d* itself is made of two laminae of different metals, mounted on the staff by the cross-arm *e* in the mode now usually adopted; but the rim of the balance *d* is made with the arm *e* so placed relatively with the divisions in the rim that the spaces between the centers of the arm *e*, from the junction with the rim to the extremities formed by each division in the rim, is as near as possible an arc forming a quarter of a circle, instead of being, as heretofore, made nearly or quite an entire half-circle, as shown in Fig. 4, which figure is introduced to show that, while any expansion, contraction, or vibration of the rim in this form will be represented by and act through nearly a semicircle and all in one direction, the same amount of causes operating on the balance made as shown in Figs. 1 and 3 will only be represented by and act through two distinct quarters of a circle in two opposite directions from each end of the arm *e*, thus operating to lessen the effect by about one-

half of any disturbing causes, and effecting a more permanent equality in the performance of the chronometer itself, and these results are equally certain whether the disturbing causes arise from inequalities in the junction or material of the two metals forming the balance, or from any atmospheric changes, or from all these causes combined, and the balance will be less susceptible to injury from extraneous causes.

In Fig. 1 the balance-rim *d* is shown in place, with regulating-screws *i i'* against each end of the arm *e*, and a balance-weight, *n n'*, in a radial line on the extremities of two quarter-segments; but the parts at which the divisions are made in the rim *d* allow of two adjusting-screws, *o o'*, on the extremities opposite to those that have a weight, thus giving additional means of equalizing the motions and of increasing the stability of the balance.

In Fig. 2 the balance is shown as fitted with a second spring, *z*, above the spring *u*, usually employed, each being fitted in the usual manner; but these may be placed either one above and one below the rim *d*, or may be made of different diameters, so as to act one within the other at the same height on the balance-staff, our intent in these arrangements being to obtain a means by which we may effect the averaging any constructive or physical inequalities in the two springs, and thus insure a more equal rate of going in any instrument to which this construction is applied.

We have described our improvements as acting in four quarter-arcs from two arms, believing that a greater number—such, for instance, as three arms and six segments—may be used, but not with so good effects as in this arrangement, and the like remarks apply to using more than two springs.

We do not claim to have invented any of the parts herein described, as all are already in use and well known; neither in our arrangements, as above described, do we claim to have obtained any results not contemplated or sought for by others, our claims being only for obtaining an increase of equality in the performance of watches, chronometers, and other time-pieces.

We claim—

1. The mode we have described and shown of forming the balance-rim *d* with quarter-circles, arcs, or segments each way from each end

of the arm *c*, instead of a half-circle from each end in opposite directions.

2. The application of a second balance-spring, *z*, above, below, or inside the single balance-spring *u*, heretofore in use, substantially as the same are described and shown.

In witness whereof we have hereunto set our

hands, in the city of New York, this 26th day of May, 1845.

JOHN BLISS.

[L. S.]

FREDK. CREIGHTON.

[L. S.]

Witnesses:

N. BLISS,

W. SERRELL.