

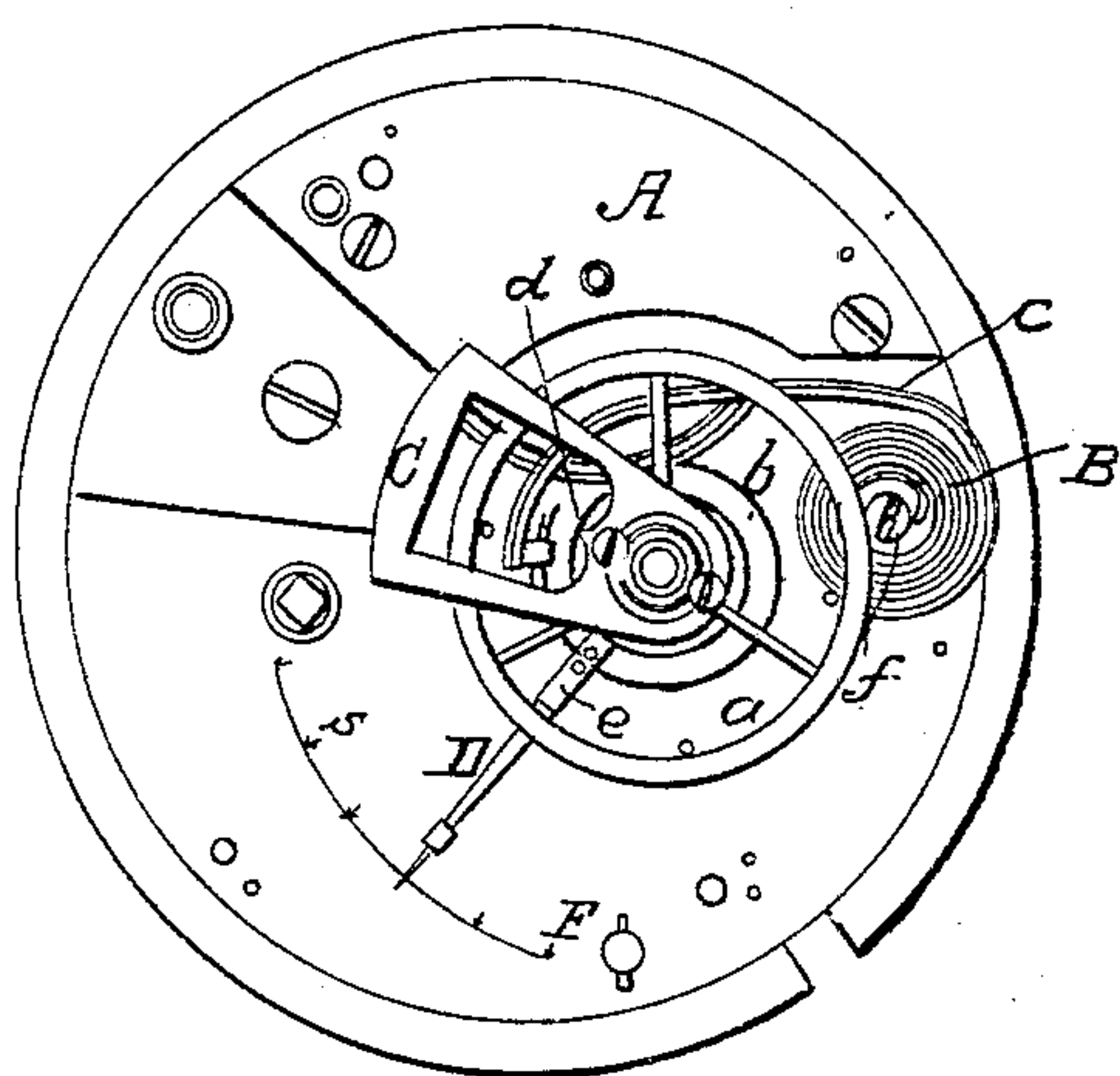
H. B. JAMES.

Watch.

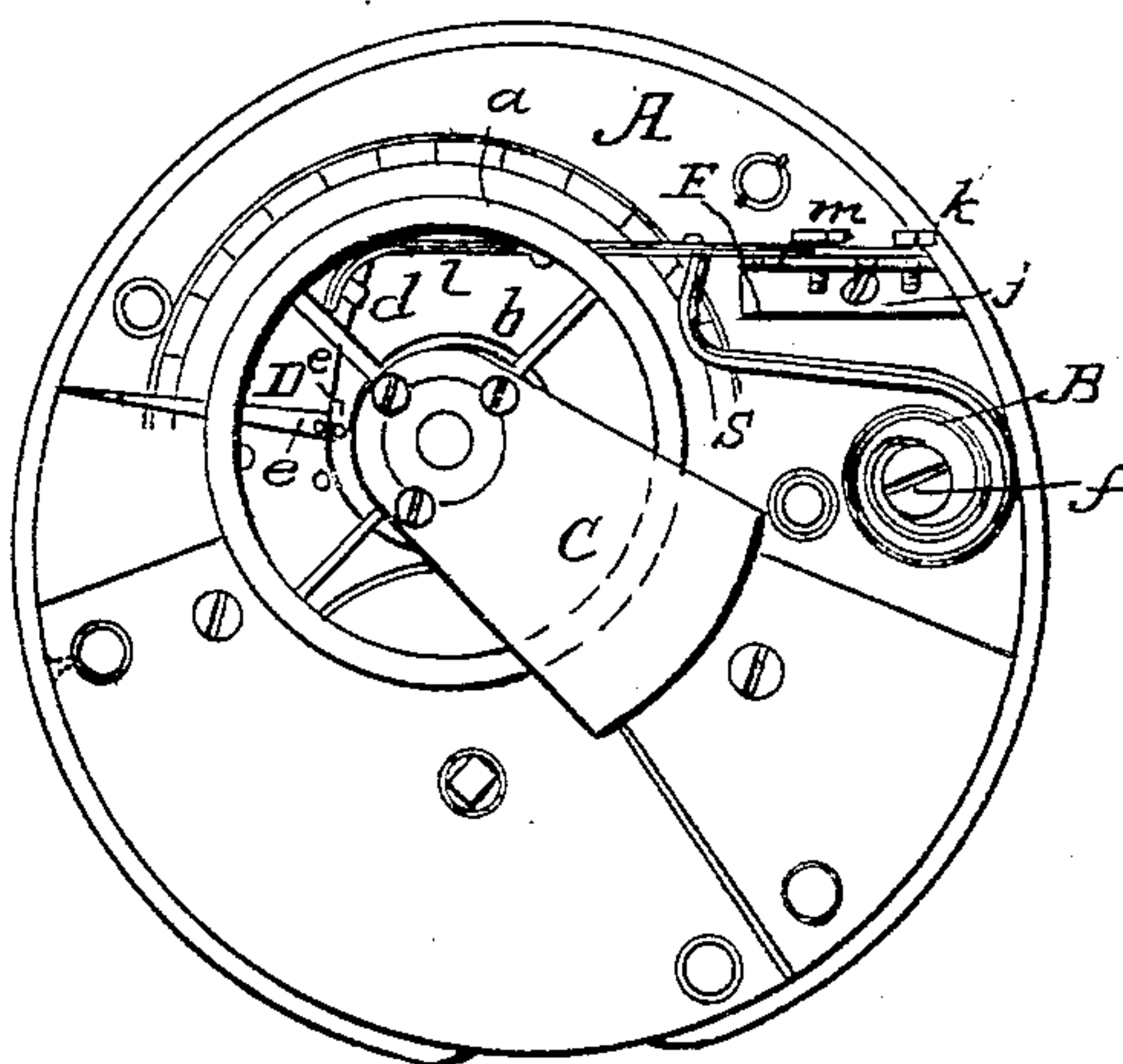
No. 26,593.

Patented Dec. 27, 1859.

*Fig. 1.*



*Fig. 2.*



witnesses:

*Samuel C. Parrott*  
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Inventor:

*Henry B. James*

# UNITED STATES PATENT OFFICE.

HENRY B. JAMES, OF TRENTON, NEW JERSEY.

## WATCH.

Specification of Letters Patent No. 26,593, dated December 27, 1859.

*To all whom it may concern:*

Be it known that I, HENRY BOEHM JAMES, of Trenton, in the county of Mercer and State of New Jersey, have invented a new and Improved Mode of Obtaining Compensation for the Effects of Changes of Temperature in Watches or other Timekeepers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention consists in controlling the active length of the pendulous spring or as it is generally termed the "hair-spring" of a watch or other time-keeper governed by a balance, by means of combined laminae of brass and steel or other metals which expand and contract differently with the same changes of temperature, so applied to that end of the said spring which has heretofore been fixed, as by their expansion and contraction to cause the said spring to be taken up through the curb pins, as it expands with an increased temperature, and to be let out as it contracts with a reduction of temperature.

The invention is capable of being applied in a variety of ways, but I propose generally to coil the combined laminae of metal into a convolute spiral form, and to attach the inner end of the coil firmly to one of the plates which hold the movement, and either to attach the end of the hair-spring to the other end of the coil, or to a bar or lever against which that end of the coil acts, in such a manner as to cause the said bar or lever to move with the expansion and contraction of the coil produced by changes of temperature, and so take up or let out the hair-spring.

Figure 1 in the accompanying drawing, represents the first mentioned mode of applying my invention; and Fig. 2 the other mode.

Similar letters of reference indicate corresponding parts in both figures.

A, represents the potence plate; *a*, the balance; C, the cock which receives the outer pivot of the staff of the balance; and *b*, the hair-spring. The inner end of the coil of the hair-spring in both of these examples of my invention is connected with the staff of the balance in the usual manner, but the outer end or as it is generally termed the "spare" end, instead of being secured in

the usual manner to a fixed stud secured in the potence plate, is represented in Fig. 1 as being attached securely to a stud *d*, carried by the arm *c*, which is formed by the extension of the outer extremity of what I term the "compensating coil" B.

D, is the regulator applied and furnished with curb pins *e*, *e*, to receive the outer coil of the hair-spring in the usual manner.

The compensating coil B, and its arm *c*, are made of a strip of brass and a strip of steel united by soldering, brazing or other means, the steel being on the outside of the coil as shown in the drawing by the tinting of the steel blue and the brass yellow. The inner extremity of the coil is firmly secured by a screw *f*, to a stud that is secured in the potence plate A, but the outer extremity and its arm *c*, are left perfectly free. The effect of an increase of temperature is to expand or open the coil and raise the arm *c*, in an upward direction from the position represented in Fig. 1, and also to produce a flexure of the arm *c*, in a similar direction, and so to draw the hair-spring up through the curb pins *e*, *e*, and reduce its active length, and thus to compensate for the expansion of the spring and balance, and the effect of a reduction of temperature is precisely the reverse.

The mode of applying the invention represented in Fig. 2 differs from that represented in Fig. 1, in having the outer or spare end of the coil attached by the stud *a*, to one end of a bar *l*, whose other end is secured by a screw *k*, to a small plate F, that is secured by a screw *j*, to the potence plate A, and in having a compensating coil B', applied so that its outer extremity presses against the bar *l*. This compensating coil is like that represented in Fig. 1, except that its outer extremity is not continued to so great a length in the form of an arm. The inner extremity of the said coil is secured firmly by a screw *f*, to a stud in the plate F. The said bar *l*, must be made sufficiently elastic to keep bearing upon the compensating coil, notwithstanding the expansion and contraction of the latter. The effect of the expansion of the compensating coil is to move the bar *l*, upward from the position shown in Fig. 2, and make it take up the hair-spring through the curb pins *e*, *e*, and the contraction of the said coil permits the bar *l*, to spring in the opposite direction to let out the hair-spring.



It is desirable to have some means of regulating the degree of compensation. In the example of my invention represented in Fig. 2, I have shown a screw *m*, applied for this purpose, said screw being screwed into one of a number of tapped holes *n, n*, in the edge of the plate *f*, and its head pressing upon the said bar to confine it to the plate *F*, at a greater or less distance from the screw *k*, according to which of the holes *n, n*, the screw is placed in. The degree of compensation is greater the nearer the screw *m*, is applied to the screw *k*, or the farther from the stud *d*. The bar *l*, may be made of one kind of metal, in which case its action is merely that of a lever or it may be made of two kinds of metal, as represented, and in the latter case the flexure of the said bar produced by changes of temperature aids the coil in effecting compensation for the expansion of the spring and balance. I have not represented any mode of regulating the degree of compensation in the example of my invention represented in Fig. 1, but such regulation may be effected by a set screw so applied as to fix or secure the coil *B*, at a greater or less distance from its center.

There are many other forms in which the compensator may be constructed, as, for instance, the compound bar *l*, represented in Fig. 2, may be used without the coil *B*, though it would in that case be necessary to use a very short and hard hair-spring. This objection may be in some degree obviated by making the said bar of a reflexed

form. Experiment seems to show that it is desirable to have the combined laminæ of steel and brass equal to about half the length of the hair-spring, except when levers are employed to multiply their effect.

Instead of the combined laminæ of brass and steel, combined laminæ of other metals, as silver and platinum, which expand and contract differently with variations of temperature, may be employed in any of the forms herein described.

I do not claim the use of curbs composed of combined laminæ of different metals to move the curb pins along, or in relation to the hair-spring when one end of the latter is fixed, as I am aware that contrivances of such character have been used. But

What I claim as my invention, and desire to secure by Letters Patent, is:—

Controlling the active length of the pendulous or hair-spring of a watch, or other time-keeper governed by a balance by means of combined laminæ of different metals, so applied to act upon the end of the spring which has been commonly fixed, that by an increase or diminution of temperature the said spring is caused to be taken up or let out through the curb pins, or their equivalent, and so to compensate for the expansion and contraction of the said spring and the balance, substantially as herein described.

HENRY BOEHM JAMES.

Witnesses:

SAMUEL C. PARROTT,  
WM. C. HOWELL.