

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 laminæ 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 laminæ 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.