

G. P. REED.

Watch Balance Spring.

No. 30,247.

Patented Oct. 2, 1860.

Fig. 1.

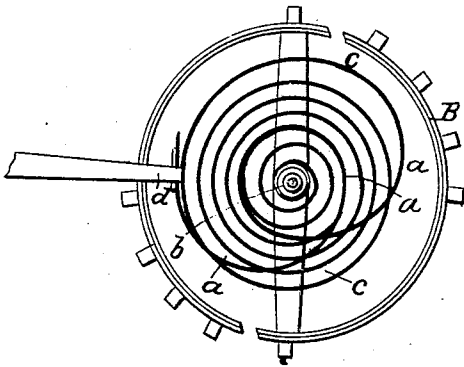


Fig. 3.

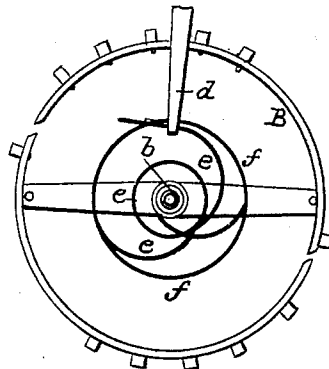


Fig. 2.

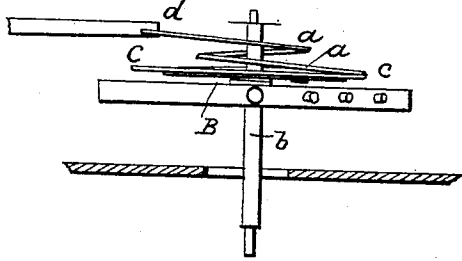
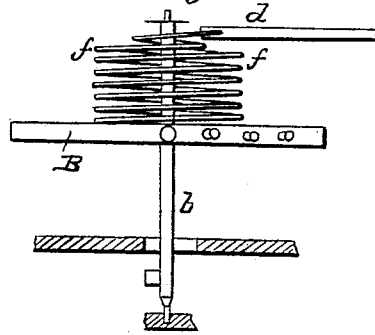


Fig. 4.



Witnesses:

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# UNITED STATES PATENT OFFICE.

GEORGE P. REED, OF ROXBURY, MASSACHUSETTS.

## WATCH.

Specification of Letters Patent No. 30,247, dated October 2, 1860.

*To all whom it may concern:*

Be it known that I, GEORGE P. REED, of Roxbury, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in the Balance-Springs of Watches and 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 drawing, forming part of this specification, in which—

Figure 1, is a plan view of a balance and a flat spiral balance spring with my improvement. Fig. 2, is a side view of the same. Fig. 3, is a plan of a balance and a cylindrical spiral spring with my improvement. Fig. 4, is a side view corresponding with Fig. 3.

Similar letters of reference indicate corresponding parts in the several figures.

The object of my invention is to provide in a better manner than has heretofore been done for the adjustment of the balance spring to obtain for it the isochronal condition or property upon which the correct performance of a watch or chronometer is so much dependent. The isochronism of the balance spring is that condition or property which causes all the vibrations of the balance whether they be long or short to be produced in the same length of time. This property of the spring is usually obtained by making the spring of some particular length, which cannot be known at first, but is found upon repeated trials of different lengths with every spring, which mode of operation is extremely tedious, vexatious and uncertain. It is sometimes obtained by compressing or enlarging the several coils which compose the spring; but this method is objectionable inasmuch as it has a tendency to destroy the regularity and uniformity of the volume of the spring and to leave it in a cramped and unnatural form.

My invention consists in forming at that end of the balance spring which is secured to the fixed stud a coil making at least one full turn around the axis of the balance but not forming a regular continuation of the coil of the volume of the spring, as hereinafter described, by which construction I make the spring present a definite adjustable portion where alterations may be made

to obtain the isochronal condition without altering its length or disturbing the regularity of the main volume of the spring.

The manner in which I apply my invention in the common flat spiral spring, is by continuing the outer coil *e, e*, of the regular spiral formation in the form of a coil *a, a*, Figs. 1, and 2, above or outside of the plane of the regular spiral formation. This upper coil *a, a*, I generally make of a sufficient length to form about one and a half turns around the axle *b*, of the balance B, using the half-turn next the fixed stud *d*, to which the spring is attached for the purpose of regulating to time by a regulator applied in the usual manner, and thus having a complete turn of the upper coil *a, a*, for the purpose of adjusting to isochronism as will be presently described.

The manner in which I apply my invention to the cylindrical spiral spring is by continuing the upper coil of the regular spiral formation or that coil thereof which is next the fixed stud *d*, in the form of a coil *e, e*, of smaller diameter than the main volume *f, f*, of the spring. This upper coil *e, e*, should be long enough to form one complete turn around the axis of the balance over and above a sufficient portion next the stud *d*, for the application of the regulator, thus leaving as in the case of the flat spiral spring, one full turn of this smaller coil *e, e*, for the express purpose of adjusting it to isochronism.

The mode of adjustment to obtain the isochronal vibrations is by increasing or diminishing the diameter of the coil *a, a*, or *e, e*, the adjusting process being the same in the flat as in the cylindrical spring. Though practice shows by the result of a large number of experiments that isochronism may be obtained by the adjustment of the coil *a, a*, or *e, e*, it also seems to show that no definite rule can be laid down for such adjustment and I have found it necessary, in order to discover whether the coil requires to have its diameter increased or diminished first to submit the watch to a trial in the long and short arcs of vibration, and to note the difference in time if any there be. If, for instance it be found that the short arcs of vibration gain over the long ones at the rate of two seconds per hour it will be

proper to enlarge the coil a very little and then submit the watch to another trial, and if it be found the short arcs gain less upon the long ones, it is evident that the enlargement of the coil is producing an effect in the right direction, and it is only necessary to continue enlarging it till isochronism be obtained; but if on the other hand after the first enlargement, the short arcs gain on the long ones in a greater degree than before it is evident that the coil instead of requiring to be enlarged requires to be diminished to obtain isochronism. In this manner the long and short arcs of vibration may be made faster or slower with a much greater degree of facility than can be done in the

usual way with springs of ordinary construction.

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

The construction of a flat or cylindrical balance spring for a watch or other time-keeper with an adjusting coil *a, a*, or *e, e*, substantially as herein described making at least one full turn around the axis of the balance but not forming a regular continuation of the coil of the spring.

GEO. P. REED.

Witnesses:

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