

(No Model.)

J. LOGAN.

MAKING HAIR SPRINGS FOR WATCH BALANCES.

No. 443,256.

Patented Dec. 23, 1890.

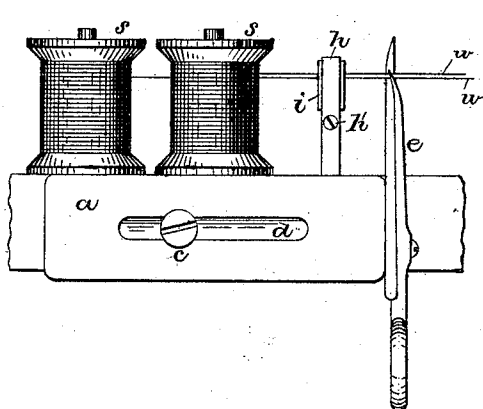


Fig. 1.

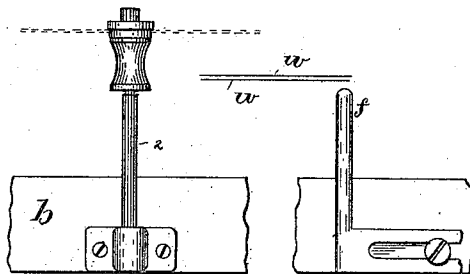


Fig. 2.

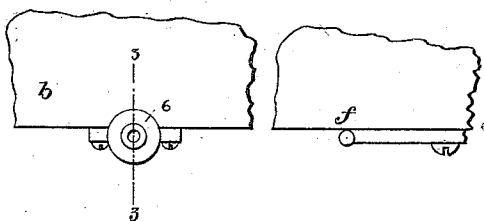
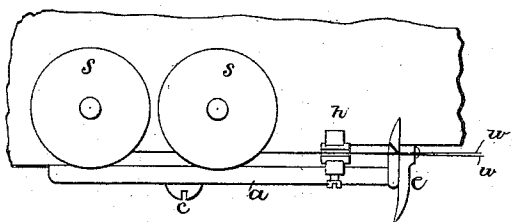


Fig. 4.

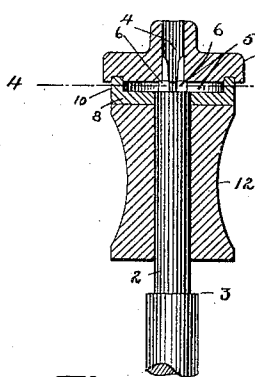


Fig. 5.

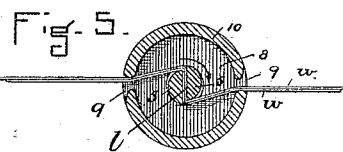


Fig. 6.

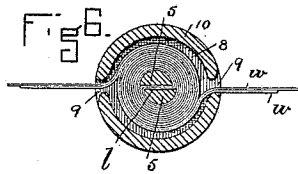


Fig. 7.

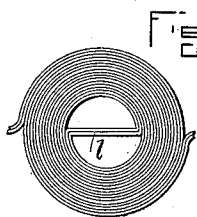


Fig. 8.

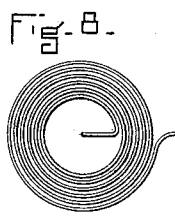


Fig. 9.

WITNESSES.

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MAKING HAIR-SPRINGS FOR WATCH-BALANCES.

SPECIFICATION forming part of Letters Patent No. 443,256, dated December 23, 1890.

Application filed October 9, 1890. Serial No. 367,524. (No model.)

To all whom it may concern:

Be it known that I, JOHN LOGAN, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in the Method of and Means for Making Hair-Springs for Watch-Balances, of which the following is a specification.

In the manufacture of hair-springs for watch-balances it is customary to wind or coil two or more separate pieces of wire upon a suitable former or mandrel, the pieces being closely wound into as many coils as there are pieces, the convolutions of each coil being separated by the convolutions of one or more of the other coils, so that when the coils are taken apart or separated the separation of the convolutions equal the thickness of the wire composing the convolutions of the other coil or coils. After the coils have been formed from soft wire they are hardened before they are separated, the usual hardening processes being employed to give the coils the required temper. Heretofore each coil has been made in a piece which is entirely separate and distinct from the pieces composing the other coils, so that both ends of each coil have been free and unconfined during the hardening operation. Owing to this freedom of the ends of the coils to move, they are liable to work out of place during the hardening operation, so that when the springs are separated they are found to have lost, to some extent, the perfection of form which is desirable.

My invention has for its object to enable hair-springs to be formed in such a manner that the inner ends will be confined or tied together during the entire operation of forming and hardening, so that there can be no distortion or loss of shape during any part of the operation.

To this end my invention consists, first, in an improved method of forming hair-springs, the same including the following steps, viz: taking a piece of wire of suitable length for two hair-springs and coiling two parts of said piece, beginning at the central portion thereof about a suitable former, thus forming two coils with alternating convolutions, the inner ends of said coils being connected by the central portion of the original piece of wire, said central portion constituting a ligature which

remains until after the hardening operation, and thus binds or ties the inner ends of the coils together, so that they cannot become distorted or misshapen.

The invention also consists in an improved method of making hair-springs, which includes the forming operation above described and the additional steps of hardening the coils while their inner ends are connected by the ligature, and then severing said ligature at its center and separating the coils, the severed parts of the ligature constituting the inwardly-projecting portions or tongues where- by the inner end of each spring is engaged with the hair-spring collet on the staff of the balance to which it is applied.

The invention also consists in certain appliances for carrying the methods above indicated into practice, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of the appliances which I prefer to employ in forming hair-springs by my improved method. Fig. 2 represents a top view of the same. Fig. 3 represents a section on line 3 3, Fig. 2. Figs. 4, 5, and 6 represent sections on line 4 4, Fig. 3, looking downwardly and showing different steps or stages in the operation of forming hair-springs. Fig. 7 represents a view of the connected hair-springs removed from the holding devices preparatory to the severing of the connecting-ligature and the separation of the springs from each other. Fig. 8 represents a view of one of the completed springs after the severing of the ligatures and the separation of the coils from each other.

The same letters and figures of reference indicate the same parts in all the figures.

In the drawings, 2 represents a preferably vertical spindle adapted to rotate in a fixed bearing attached to a bench *b* or other suitable support. Said spindle has in its upper end a slot 4, adapted to receive two pieces of flat wire *w w* when said pieces are placed side by side.

5 5 represent eccentric faces formed on the periphery of the spindle at opposite sides of the slot 4, said faces being technically known as "snails." These snails or formers are slightly offset one from another, as shown in

Figs. 4, 5, and 6, the edge of one projecting outwardly from the corresponding edge of the other by the thickness of the two pieces of wire, which are placed in the slot between the snails, so that when the spindle is rotated, as hereinafter described, to coil the pieces of wire upon the formers there will be no shoulders or projections to distort the wires.

8 represents a circular box, which has a circular hole adapted to receive the spindle 2 and is provided at its margin with a circular flange 10, in which are formed at diametrically opposite points two wire-guiding slots 9 9, through which the strips *w w* pass.

The central portions of the strips *w* are placed in the slots 4, the strips projecting in opposite directions from the spindle in two general divisions or parts of equal length. The spindle is then rotated in the direction indicated by the arrow in Fig. 4, and the box 8 is at the same time held stationary. Both of these operations may be performed by the fingers of the operator, who grasps and rotates the spindle by the fingers of one hand and holds the box 8 by the fingers of the other hand. This operation causes the gradual coiling of the strips upon the formers 5 5, as indicated by Figs. 4, 5, and 6, until each strip is converted into two complete coils, the inner ends of which are connected by a ligature 1, which is composed of the central portion of the original strip *w*.

After the described coiling or forming operation the coils may be hardened in the usual or any suitable manner to give the convolutions the desired elasticity and temper, the inner ends of the coils remaining connected by the ligature 1 during the operation of hardening, after which the ligature is severed at its center, and the now completed springs are separated. The portion of the ligature left at the inner end of each spring constitutes the inwardly-projecting finger *f*, which serves to connect the spring to the hair-spring collet. I have found that by thus tying together the inner ends of the coils before the hardening operation any change of shape of the coils during said operation is prevented, so that the springs retain the desired perfection of form after the hardening operation is completed.

When two strips *w w* are placed side by side in the manner above indicated and coiled simultaneously upon the snails or formers 5 5, four springs are formed by the coiling operation, each strip containing two springs. It is obvious, however, that one strip *w* may be used instead of two, in which case only two springs will be formed at a time. It is usual and preferable, however, to form two strips at once, because by so doing the convolutions of each spring have the desired separation or openness, which is greater than would be the case if only one strip were used.

In connection with the spindle 2 and box 8, I prefer to use several adjuncts for the convenience of operation. A sleeve 12 is placed

upon the spindle 2 under the box 8, said sleeve being movable vertically upon the spindle, and when not in use resting upon a shoulder 3, formed on the spindle, said shoulder being arranged so that when the sleeve rests upon it the box 8, when resting on the sleeve, will be sufficiently depressed below the lower end of the slot 4 to permit the convenient insertion of the wire strips *w w* into said slot.

13 represents a cap which rests upon the upper end of the spindle 2, said cap resting upon the shoulder 6, formed upon the spindle immediately over the snails or formers 5 5. The object of said cap is to furnish a stop to limit the upward movement of the box 8, the cap being held down by the operator's hand against the shoulder 6 and the box 8 pressed upwardly as far as the cap will permit during the described coiling operation.

The wire strips *w w* are preferably drawn from reels or spools *s s*, which are adapted to rotate on fixed spindles or supports attached to a bracket or holder *a*, which is secured to the bench *b* by means of a screw *c*, passing through a slot *d* in said bracket.

e represents a wire-cutting device between the spools *s s* and the spindle 2, said device being here shown as a pair of shears, one end of which is affixed to the end of the bracket *a*, while the other blade is movable, said blades being arranged to sever the strips *w w* between the spools and the spindle 2, and at such distance from the spindle that the portions of the wire between the cutting-blades and the spindle will be of the length required for one part or half of each strip *w*. In practice the operator draws off from the spools sufficient wire for the strip, the quantity being determined by a suitable mark or indicator *f* on the bench on the opposite side of the spindle 2 from the cutter *e*. After the wire is thus drawn off and inserted in the slot 4 in the spindle 2 it is then cut off and coiled, as above described.

h represents a brake or friction device through which the wire passes between the spools and the cutter *e*, said brake holding the wire with sufficient friction to prevent the ends from swaying or moving loosely after they are cut off. The brake here shown has a standard affixed to the bracket *a*, and having its upper portion split and provided with a compressing-screw *h'*, whereby the divisions of the standard may be pressed inwardly to exert pressure upon the wire. Cushions *i i*, of felt or other suitable soft material, are placed upon the inner sides of the divisions of the standard to prevent the scratching of the sides of the wire strips by the holding pressure exerted upon them.

I claim—

1. The improved method hereinbefore described of forming hair-springs, the same consisting in simultaneously coiling two parts of a piece of wire around a suitable snail or former, beginning at a ligature which constitutes the central portion of said piece, and

thereby converting the said parts into two coils which are integral with each other, their inner ends being connected by said ligature, as set forth.

5 2. The improved method hereinbefore described of making hair-springs, the same consisting in simultaneously coiling two parts of a piece of wire around a suitable snail or former, beginning at the central portion of
10 said piece, and thereby converting the said parts into two coils which are integral with each other, their inner ends being connected by a ligature consisting of a part of the original piece of wire, then hardening said coils
15 while their inner ends are thus connected, and finally severing the ligature and separating the completed springs from each other, as set forth.

3. As a means for forming hair-springs, the
20 combination of a rotary rod or spindle having a transverse slot formed to receive the wire from which the springs are made, and two snails or eccentric formers at opposite sides of said slot, and a circular box or holder
25 within which the spindle is adapted to rotate, said box having a flange surrounding the spindle and provided with slots arranged to guide the wire during the operation of coiling the same, as set forth.

30 4. The combination of a rod or spindle adapted to rotate in a fixed bearing and provided with a shoulder 3, a slot 4 in one end, snails or formers 5 5 at opposite sides of said slot, and a shoulder 6 above said snails, a box
35 8, formed to surround the spindle below the snails or formers and provided with a raised rim or flange 10, in which are wire-guiding slots 9 9, a sleeve 12, loosely mounted on the spindle and adapted to rest on the shoulder
40 3, said sleeve supporting the box and being

shorter than the distance between the said shoulder 3 and the snails or formers, so that when the sleeve rests on the shoulder 3 the box is depressed below the snails to permit the insertion of the wire into the slot 4 of the spindle, and a cap 13, adapted to be applied
45 to the spindle above the snails and to rest on the shoulder 6 as a stop to limit the upward movement of the box and sleeve, as set forth.

5. The combination of a rotary spindle having a wire-receiving slot and coil formers or snails at opposite sides of the slot, a box or guide adapted to be held stationary on said spindle while the latter is being rotated and
50 provided with wire-guiding slots in its periphery, one or more rotary spools or reels for coils of wire at one side of said spindle, and a wire-cutter located between the spools and the spindle, as set forth.

6. The combination of a rotary spindle having a wire receiving slot and coil formers or snails at opposite sides of the slot, a box or guide adapted to be held stationary on said spindle while the latter is being rotated and
60 provided with wire-guiding slots in its periphery, one or more rotary spools or reels for coils of wire at one side of said spindle, a wire-cutter located between the spools and the spindle, and a brake or friction device arranged to control the wire between the spools
65 and the cutter, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of October, A. D. 1890.

JOHN LOGAN.

Witnesses:

C. F. BROWN,
A. D. HARRISON.