April 1, 1941. W. HOFFSOMMER 2,236,907

HAIRSPRING BENDING APPARATUS

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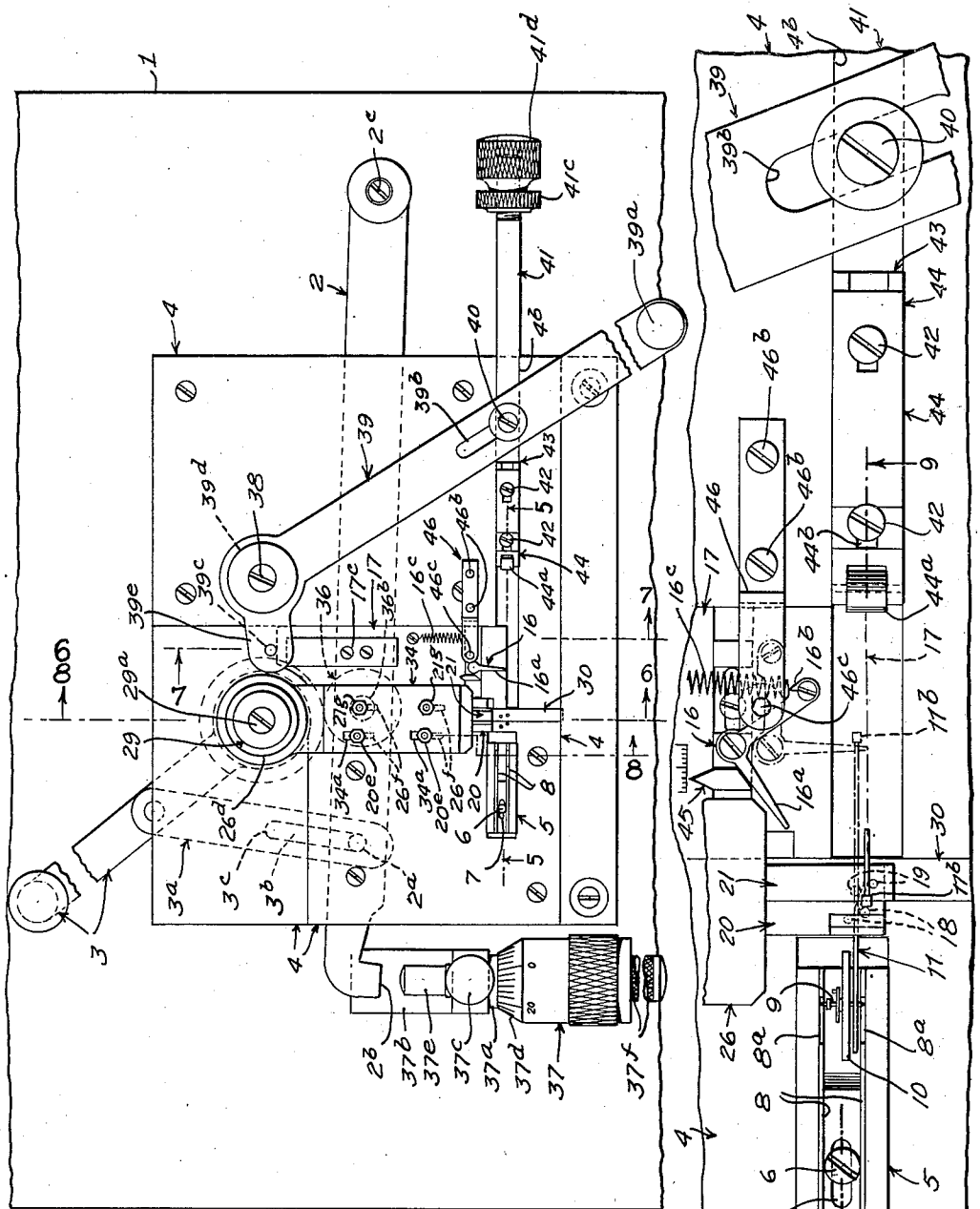


Fig. 1.

Fig. 2

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Fig. 3.

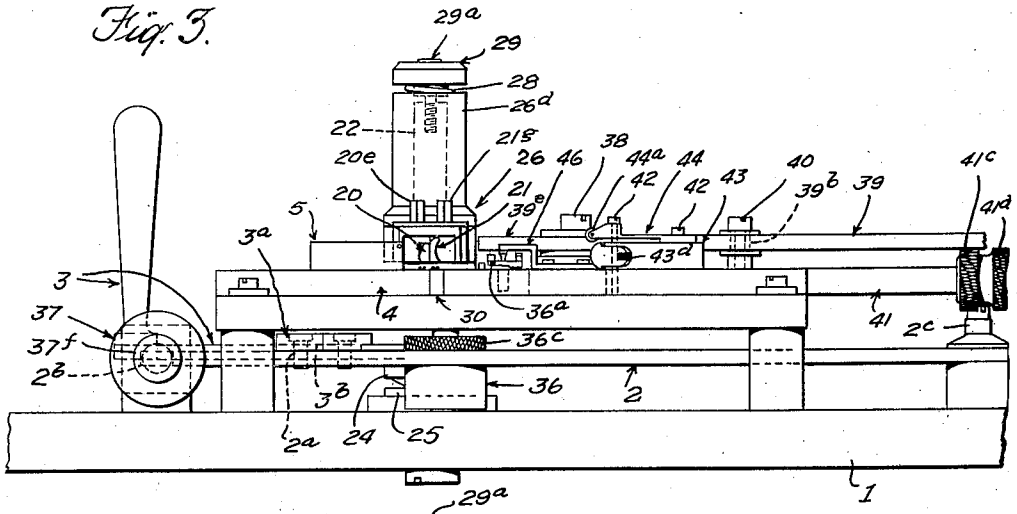


Fig. 4.

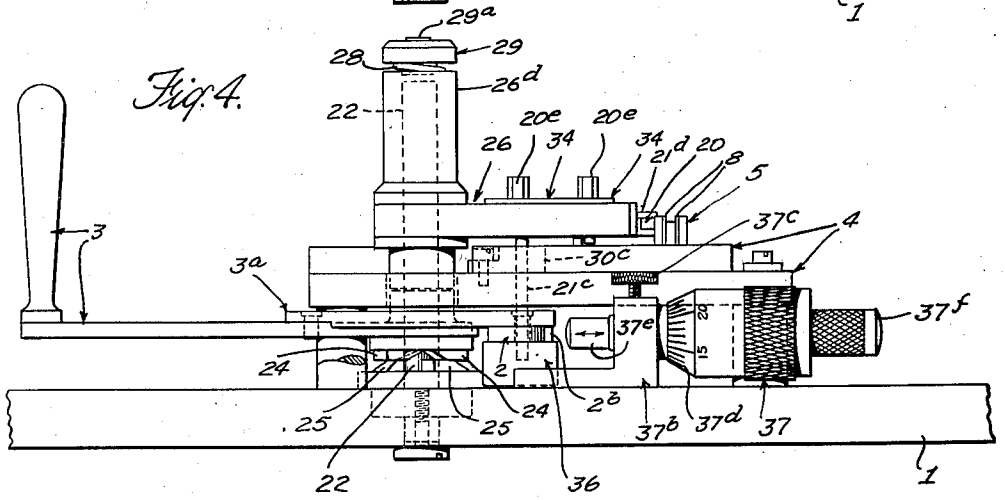
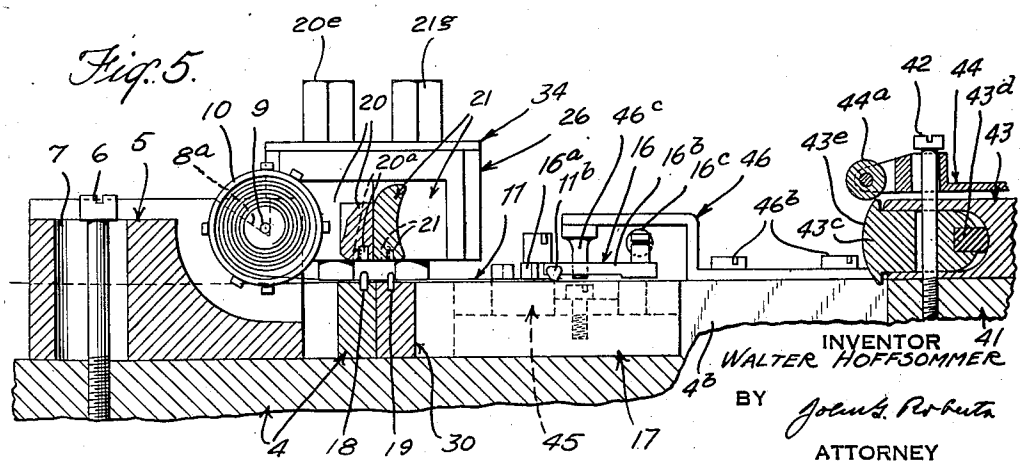


Fig. 5.



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Fig. 6.

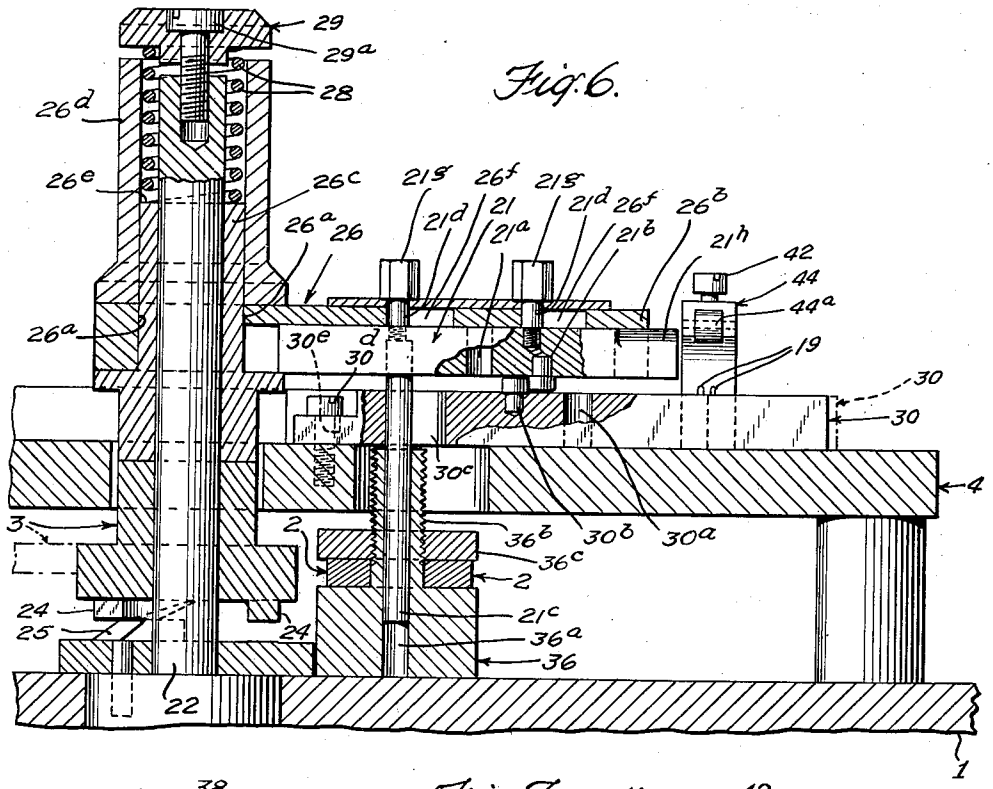
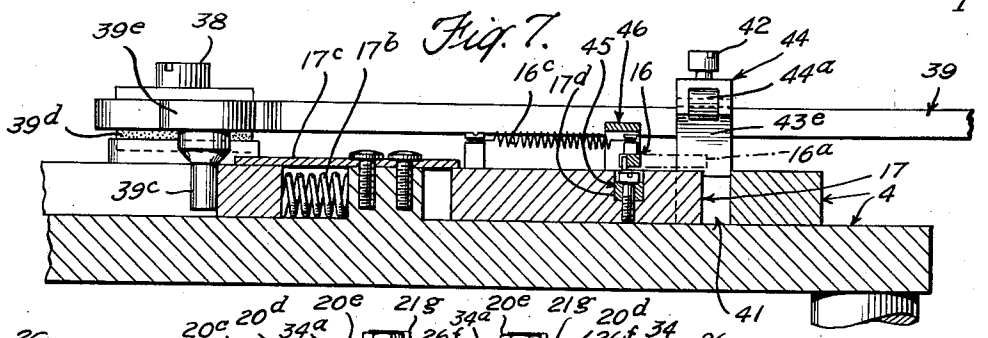


Fig. 7.



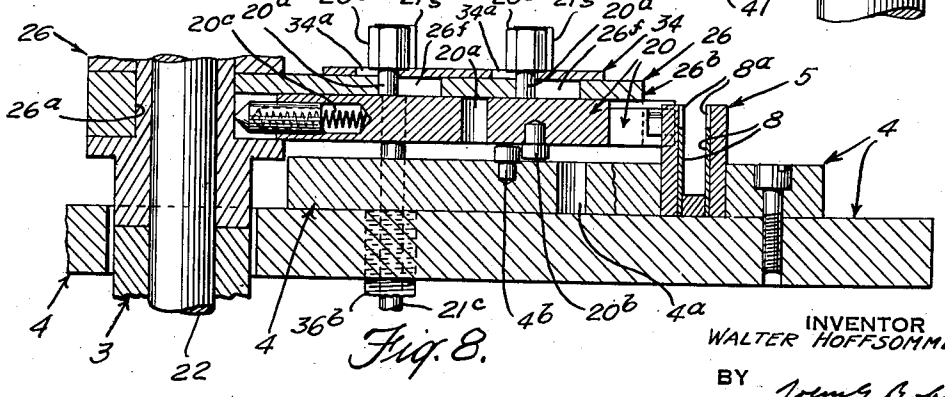


Fig. 8.

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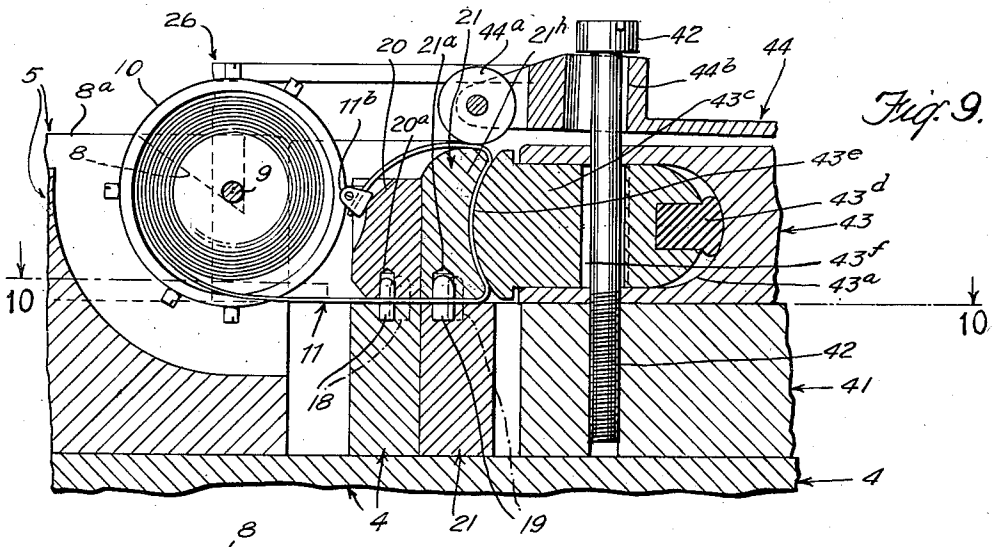


Fig. 9.

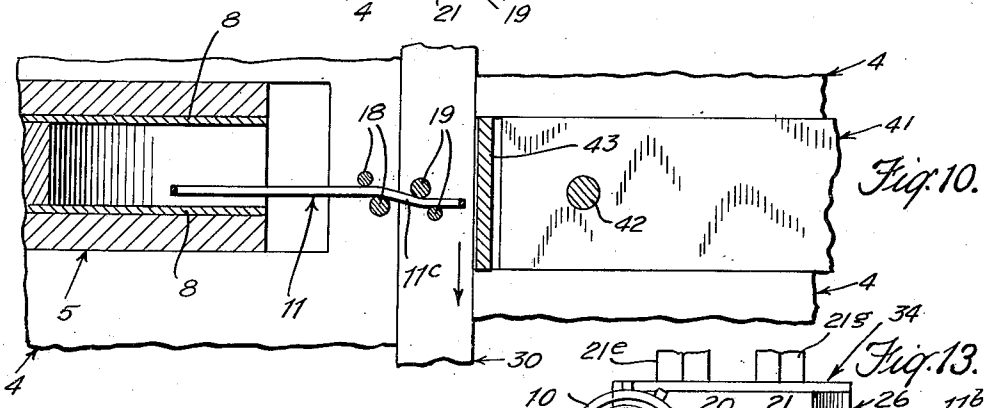
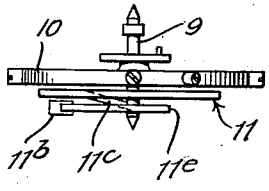


Fig. 10.

Fig. 11.



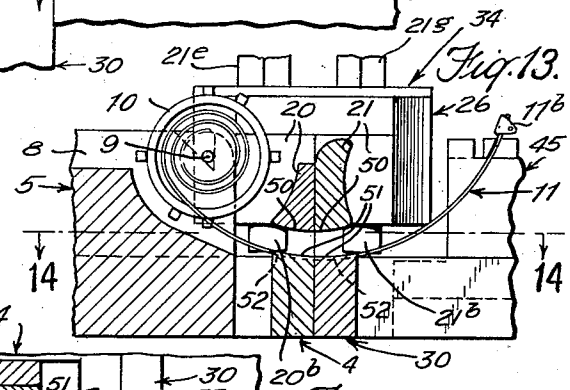
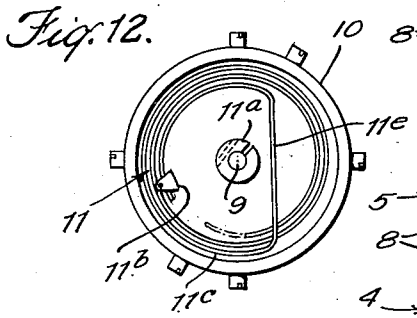


Fig. 13.

Fig. 12.



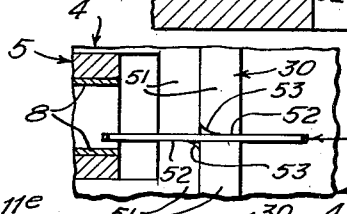


Fig. 14.

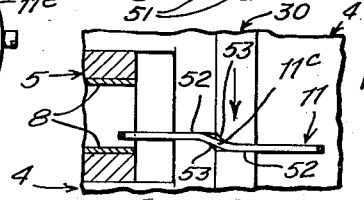


Fig. 15.

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Patented Apr. 1, 1941 2,236,907

UNITED STATES PATENT OFFICE

2,236,907

HAIRSPRING BENDING APPARATUS

Walter Hoffsommer, Astoria, N. Y.

Application November 10, 1939, Serial No. 303,753

14 Claims. (Cl. 153—64)

This invention relates to time-piece hairsprings and more particularly to a machine for bending them.

One of the objects of this invention is to provide an apparatus of the above mentioned character which will be capable of a high rate of production and of higher efficiency of operation.

Another object is to provide a machine of the above mentioned character in which movements of the operating tools may be accurately and dependably achieved.

One of the principal objects of my invention is to provide a machine whereby the over-coil of a hairspring may be formed, accurately and efficiently, with little or no skill required by the operator of the machine. Prior to the development of this machine the over-coil of the hairspring was formed by various hand tools. These tools required the exercise of great skill by the user and therefore greatly added to the cost of production of a hairspring assembly. The machine carries dies and operating parts which are caused to act upon a hairspring by means of simple hand operated levers, which required little or no skill in operating them. The machine illustrated is adapted to handle only one size of hair coil but by changing the parts acting upon the coil different size of hair coils may be bent. Also, changes of the shape of the dies may be affected to produce different over-coil bends.

In the following specification are set forth two embodiments of this invention as applied to a hairspring bending machine whereby the objects above stated may be attained, but it will be understood that these embodiments are illustrative and not to be considered limitative.

In the drawings which form a part of the specification—

Fig. 1 is a plan view of the machine with some portions broken away to save space and with parts in normal positions.

Fig. 2 is an enlarged fragmentary plan view showing similar parts shown in Figure 1 in the position they would assume after the offset bend has been formed in the hairspring and its free end released.

Fig. 3 is a front elevation of the machine with parts in normal position as shown in Figure 1.

Fig. 4 is a left side elevation with parts in similar position as shown in Figures 1 and 3.

Fig. 5 is an enlarged fragmentary vertical section taken on line 5—5 of Figure 1 with a hairspring in position to be acted upon by the machine.

Figures 6, 7 and 8 are fragmentary vertical sections taken on line 6—6, 7—7 and 8—8 respectively, of Figure 1 showing parts in their normal position as shown in Figures 1, 3 and 4.

Fig. 9 is an enlarged fragmentary vertical cross-section taken on line 9—9 of Figure 2 but showing parts in operated position with a hairspring fully acted upon.

Fig. 10 is a section on line 10—10 of Figure 9 showing the transverse bend formed by the bending devices.

Fig. 11 is a plan view of the balance wheel assembly after removal from the machine.

Fig. 12 is a front elevation of the same unit shown in Figure 11.

Fig. 13 is a modified form of the invention and is a fragmentary section taken in the same plane as Figure 9.

Fig. 14 is a section taken on line 14—14 of Figure 13 showing a modified form of the transverse bending devices.

Fig. 15 is an operated view of the transverse bending device similar to that shown in Figure 14.

Referring to the drawings, the machine disclosed in Figures 1 to 10, inclusive, comprises generally a base 1 pivotally carrying a lever 2 at 2c. A hand operated lever 3 and an auxiliary base plate 4 is spaced from the top of the base 1. The left hand forward part of the base plate 4 carries a balance wheel assembly support 5, adjustably mounted and secured by means of a bolt 6 which after passing through an elongated slot 7 in the support 5 is threaded into the base 4, as shown clearly in Figures 2, 5, 8 and 9. The support 5 is provided with a pair of V shaped plates 8 rotatably supporting in its V shaped cut-outs 8a the ends of the balance wheel staff 9 as shown in Figures 2, 5 and 9.

The balance wheel assembly comprises the usual staff 9, balance 10, hairspring 11 substantially rectangular in cross-section, collet 11a and anchor stud 11b to which the inner and outer convolutions or ends of the spring are secured respectively. Such an assembly is shown in Figures 5 and 13, prior to the formation by the machine of the offset 11c and over-coil 11e which will be more fully described hereinafter.

The balance wheel assembly when placed manually by means of a pincette into the support 5, has its hairspring convolutions all in one plane (best shown in full and dotted lines in the plan view of Figure 2), then stud 11b grasped by the pincette is measured or uncoiled and subsequently brought under a pivotal limit stop 16, adjust-

ably mounted on slide 17 in base plate 4, which will be more fully described hereinafter. In order to avoid any undue distortion or strain on the convolutions while measuring or uncoiling the hairspring 11, preparatory to forming same, the support 5 permits the rotation of the balance wheel assembly on its staff 9 supported in the above mentioned V shaped cutouts 8a.

Midway between the support 5 and stud 11b the hairspring 11 is placed between fixed and movable pairs of pins 18 and 19 respectively, the former mounted in the base plate 4, and co-operating with depressions 20a in clamp bar 20 and the latter with similar depressions 21a in the concave bending die clamp 21; Figure 9. These clamps 20 and 21 are controlled through a series of connections by hand operated lever 3. The description of these connections follows:

Vertically mounted on base 1 and projecting through and above base plate 4 is a fixed post 22 pivotally mounting the lever 3 and at its pivotal end concentrically carries a pair of crown cams 24 diametrically opposed and co-operating with a similar pair 25 fixed to base 1; Figure 6. Also mounted on fixed post 22 and located above lever 3 and base plate 4 is a housing 26 apertured at 26a and which slidably carries the above mentioned clamps 20 and 21. This housing 26 comprises a flat rectangular member 26b and receives through its aperture the hub of a collar 26c secured to both the sleeve 26d and member 26b. These elements act as a unit and can be made integral if so desired. The bore formed in sleeve 26d which receives the hub of the collar 26c also embraces a compression spring 28 which exerts its pressure against the shoulder 26e formed by sleeve 26d and hub 26c. This pressure is adjustably controlled by a shouldered cap 29 which can be adjusted to vary the pressure on the upper end of the spring 28 by means of a bolt 29a which is threaded into the upper end of the fixed post 22. In this way housing 26 under the influence of the spring 28 can be brought down, providing, of course, that the hand lever 3 carrying crown cams 24 is turned counter-clockwise, as viewed in Figure 1, and moves the above mentioned cams out of contact or away from fixed cams 25.

The movable pins 19 are securely carried in the slide bar 30 which is adapted to slide back and forth in base plate 4 in a small movement, and is held from displacement by screw 30d passing through an open slot 30e and threaded into base plate 4. The slide bar has an elongated hole 30c which snugly guides an elongated vertical pin 21c secured in the clamp bar 21. The clamp bars 20 and 21 are adapted to slide back and forth in the rectangular housing 26b and are usually in the rearmost or retracted position (see Figures 1, 6 and 8) with their forward ends clear of the fixed and movable pins in order that the hairspring may be placed manually in position between said pins. The clamp bars are raised above said pins 18 and 19 by the above mentioned co-operating crown cams 24 and 25. The clamp bars are held upwardly in their housing 26b by means of threaded and shouldered bolts 20d and 21d which project through a floating slide plate 34, through slots 26f in the rectangular housing 26b, and in pairs are threaded into clamp bars 20 and 21. The clamp bar 20 carries a coupling hole 20a and a depending co-operating coupling pin 20b, the hole 20a co-operates with a pin 4b in base plate 4, and the coupling pin 20b co-operates with a hole 4a in the same base plate 4. Corresponding sets of coupling holes 21a and 30a and pins 21b and 30b in clamp bar 21 and slide bar 30 are provided to interlock clamp bar 21 and slide bar 30 for reasons to be pointed out hereinafter. As shown clearly in Figures 6 and 8, these above mentioned interlocking parts are in normal or unlocked position.

Carried and depending from slide bar 21 is the vertical pin 21c projecting through the elongated slot 30c in slide bar 30 and entering a bore 36a in a slide member 36. This slide member at its upper end is provided with a long externally threaded reduced portion 36b which passes through an aperture in lever 2 and pivotally secured thereto by means of a nut 36c. This construction gives rigidity to the pin 21c and serves as a pivotal connection between the slide bar 21 and the lever 2.

The clamp bar 20 is provided at its left hand end with a floating compression spring 20c urging the clamp bar toward the right as viewed in Figure 8 but is prevented from so moving by the lever 3 and connections as will be seen hereinafter.

The previously mentioned shouldered bolts 20d project through the elongated slots 26f and then through similar slots 34a in floating plate 34 and are provided with nuts 20e for frictional adjustment between floating plate 34 and rectangular housing 26b. The other shouldered bolts 21d carried by clamp bar 21, project through similar slots 26f and then through snugly fitting holes in the said floating plate 34, and are also provided with nuts 21g for adjusting the pressure between surfaces of the floating plate 34 and rectangular housing 26b.

It can be seen therefore that upon the manual operation of the lever 2, by means of the hand lever 3, the pin 21c, with clamp bar 21, including shouldered bolts 21d carrying with them the plate 34 can be moved as a unit toward the right from the position shown in Figure 6. This movement of the clamp bar 21 is permitted by elongated slots 26f and by the slot 30c carried in the slide bar 30. At the same time the clamp bar 20, including shouldered bolts 20d riding in slots 26f, moves in the same direction under pressure of the spring 20c, as permitted toward the right by the plate 34 mentioned above. The spring pressure is exerted against the right hand ends of the elongated slots 34a and as the plate 34 moves it permits the clamp bar 20 to move an amount corresponding to that of clamp bar 21.

Mounted on the far end of the pivotal hand lever 3 and midway of its ends is a link 3a provided with an elongated slot 3b which co-operates with a pin 2a secured to the lever 2; shown clearly in Figure 1. The extreme left hand or free end of the lever 2 is so shaped as to present a hardened surface 2b which co-operates with a micrometer 37.

When the far end 3c of the slot of the link 3a has reached the pin 2a of the lever 2 the crown cams 24 have cleared the fixed co-operating cams 25. Consequently the housing 26 and the clamp bars 20 and 21 carried thereon are unsupported as a unit and would be in the condition to move down but for the pins 20b, 4b and 21b, 30b, which are at this time out of register with their co-operating coupling holes. The continued movement of the link 3a, however, against the connection 2a will now move the lever 2 (which up to this time has not moved) and, by means of its pin 21c and associated train of connections above described, will move the clamping bars 20 and 21

as a unit toward the right as viewed in Figures 6 and 8 until coupling pins and co-operating holes are in vertical alignment at which point the spring 28 and gravity depress the housing 26 and cause the pins and holes to register and interlock. When this alignment and the subsequent interlocking has taken place, the forward ends of the clamping bars 20 and 21 grip the hairspring 11 firmly against the base plate 4 and slide bar 30. The pins 18 and 19 carried by plate 4 and slide bar 30 co-operate with the depressions in the clamping bars 20 and 21 to prevent any unwanted displacement of the hairspring 11 during its subsequent offsetting.

On the forward and left hand side of the base plate 1 is mounted a micrometer 37 comprising the usual sleeve 37*a* mounted in an aperture in a bracket 37*b* and held securely therein by means of a thumb screw 37*c*. The usual thimble 37*d* carrying a locking thumb piece 37*f* and calibrations in thousandths of an inch, rotates a spindle 37*e* toward and away from the left hand end 2*b* of the lever 2; Figures 1 and 4.

The adjustment of the spindle 37*e* therefore predetermines the amount of offset given to the hairspring 11.

It can be seen from the foregoing that when the clamping bars 20 and 21 have reached their interlocked position with respect to base plate 4 and slide bar 30, the end 2*b* of the lever is spaced from the spindle 37*e* a distance sufficient to offset the hairspring the desired amount, i. e., fifteen thousandths of an inch, when the end 2*b* is brought up against the spindle 37*e*.

This offset is made possible by the fact that clamp bar 20 with the left hand portion of the hairspring clamped between it and the base plate 4 cannot move, while clamp bar 21 interlocked with slide bar 30, between which is clamped the right hand portion of the hairspring 11, can move beyond bar 20, by reason of the elongated slots 34*a* in plate 34, to produce the offset 11*c* in the hairspring as shown completed in plan view in Figure 10. It is understood that the degree of offset of the hairspring may be varied by the simple expedient of adjusting the spindle 37*e* to and away from the end of the lever 2*b*. The mechanism for bending the overcoil of the hairspring will now be described.

The base plate 4 pivotally carries at 38 a bell-crank lever 39 provided with a handle 39*a*. A screw 40 which passes through an elongated slot 39*b* and is threaded into a slide bar 41 guided in a channel 4*b* in the base plate 4, provides a connection between the lever 39 and the said slide bar 41. Secured to the slide bar 41, by means of screws 42 is a bending die block 43, which yieldably carries at its left hand end in a horizontal slot 43*a* a convex die 43*c* vertically apertured at 43*f* to receive one of the screws 42. A cushion 43*d* of rubber is mounted in the die 43*c* and positioned between itself and the block 43 so as to exert an outward pressure on the die. Also secured to the block 43 and adjustably mounted thereon is a resilient bar 44, carrying a roller 44*a* rotatably mounted on the free end of the bar. This bar is vertically apertured at 44*b* to receive the bolt 42, which serves to vertically adjust the position of the roller 44*a*. The roller 44*a* co-operates with the concave complementary die 21*h* formed on the outer end of the clamping bar 21 as will be seen hereinafter.

The bell-crank lever 39 has a short arm 39*e* carrying a pin 39*c* engaging the rear edge of the slide 17 which carries the previously mentioned pivotal limit stop 16 shown in operative position in dotted and full lines in Figures 2 and 7. The slide 17 is normally in the position shown clearly in Figures 1 and 7; and a compression spring 17*b* is cradled in the slide and held in place by a cover plate 17*c*. The slide 17 and lever 39 are held in the normal position by reason of a friction washer 39*d* located at the fulcrum of lever 39, which friction the pressure of the spring 17*b* cannot overcome. Upon manually moving the lever 39 to the left; Figure 1, the pin 39*c* moves away permitting the slide 17 to follow under the thrust of the spring 17*b*. This movement under the manual control of the lever 39 brings the forward end of the slide 17 out of the path of the slide bar 41 as shown in the enlarged Figure 2.

Carried by and adjustably secured to the slide 17 in a transverse channel 17*d* is an indicator slide 45, which in turn pivotally mounts the limit stop 16, having arms 16*a* and 16*b* set 90° apart, the latter secured to the one end of a tension spring 16*c*. The other end of the spring 16*c* is mounted on the slide 17. A fixed pin 46*c* projecting down from a bracket 46 which is secured to the base plate 4 by screws 46*b*, contacts the arm 16*b* in both positions that the slide 17 takes as shown in Figures 1 and 2.

Following the formation of the offset the lever 39 is manually moved to the left permitting the spring 17*b* to push the slide 17 and its associated parts carried thereon to the full line position shown in Figure 2. This causes the fixed pin 46*c* to rotate limit stop 16 about its pivot, releasing the studded end of the hairspring to its normal coiled condition preparatory to the forming of the bend in the over-coil, as shown clearly in Figure 9. The bending of the over-coil counter to its original curve is done by the convex die 43*c* and against a complementary concave die 21*h* in order to set that portion 11*e* of the over-coil in a straight line as shown in Figure 12 which shows a finished hairspring assembly. By simply changing the bending dies, different types of over-coils may be produced. The extreme end of the over-coil carrying the stud 11*b* has been rolled over by means of the roller 44*a* to make the proper bend at that point in the hairspring, just prior to the application of pressure against the over-coil portion 11*e* by the convex portion of die 43*e*. This pressure is cushioned by the rubber insert 43*d* and allows the convex die to accommodate itself to different hairspring materials and thicknesses and prevents percussive contact with the over-coil portion of the hairspring when a quick movement of the lever 39 by a hurried operator is made. The pressure on the over-coil received from the convex die to properly set the section 11*e* of the hairspring may be repeated several times depending on the resistance of the material of the spring.

A micrometric adjustment of the slide 41 may be made to accommodate different hairspring thicknesses and to vary pressures against it by providing an adjusting nut 41*c* and locking nut 41*d* which limits the movement of the slide to the left. The former contacting with the right hand edge of base plate 4, when the block 43 and the slide 41 are manually brought to the position shown in Figure 9.

With the offsetting and bending of the hairspring completed and after the lever 39 is brought back to its normal position shown in Figure 1, the hand lever 3 is manually started on its return. It follows therefore that during the first

part of the return of hand lever 3 the lost motion due to the elongated slot 3b is taken up while the housing 26 and the associated parts are raised straight up from their clamped position on the hairspring now in its offset condition. This raised position of the housing and the clamp bars 20 and 21 is brought about by the crown cams 24 in their return movement engaging the co-operating fixed cams 25, thereby raising the said housing and clamps. This leaves the slide bar 30 with its offset hairspring in its offset position. While the housing and clamps are so raised the continued return of the hand lever 3 to normal position will cause the near end of the elongated slot 3c to engage the pin 2a on the lever 2 and move same in the direction to take the position shown in Figure 1. The last part of the return movement of lever 2 with its associated parts operating therewith, and referring particularly to the pin 21c, result in the retraction to normal position of the clamp bars 20 and 21. The return movement of these clamp bars differs slightly from the forward movement and their function is as follows. The clamp bar 21 (under the control of the levers 2 and 3) carries with it the plate 34, until the right hand end of the elongated slots 34a has taken up the lost motion between the shouldered bolts 20d and the right hand end of said elongated slots 34a in order to move clamp bar 20.

The increment of movement to be given the slide 30 corresponding to the amount of the offset of the hairspring will now be restored to its normal position by the pin 21c which after riding in the slot 30c in slide bar 30 will engage the left hand end of said slot and bring back the said slide bar to the normal position shown in Figures 1 and 6.

Simultaneously with the movement of the hand lever 3 the clamping bars 20 and 21 are brought to their retracted position; shown in Figures 1 and 6 permitting the free end of the hairspring to slip from the ends of the clamp bars 20 and 21.

The manual operation by an operator is as follows: Starting with the machine in normal position shown in Figure 1 and after the operator has placed a hairspring assembly in support 5, the studded end of the hairspring is now ready to be formed to the desired shape as shown in Figures 11 and 12. The hand lever 3 is then actuated to bring clamp bars 20 and 21 over and down to clamp the uncoiled portion of the hairspring. A further movement completes the offset bend. The extent of this movement and therefore the degree of the offset bend is determined by the movement of the lever 2 as the end 2b comes into contact with the end of the spindle 37e of the micrometer 37, previously adjusted to limit such movement. The operator now grasps lever 39 and moves it to the left; Figure 1, releasing the over-coil or studded end of the hairspring which coils against the clamp bar 21; shown in Figure 2. The still further movement in the same direction of the lever 39 finally causes the convex die 43c to co-operate with the concave die 21h in the clamp bar 21, thus forming the bend in the over-coil clearly shown in Figure 9. Then the convex die 43c by means of the lever 39 is moved back to its normal position as shown in Figure 1. When this has been done the left hand, of the operator, returns the hand lever 3 to normal position which releases the clamping action on the offset portion of the hairspring and then moves the clamping bars 20 and 21 to the position shown in Figures 1, 3, 4 and 5. Released from the ends of the clamping bars 20 and 21 the free end of the hairspring will take the form shown in Figures 11 and 12 whereupon the completed balance wheel assembly is removed from the support 5 and the machine is ready to receive the next balance wheel assembly.

Figures 13, 14 and 15 show a modified form of construction of the clamping surfaces. In this instance the clamping bars 20 and 21 are provided with curved undersurfaces 50, 50 and together produce a smooth convex clamping surface. Complementary to the said convex clamping surfaces, concave surfaces 51, 51 are formed in base plate 4 and in the slide bar 30. Both concave surfaces in combination present a smooth concave clamping surface which co-operates with the convex clamping surfaces 50, 50 mentioned above.

Instead of pins 18 and 19, shallow grooves 52, 52 are milled to sufficient depth in the concave surfaces 51, 51 to receive the hairspring 11 flush with the gripping surfaces. This prevents the hairspring from slipping when it is acted upon by the clamp bars. The grooves 52, 52 are provided at their intersection formed by the demarcation of the base plate 4 and slide bar 30 with diagonally apposed rounded corners 53, 53 for the purpose of producing smooth and uniformly rounded corners in the offset 11c in the hairspring 11 clearly shown in the Figure 15.

The purpose of the foregoing modified construction is to apply curved clamping surfaces to the partially uncoiled curved portion of the hairspring. Under operating conditions depending on certain hairspring materials used, it is essential to avoid subjecting the set hairspring to undue strains when uncoiling it to be clamped and formed. An important advantage is therefore obtained over the straight clamp bars used and described in Figures 1 to 12, inclusive, because the complementary curved clamped surfaces more closely conform to the natural set of the convolution of the hairspring. Consequently after the formation of the offset and the bending of the over-coil, the hairspring will approximate very closely the original sinuous curve it had prior to the clamping action. The above construction of the clamp bars and co-operating members have the advantage to produce a more accurate balance wheel assembly.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a hairspring bending machine having a base, and thereon means for rotatably supporting a coiled hairspring having a free end, means for measuring a partial uncoiled portion of said free end and for holding said portion uncoiled, fixed means intermediate said measuring means and said supporting means for holding said portion against transverse movement, and movable means for engaging a section of said portion adjacent said fixed means and bending said hairspring transversely in order to produce an offset.

2. The machine according to claim 1, in combination with means for releasing the free end of said hairspring from said holding means after the bending operation.

3. In a hairspring bending machine having a base, and thereon means for rotatably supporting

a coiled hairspring having a free end, an anchoring means carried by said free end, means for measuring a partial uncoiled portion of said free end and for engaging said anchoring means to keep said free end uncoiled, and means substantially intermediate said supporting means and said measuring means for bending said hairspring transversely to produce an offset.

4. The machine according to claim 3, in combination with means for releasing said anchoring means from said measuring means after the bending operation.

5. The machine according to claim 1, in combination with a micrometrically positioned stop for controlling the bending movement of said movable bending means.

6. In a hairspring bending machine having a base, and thereon means for rotatably supporting a coiled hairspring having a free end, means for measuring a partial uncoiled portion of said free end and for holding said portion uncoiled, means substantially intermediate said supporting means and said measuring means for bending said hairspring transversely to produce an offset, a concave bending die formed upon a portion of said bending means, a block having a complementary convex bending die adapted to co-act with said concave die, and means for releasing said hairspring from said holding means and for causing said dies to engage and bend a portion of said hairspring into a straight section.

7. In a hairspring bending machine having a base provided with a concave groove formed therein adapted to receive a portion of a coiled hairspring, a part movable transversely to said hairspring and provided with a concave groove adapted to receive a portion of said hairspring and positioned so as to form a longer concave groove with said first mentioned groove, convex clamps for holding said hairspring in said grooves, and means for moving said movable part so as to produce a transverse offset bend in said hairspring.

8. The machine according to claim 7, in combination with a micrometrically positioned stop for controlling the offset bending movement of said movable part.

9. In a hairspring bending machine having a base, and thereon means for rotatably supporting a coiled hairspring having a free end, means for measuring a partial uncoiled portion of said free end and for holding said portion uncoiled, a pair of fixed lugs adapted to guide said hairspring substantially intermediate of said free end and said supporting means, a second pair of lugs adapted to guide said hairspring, a slide movable transversely of said hairspring carrying said second pair of lugs, clamps for holding down said hairspring adjacent said fixed and movable lugs, and means for moving said slide in order to produce a transverse offset bend in said hairspring.

10. The machine according to claim 9, in combination with adjustable means for controlling the amount of said offset bend.

11. The machine according to claim 9, in combination with an adjustable stop for controlling the amount of said offset bend, and means for releasing said free end from said holding means after the bending operation.

12. In a hairspring bending machine having a base carrying a pair of V shaped supports, a balance wheel assembly comprising a balance wheel staff and a hairspring carrying an anchor stud on its free end adapted to be removably and pivotally carried in said V shaped supports by means of said staff, a measuring and shiftable stop carried on said base to which the free end of said hairspring is unwound so that said anchor stud is caught on said stop, a pair of fixed lugs adapted to guide said hairspring substantially intermediate said stop and said V shape supports, a second pair of lugs adapted to guide said hairspring, a slide movable transversely of said hairspring carrying said second pair of lugs, a clamp bar adapted to press down on said hairspring adjacent said fixed lugs, a second clamp bar adjacent said first clamp bar adapted to press down on the hairspring adjacent said second pair of lugs, means for causing said slide and said second clamp bar to move transversely of said hairspring thereby causing said second pair of lugs to bend said hairspring transversely, a concave bending die formed on said second clamp bar, a block carrying a convex bending die complementary to said concave bending die and adapted to be pressed against said concave die, and means for releasing said anchor stud from said stop in order to let said hairspring resume its coil over and beyond said second clamp bar and for causing said complementary dies to meet and bend a portion of said hairspring into a straight line.

13. The machine according to claim 12, in combination with means connected with the said last mentioned means for bending the said portion of the coil lying over and beyond said second clamp bar.

14. In a hairspring bending machine having a base and thereon means for supporting a coiled hairspring having a free end, means for measuring a portion of said free end and for holding said portion, a pair of fixed lugs adapted to guide said hairspring substantially intermediate of said free end and said supporting means, a second pair of lugs adapted to guide said hairspring, a slide movable transversely of said hairspring carrying said second pair of lugs, clamps for holding down said hairspring adjacent said fixed and movable lugs, and means for moving said slide in order to produce a transverse offset bend in said hairspring.

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