June 20, 1933. C. CULMAN 1,915,087

PIVOT POLISHING DEVICE

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Fig. 9.

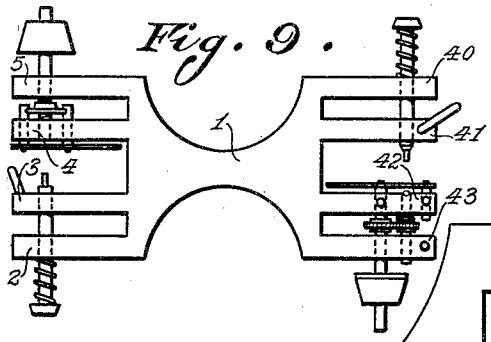


Fig. 1.

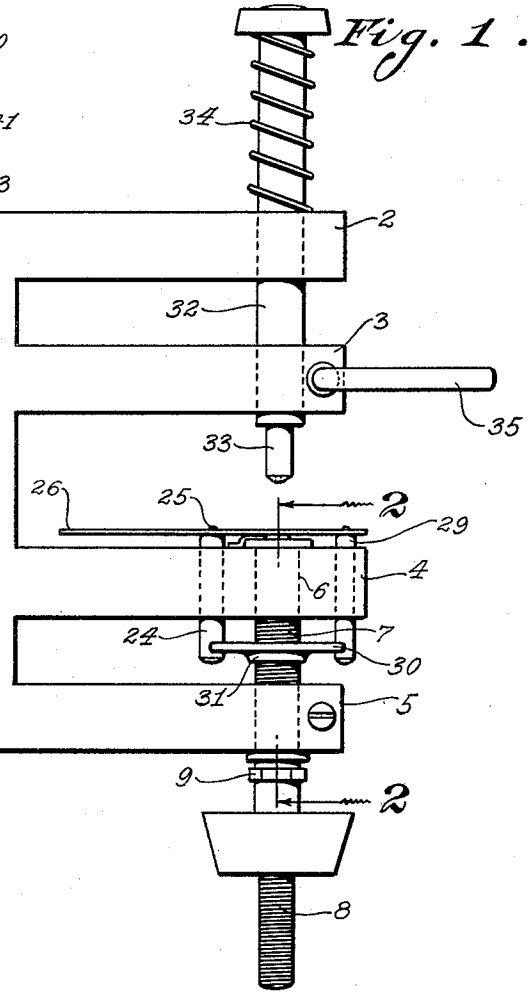


Fig. 10.

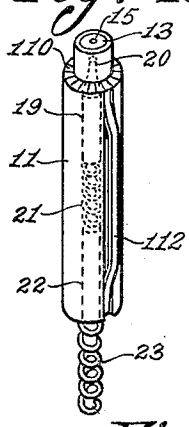


Fig. 2.

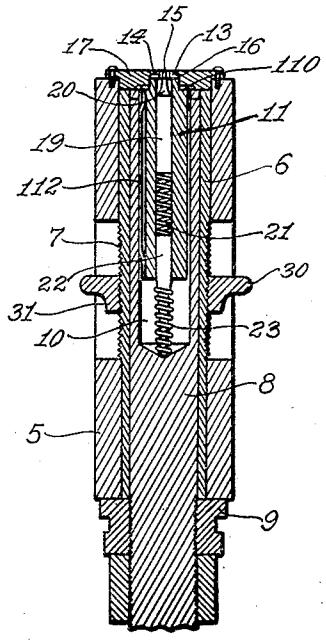


Fig. 3.

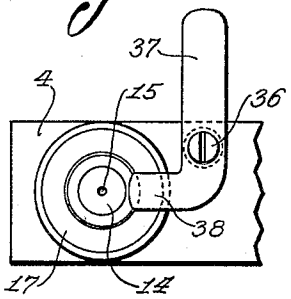
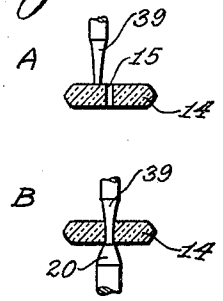


Fig. 4.



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PIVOT POLISHING DEVICE

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Fig. 5.

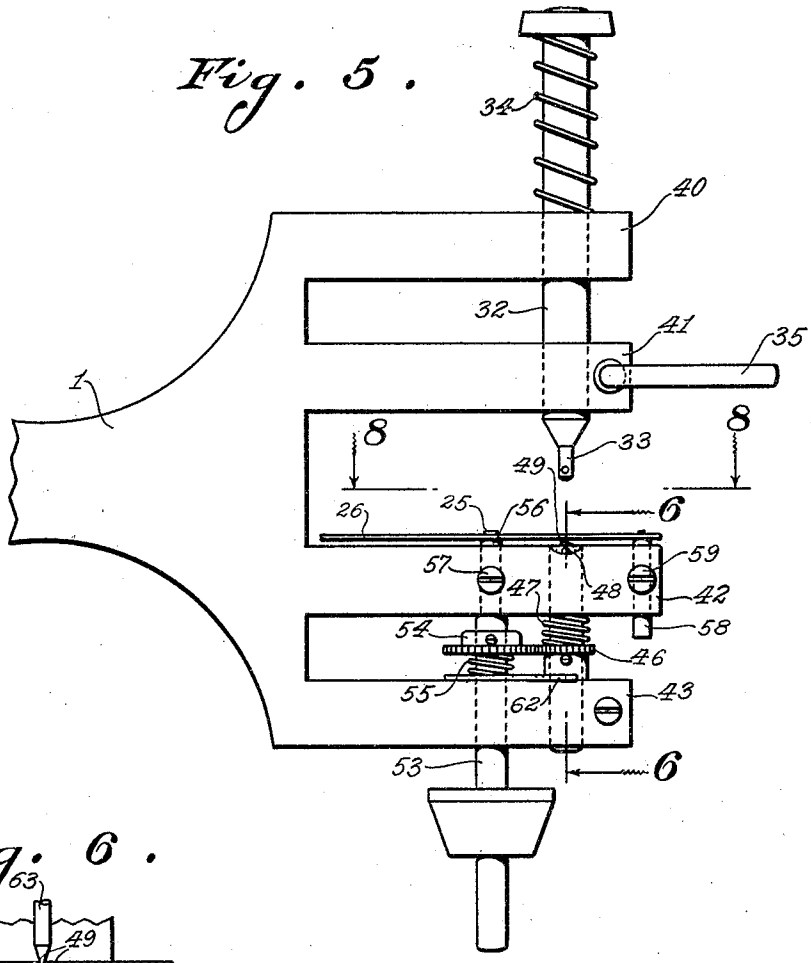


Fig. 6.

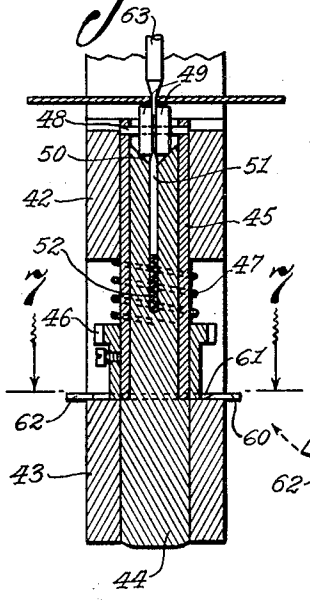


Fig. 7.

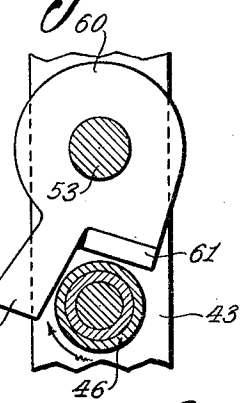
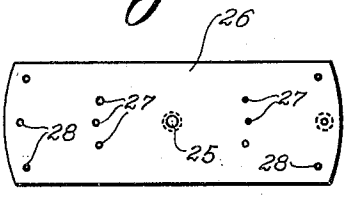


Fig. 8.



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Patented June 20, 1933 1,915,087

UNITED STATES PATENT OFFICE

CARL CULMAN, OF HONOLULU, TERRITORY OF HAWAII

PIVOT POLISHING DEVICE

Application filed April 14, 1928. Serial No. 269,900.

This invention pertains to apparatus for polishing the pivots of small watches.

The pivots of most watches of good construction have jewel bearings. These may be train bearings, in which the jewel is perforated, and the pivot is in the form of a journal, having a bearing in the perforation; or they may be balance pivots, used on balance wheels and the like, in which the end of the pivot shaft passes through a perforated jewel, the end bearing upon a second jewel, called a cap jewel. In either case that part of the pivot which bears upon the jewel must be highly polished, so as to reduce the friction to a minimum. In the case of injury to a watch bearing or pivot, it may happen that a jewel becomes cracked and in consequence the operation of the pivot upon the cracked jewel damages the pivot, so as to increase the friction and render the operation of the watch unreliable. In repairing such a watch, it is necessary not only to replace the broken jewels, but to repolish the pivots.

One of the objects of the present invention is to furnish a device by means of which watch pivots may be polished in a convenient manner and in a minimum time.

Another object is to provide such polishing means which will be adaptable to all kinds of pivots.

Another object is to provide polishing means which will polish any of the different types of pivots.

Another object is to provide a polishing device which will adjust itself to the size of the pivot.

Further objects will appear from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side view of one end of a polishing device embodying this invention;

Figure 2 is a section, somewhat enlarged, on line 2—2 of Figure 1;

Figure 3 is a plan view of the device for polishing balance pivots, shown in Figures 1 and 2;

Figure 4 shows two views, illustrating diagrammatically the operation of polishing a balance pivot;

Figure 5 is a view similar to Figure 1, showing another portion of the device, arranged for polishing train pivots;

Figure 6 is a section, somewhat enlarged, on line 6—6 of Figure 5;

Figure 7 is a section on line 7—7 of Figure 6;

Figure 8 is a plan view of the guide plate;

Figure 9 is a side view of the complete device; and

Figure 10 is an enlarged detail of the shank of Figure 2.

Figures 1, 2 and 3 show that part of the device arranged for polishing balance pivots. A support 1, only one end of which is shown in Figure 1, is slotted so as to provide a series of parallel arms 2, 3, 4 and 5. A bushing 6 is mounted in the arms 4 and 5 and is provided with a threaded portion 7 at a point between said arms. Journaled within the bushing 6 is a stem 8. This stem may be held in place by a nut 9, engaging said stem, or other suitable means. The upper end of the stem 8 is provided with a bore 10, in which is mounted a shank 11. Mounted on the head of the shank 11 is a ring 13 of metal or other suitable material, in which is suitably mounted a jewel 14, having a central perforation 15. The ring 13 has a peripheral flange 16 on its lower portion. A retaining ring 17, having an inwardly extending flange arranged to cover the flange 16, so as to retain the jewel in place on the stem 8, is held in place on the arm 4 by screws or otherwise. The fit of the ring 13 in the ring 17 is loose, so that a small amount of play is permitted the jewel in a lateral direction. The shank 11 has a central bore in which is slidably mounted a pin 19 having a reduced tip 20 standing opposite the perforation 15 in the jewel, so as to provide an abutment for the pivot when inserted in said perforation. The pin 19 is yieldingly held in abutment with the jewel by a spring 21, which abuts against a plug 22 in the lower end of the shank 11. The lower end of the plug 22 carries a spring 23 arranged to abut against the inside of the bore 10, so as to provide a yielding drive for the shank 11. This spring also forces the shank 11

upwardly against the lower portion of the ring 13.

The shank 11 is provided with a toothed upper flange 110, which engages corresponding teeth 111 on the under side of the ring 17 so that rotation of the spindle 8 will cause the shank 11 to rise and fall as these teeth pass over each other. The shank 11 is held in frictional engagement with the inside of the bore 10 by a lateral spring 112.

Slidably mounted in the arm 4 is a pin 24 having pivoted thereto at 25 a guide plate 26. The plate 26 is shown in plan view in Figure 8. It is provided at a suitable radius, having the pivot 25 as a center, with a series of perforations 27 of different sizes, adapted to accommodate different sizes of pivots. These holes are so placed that, in the proper position of the guide plate, one or the other of these holes will register with the perforation 15 in the jewel. The plate 26 is also provided with a series of index holes 28 adapted to receive the reduced tip of an index pin 29 slidably mounted in the end of the arm 4. The pins 24 and 29 are notched at their lower ends to receive the flange 30 of a nut 31 threaded on the portion 7 of the bushing 6. By turning the nut 31 on the threaded portion 7, the pins 24 and 29 may be raised and lowered so as to adjust the guide plate with reference to the jewel. The guide plate may be turned about its pivot 25, so that either of the holes 28 will be positioned to receive the tip of the pin 29, and in each such position one of the holes 27 will be positioned to register with the perforation 15.

Mounted to slide in suitable perforations in the arms 2 and 3, is a support 32, whose tip 33 is perforated to receive the upper end of a pivot shaft in order to support the same in proper position for polishing. A spring 34 serves to raise the support 32 until the pivot shaft is adjusted to proper position, when the support is depressed, so as to engage said shaft, after which a clamp 35, operating the slit arm 3, is tightened so as to clamp the support 32 in adjusted position.

Pivoted at 36 on the arm 4 is a lever 37, having a lateral extension 38 adapted to engage the ring 13, as illustrated in Figure 3. By operating the lever 37, the extension 38 may be brought against the ring 13, so as to throw the jewel 14 off center with respect to the stem 8.

In the operation of this device, the pivot plate 26 is adjusted to bring the proper hole 27 into position to receive the pivot to be operated on. This pivot is inserted in the hole 27 and the other end of the pivot shaft is engaged in the support 32, which is then clamped. The lever 37 is operated to throw the jewel 14 off center, so that the watch pivot 39 rests on the top of the jewel 14, as shown at A, Figure 4. The stem 8 is then rotated, either by hand or by suitable driving mechanism, not shown. The jewel 14 is not highly polished, but is only semi-finished, so as to have an abrasive texture. The rubbing of the jewel on the end of the pivot 39 will polish that end. When the end has been polished, it may be that a slight burr is raised at the edge thereof. This is removed by returning the jewel 14 to a central position, so as to permit the pivot 39 to enter the perforation 15, as shown at B in Figure 4. The jewel 14 now rubs the sides of the pivot, so as to polish the same and remove the burr. The tip 20 provides an abutment to hold the pivot in proper position during this operation.

Referring now to Figures 5, 6 and 7, Figure 5 shows the other end of the support 1, which is similarly slotted, to provide arms 40, 41, 42 and 43.

Mounted in the arms 42 and 43 is a shank 44, which has a reduced portion surrounded by a sleeve 45. Mounted on the sleeve 45 is a pinion 46. A spring 47, bearing against the pinion 46 and the arm 42, forces the sleeve downwardly on the shank, the latter being clamped in the arm 43. The upper end of the sleeve 45 carries a transverse shaft 48, on which is mounted a pair of lapping elements 49. These elements are in the form of discs or wheels and may be of any suitable material, such as metal, jewels or suitable abrasive material. The elements 49 rest in a concave, conical seat 50 in the upper end of the shank 44. The spring 47, forcing the sleeve 45 downwardly, forces the elements 49 against the seat 50. The shank 44 has a central bore in which is slidably mounted a pin 51 resting on a spring 52 and having a tapered point extending between the element 49 and yieldingly forced therebetween by the spring 52.

Mounted in the arm 43 is a shaft 53, which carries a gear 54 meshing with the pinion 46. The gear 54 is held in proper relation with the pinion 46 by a spring 55. A guide plate 26, as previously described, is pivoted at 25 on a pin 56 extending through the arm 42 and into a bore in the shaft 53. The pin 56 may be fixed in adjusted position by a set screw 57. An index pin 58, similar to the pin 29, is adjustably mounted in the arm 42 and fixed by a set screw 59. The pins 56 and 58 may also be operated as shown in Figure 1. The plate 26 is so adjusted that any one of the holes 27 may be brought into registry with the axis of the shank 44.

Pivoted on the shaft 53 is a plate 60, having a cam edge 61 adapted for insertion under the hub of the pinion 46 by operation of a lever 62 formed on said plate. The plate 60 is rotated on the shaft 53 by manipulating the lever 62 so as to force the cam edge 61 under the pinion 46, thereby lifting the sleeve 45. This raises the lapping elements 49 out of the concave socket 50, so as to permit them to separate. The pivot 63 to

be polished is then inserted through the hole 27 and between the elements 49. When the elements 49 are lifted from the seat 50, the pin 51 is forced between them so as to separate them. This pin adjusts itself to the spacing of the elements 49 and provides a support for said elements opposite the point where they engage the pivot 63, so as to prevent springing or distortion of said elements.

The shaft 53 is now rotated so as to drive the pinion 46 in the direction indicated by the arrow in Figure 7. This rotation operates to turn the plate 60 until the cam portion 61 moves out from under the pinion 46, thereby permitting the sleeve 45 to be lowered by the spring 47. This action forces the lapping elements 49 downwardly in the seat 50 and brings them together against opposite sides of the pivot 63. The rotation of the pinion 46 carries the sleeve 45 in rotation and turns the lapping elements 49 about the axis of said sleeve. This causes said elements to roll in the socket 50 and causes them at the same time to rotate on the shaft 48, in opposite directions. Such rotation causes the elements to rub on opposite sides of the pivot 63, at the same time moving around said pivot so as to polish the same on all sides thereof. A support 32 for holding the pivot shaft is also provided at this end of the support 1.

It will be seen that this invention provides a simple and effective device for polishing watch pivots. The mechanism at one end of the device, shown in Figures 1 to 3, provides for quickly and easily polishing a balance pivot, both at the end thereof, where it engages the cap jewel and at its sides, where it bears against the hole jewel. By simple manipulation of the lever 37, the pivot is changed from one position to another and the entire operation may be carried out very quickly. The guide plate 26 provides for properly centering the pivot, which is held in true axial position by the support 32.

At the other end of the support 1, the means shown in Figures 5, 6 and 7 are arranged for polishing train pivots. In this case also, the pivot is simply inserted in the guide plate 26 and the support 32, by which it is held accurately in proper relation for lapping. The lapping elements 49 adjust themselves to the diameter of the pivot and are supported at their pivot side by the separator 51, so as to eliminate distorting stresses. The lapping elements are automatically forced against the sides of the pivot with a yielding pressure. This pressure adjusts itself to the diameter of the pivot.

While this device has been described as a unitary invention, and is intended for use as such, it will be understood that certain parts or sub-combinations may be useful by themselves, but without reference to the remaining portions of the device, and such use is contemplated by this invention. It is further obvious that various changes may be made, within the scope of the appended claims, in the details of construction without departing from the spirit of this invention; it is, therefore, to be understood that this invention is not limited to the specific details shown and described.

Having thus described the invention, what is claimed is:

1. A device for polishing watch pivots, comprising, means for supporting the pivot shaft in a fixed position and alinement having an opening thru which the end of the pivot projects, lapping means engaging the projecting end of the pivot on opposite sides thereof, means for applying pressure to said lapping means, and means for relieving the pressure.

2. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, and oppositely rotating lapping wheels engaging the pivot on opposite sides thereof.

3. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, oppositely rotating lapping wheels engaging the pivot on opposite sides thereof, and means for preventing distortion of said wheels.

4. A device for polishing watch pivots comprising, means for supporting the pivot shaft, oppositely rotating lapping wheels engaging the pivot on opposite sides thereof, and means extending therebetween for preventing distortion of said wheels.

5. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, lapping wheels engaging opposite sides of the pivot, and a concave driving element engaging said wheels.

6. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, lapping wheels engaging opposite sides of the pivot, a concave driving element engaging said wheels, and a separator within said element.

7. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a rotatable sleeve, a lapping wheel mounted in said sleeve and positioned to engage the side of the pivot, a concave driving element within said sleeve and engaging said wheel, and means for rotating said sleeve.

8. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a lapping element mounted to engage the end of the pivot, means for rotating said element, and means for throwing its rotation out of center.

9. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a jewel loosely mounted for rotation and so as to engage the end of the pivot,

means for rotating said jewel, and means for throwing the rotation thereof off center.

10. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a perforated lapping element, means for rotating said element, and means for manipulating said element whereby it may be shifted with respect to its axis of rotation to engage either the tip or the side of the pivot.

11. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a spindle, a perforated lapping element mounted in the end of said spindle, means for rotating said spindle, and yielding abutment for the pivot tip behind said element.

12. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a spindle, a perforated lapping element mounted in the end of said said spindle, yielding means for rotating said spindle, and a yielding abutment for the pivot tip behind said element.

13. A device for polishing watch pivots, comprising, means for supporting the pivot shaft, a spindle, a perforated lapping element mounted in the end of said spindle, means for rotating said spindle, a yielding abutment for the pivot tip behind said element, and means for shifting said element.

14. A device for polishing watch pivots, comprising, a hand holder adapted to grip the pivot shaft with its end projecting therefrom, and lapping means mounted on said holder to engage the projecting end of the pivot and movable to engage different portions thereof.

15. A device for polishing watch pivots, comprising, a hand holder adapted to grip the pivot shaft with its end projecting therefrom, and lapping means mounted on said holder to engage the projecting end of the pivot and rotatable on the pivot axis.

In testimony whereof I affix my signature this 10th day of February, 1928.

CARL CULMAN.

CERTIFICATE OF CORRECTION.

Patent No. 1,915,087. June 20, 1933.

CARL CULMAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, line 2, claim 9, after "center" insert the words "with respect to its axis of rotation"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of August, A. D. 1933.

M. J. Moore.

(Seal) Acting Commissioner of Patents.