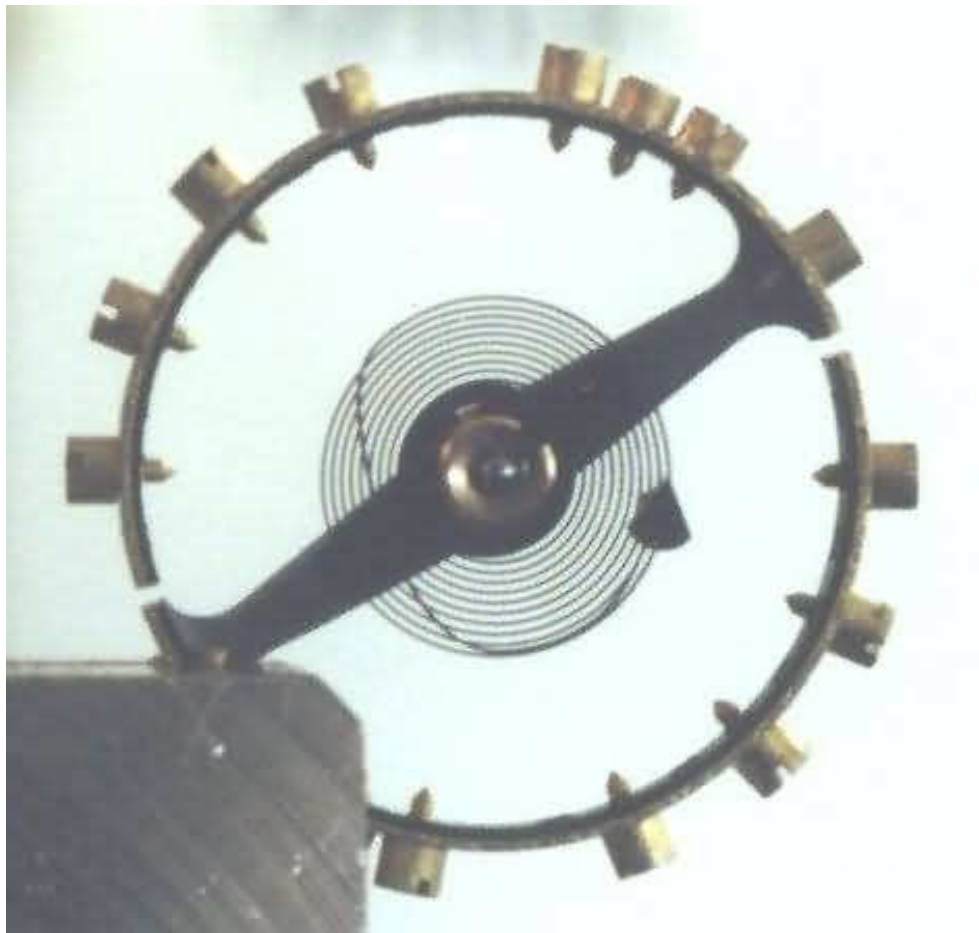
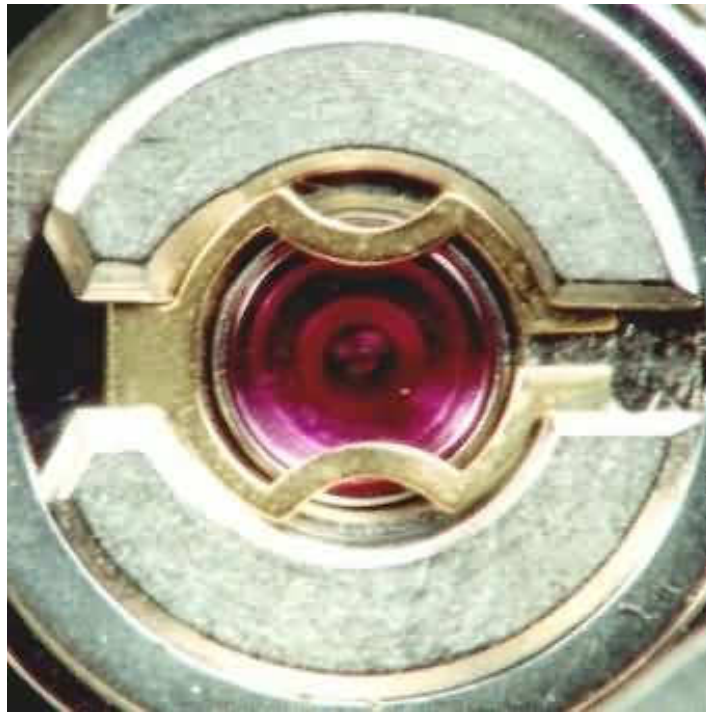


## An Introduction to Replacing a Watch Balance Staff

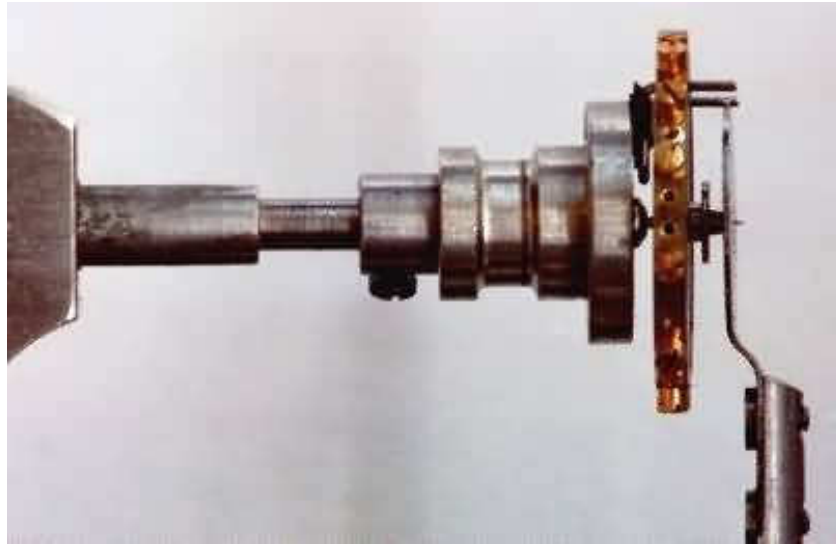
The balance staff is quite simply the shaft that the balance wheel, the roller table and the hairspring are mounted onto. The two ends of the staff have very small tapered pivots that break easily, particularly if the balance jewels do not have shock springs (like the Incabloc System: see second photo).



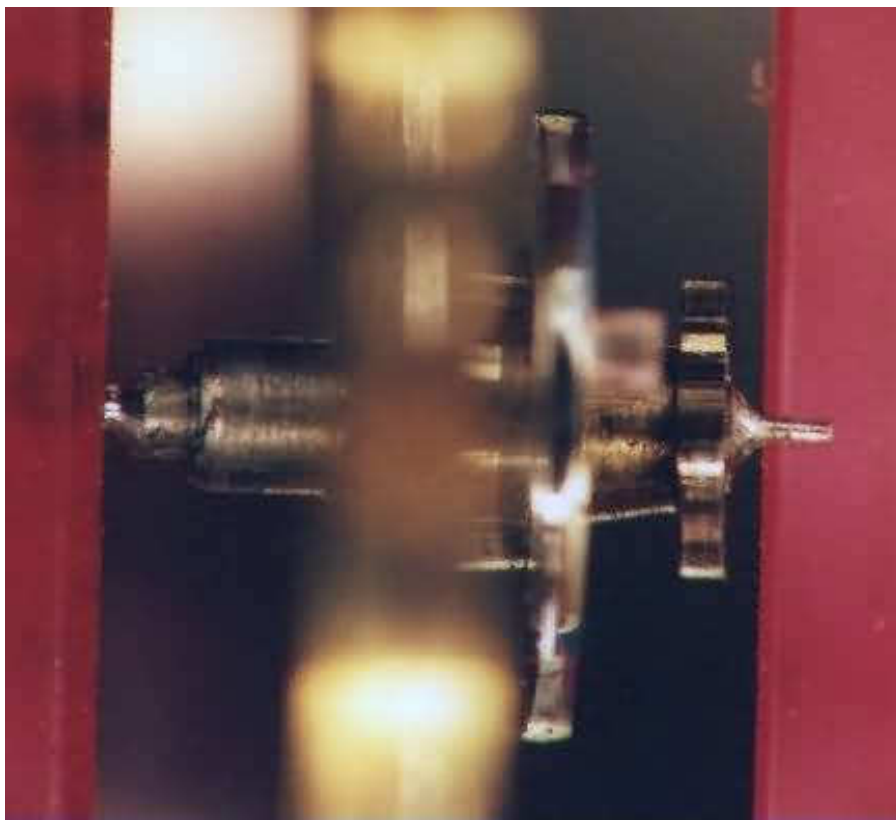


If the pivots are only slightly scored, the pivots could be polished using a tool like this Dorrington, without having to replace the balance staff.





The pivot on the left side has obviously broken off and the other pivot appears to be bent:



Since the balance pivot is broken, you must check the balance jewels that these pivots rotate in, to see if a hole jewel or a cap jewel is chipped or cracked. A damaged jewel would need to be replaced. This photo shows a balance hole jewel next to the pallet fork:

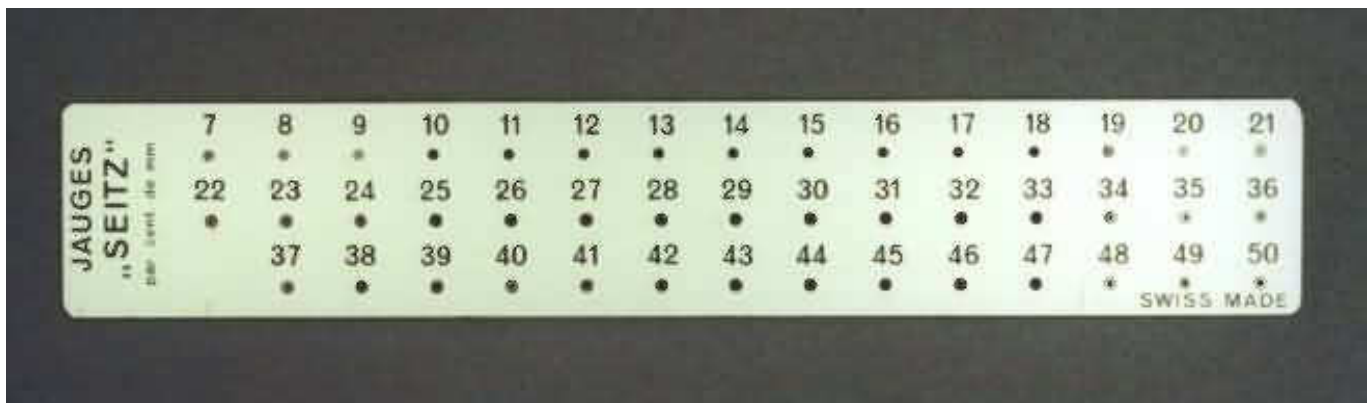


After marking the positions of the roller jewel and the hairspring stud on the balance wheel (you could use a felt tip pen that could be cleaned off later), the hairspring is removed by using a pair of miniature tools for this purpose. For clocks and pocket watches, two of the smallest watchmaker's screwdrivers would work well to remove the hairspring, but this must be done very carefully! To remove the roller table, a nice staking set like this one serves the purpose:

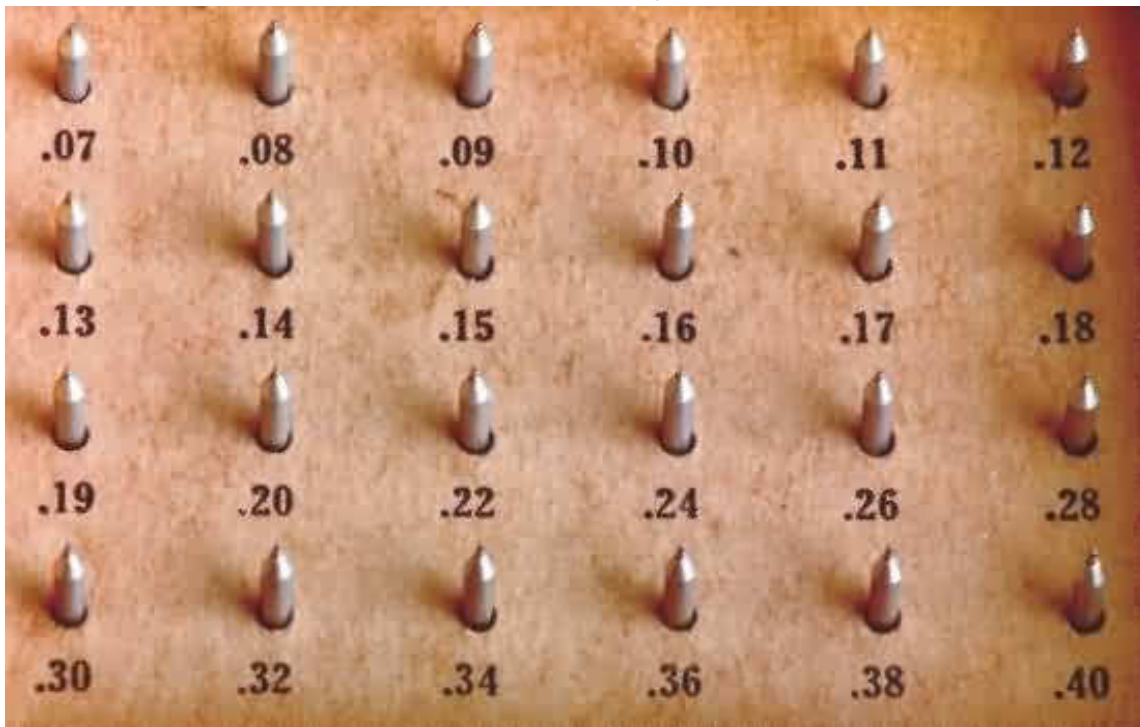




Measure the diameter of the pivot. A pivot gauge like this one makes this measurement easy ("12" is 0.12 mm.):



If you have no pivots, you could measure the inside diameter of the balance hole jewels ("0.12" is 0.12 mm.):



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By providing the watch's serial number, movement size, and balance pivot diameter, the parts supplier can provide the replacement staff (if you do not have the parts catalog to find the part number). Balance staffs come in all shapes and sizes:



Mount the hairspring side of the staff into a lathe collet that just fits onto it, and install the collet into the lathe:

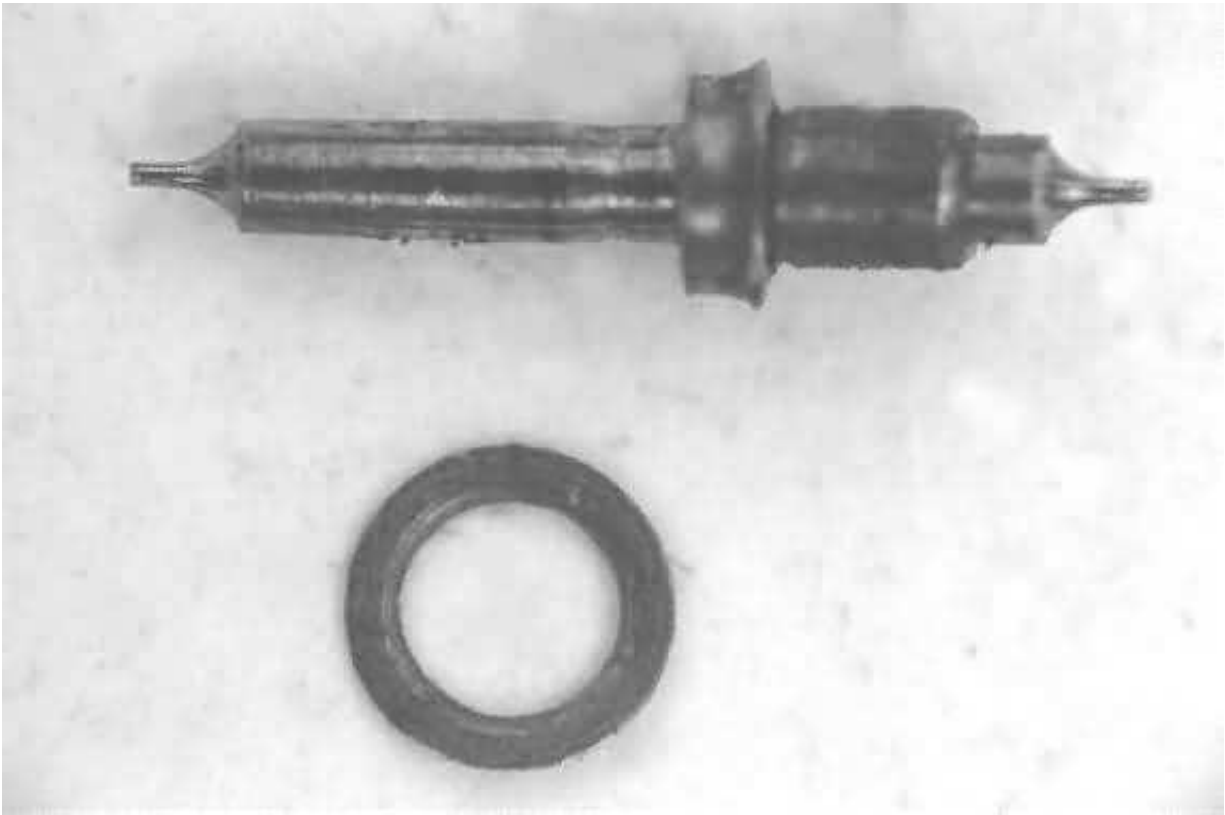




Use a graver to remove the hub on the staff. This is a steel graver (a carbide graver is much better for this purpose):



I hold the graver against the t-rest with the diamond-shaped side of the graver facing upwards and at right angles to the surface of the metal to be cut. Do not remove the entire hub in order to avoid cutting into the balance arm itself, but leave a very small amount of hub that will easily break off like a small washer. Here is a balance staff (from another watch) with the remainder of the hub (the small "washer"):



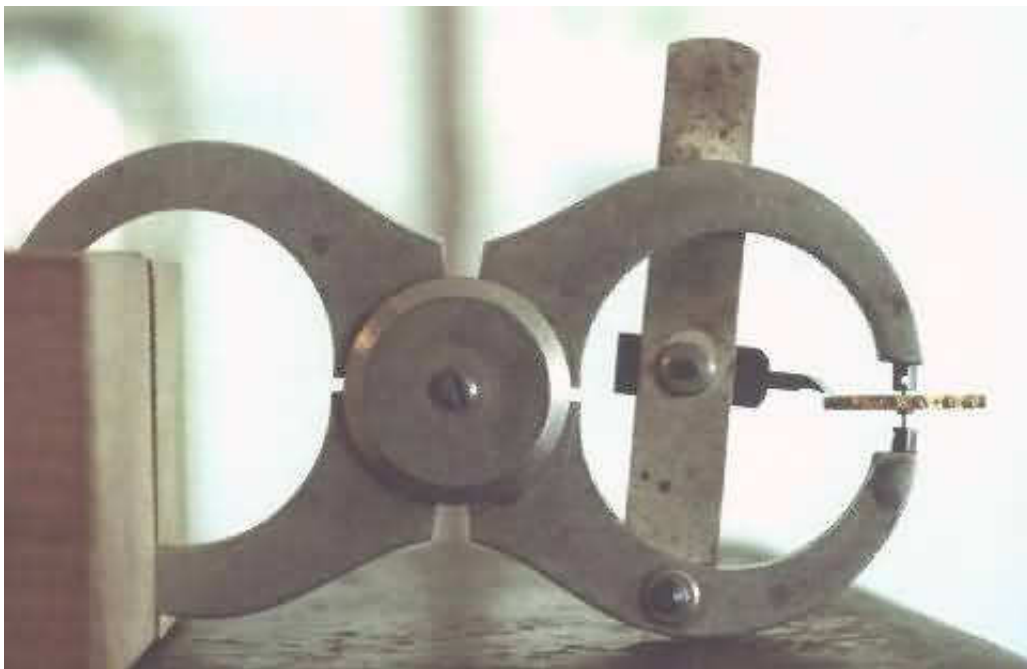
The balance and staff are mounted onto a hole stump (part of the staking set) with the hairspring side facing down. A hole punch with rounded edges is mounted through the hole at the top of the stake and over the end of the staff pivot. A small amount of tapping with a one-ounce hammer and the balance staff should fall out easily.



Place the new staff into a hole in the staking block, where the hole just fits around the staff, with the small shoulder just above the staff hub facing upwards. Place the balance wheel onto this hub shoulder and stake the shoulder over the edge of the balance using a round-edged hole punch first, to spread the shoulder, and then a flat-faced hole punch to "fold" the edge of the shoulder over the balance.

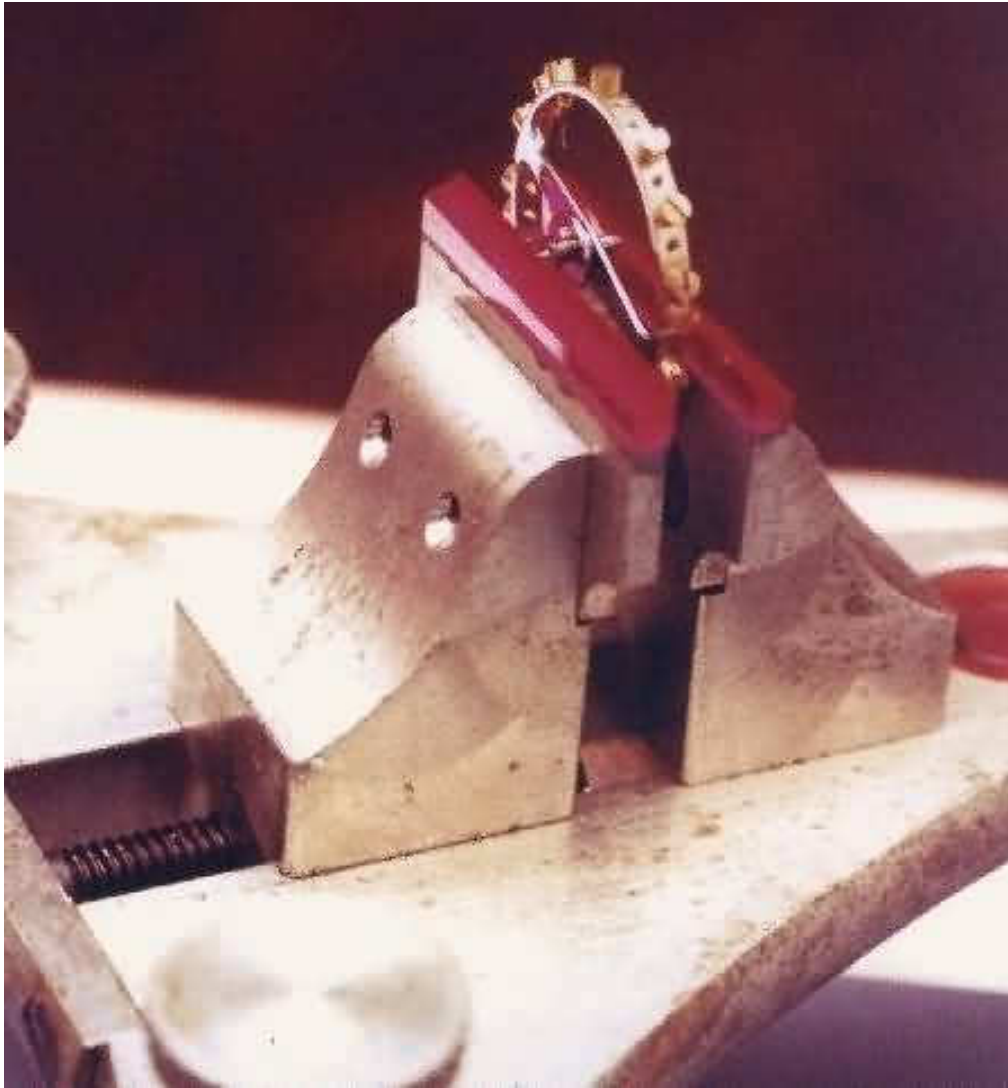


You must check that the balance wheel on the new staff is true:



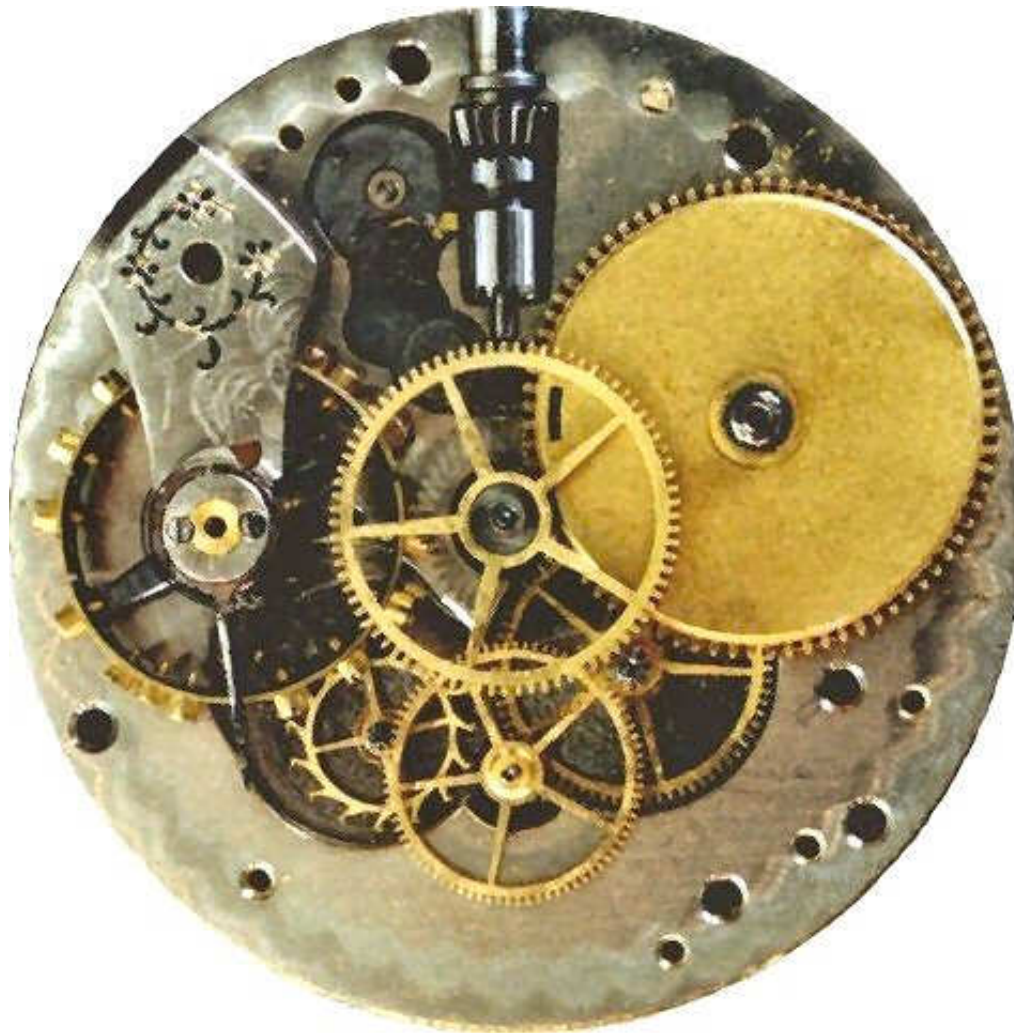


The roller table is installed under the balance wheel against the hub using the staking set. If the roller is a single roller, you must select a hole punch with a notch on the side for the roller jewel. This watch has a double roller, however. You must align the roller jewel with the marking you made on the balance wheel earlier. After staking on the roller table, you must check the poise (weight distribution) of the balance assembly, without the hairspring:



The poising tool must be absolutely level for this test. This poising tool has a bubble level built into it, which makes leveling it easy. If the balance wheel were out of poise, the heavier side would consistently rotate to the low side because of gravity. Weight could be added or removed by using timing washers or by undercutting one or more screws on the balance rim. Note that while you want to alter the weight distribution to poise the balance, you do not want to alter of overall weight of the balance or you would experience timekeeping problems.

Mount the hairspring onto the balance by pushing the hairspring collet onto the staff, using a flat-faced hole punch and the staking block (to keep the punch in a vertical position). The watch must be cleaned, repaired, assembled and lubricated prior to testing on the timing machine. Here is a photo of the watch with all the gears and other parts, but without the pillar plates, in order to show the gear train:



Please note that this essay is intended to introduce readers to a method for replacing a balance staff for a pocket watch or clock. This essay is not an adequate substitute for proper instruction from a qualified watchmaker. In other words, you could not go out and successfully replace a staff by just reading this essay: you must have appropriate instruction and guidance from an experienced watchmaker looking over your shoulder as you learn. There is no substitute for experience, just as there is no substitute for proper instruction.

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