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A New Type of Straight Grain Screw Head Polisher

A Quicker Way to a Fine Flat Finish

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Increasingly, high-end watches are being made with transparent sapphire backs so that their inner workings can be readily inspected and admired. Or, in skeleton clocks that are currently occupying the making skills of members of the Sydney Clockmakers Society, all metal components need to display a fine finish. What typically first captures the eye is the quality of the screws, especially if they are blued. Therefore, for the watch or clock maker, a fine finish on the screw heads warrants special attention. I present here a tool that was made a few years ago to impart a fine flat finish to screw heads in a very short time, avoiding the risk of circular score marks that can arise with polishers in which the screw is rotated. It has performed sufficiently well for me to conclude that others might like to make their own versions.

The new device uses the long, faceted body of a conventional hand-operated rotary screw head tool. Such a tool, made by Boley, is described by Britten[1], while a version made by Lorch-Schmidt is described by de Carle[2]. **Figure 1** shows the Lorch-Schmidt tool that I use.

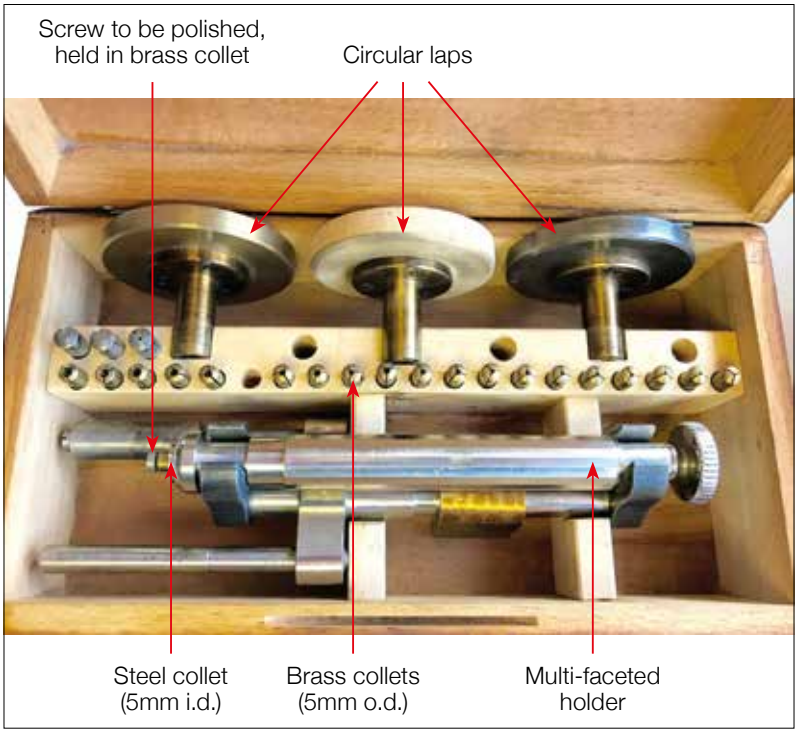

Figure 1. Lorch-Schmidt screw head polishing tool.

The new tool holds the screw head perfectly flat against a sheet of Emery paper that, in turn, rests on a flat glass platen. The screw holder is held in place by a knurled screw-and-arm on a carriage that has three small ball races and grooved rollers, which enable it to move up and down with no play, on a precision-ground steel bar. This bar is rigidly screwed to the main carriage, which has three sealed, steel ball races that serve as the wheels that run over the Emery paper on the glass platen. **Figure 2** shows the complete tool with a screw mounted in it ready for polishing.

A clearer view of the main carriage and the vertically mounted precision steel slider bar is shown in **Figure 3**, while **Figure 4** shows the sliding carriage that holds the screw head tool. The various metal components were salvaged from scientific instruments previously used in my research laboratory.

The slider bar is adjusted via its fixing screw (**d** in **Figure 2**) to be at right angles to the plane of the Emery paper, by using a set-square. However, it is worth observing that ultimately it is the axis of the screw holder that must be at right angles to the polishing plane, and yet in my tool the two axes are parallel.

Once the slider had been adjusted to be absolutely vertical to the Emery paper, the results of polishing screws have been very pleasing, **Figure 6**. In practice, I have found the best results of polishing are obtained if the screw slot is aligned parallel with the direction of travel of the main carriage. This means that the edges of the slot are kept sharp. Also, an advantage of this tool over conventional rotary polishing is the relative ease with which the screw slot is brushed out to free it of abrasive and metal fragments before transferring the work to Emery paper of a finer grit.

I hope other watch and clock makers might be encouraged to make their own versions of the tool and increase the speed and fineness of the outcomes of their screw polishing.

ENDNOTES

1. *F. J. Britten, The Watch & Clock Makers' Handbook, Dictionary and Guide* (Baron Publishing, Suffolk, UK, 11th edn, 1915, reprinted 1976) pp324–325.
2. D. De Carle, *Watch & Clock Encyclopedia* (N. A. G. Press, London, 2nd edn, reprinted 1975) pp220–221.

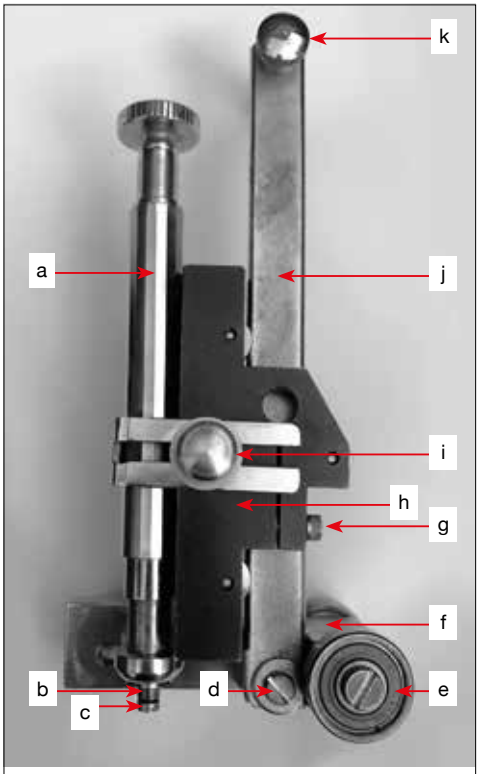

Figure 2. The new type of screw head polisher

Key

a. Mounting for the holder of a Lorch-Schmidt screw head tool.

b. 5mm o.d. brass collet selected from the set in the Lorch-Schmidt box.

c. The screw to be polished.

d. Mounting screw for the vertical, precision steel bar.

e. One of the three 22mm sealed, steel ball races, mounted on 5mm metric cheese-head screws.

f. Main carriage of nickel-plated brass.

g. Screw to adjust the rolling resistance of the three steel ball races on the sliding carriage.

h. Sliding carriage on which are mounted three 7mm steel ball races, each inside a grooved steel pulley.

i. Knurled knob that locks the bracket to secure the Lorch-Schmidt holder.

j. Precision steel slider bar (160 x 13.75 x 3.15mm).

k. Knurled knob to prevent exiting of the sliding carriage.

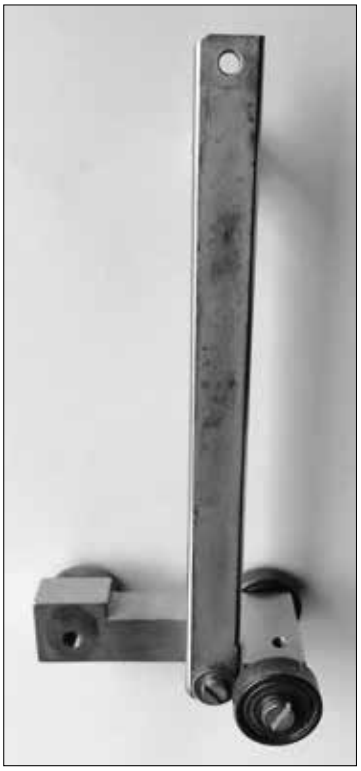

Figure 3. Details of the main carriage, with its three 22mm sealed, steel ball races that serve as wheels, and the vertically mounted precision, steel slider bar; the hole at the upper end is for item k *in* Figure 2.

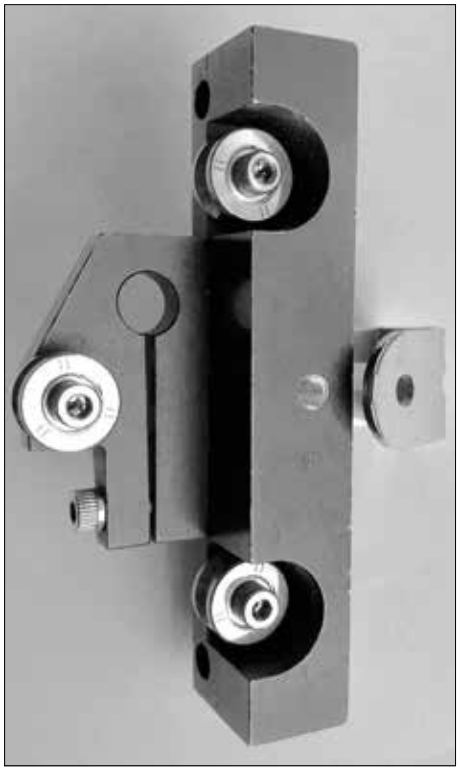

*Figure 4. The sliding carriage to which the screw holder is attached. Note the screw (*g *in* Figure 2*) for adjusting the rolling tension of the ball races.*

Figure 5. Close up of a screw head being drawn across 1200-grit Emery paper that rests on a glass platen. Note the streak of iron filings on the paper.

Figure 6. The screw head after a further few strokes across 3000-grit Emery paper.

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Further Discussion

When this article was reviewed prior to publication, the Technical Editor discussed with the author whether this tool is not perhaps more complicated than is required. The results of that discussion are reproduced here so that students and other readers may benefit from this related information.

A simple old-fashioned bolt tool can certainly perform the task. Such a tool is depicted in De Carle's *Watch & Clock Encyclopedia*, p69 (referenced in the second endnote). It has two hardened screw shanks, which together with the screw head (the one to be polished) form a tripod that is pushed across the surface of Emery paper. However, the rounded ends of the screw shanks do not provide reproducible straight tracking of the screw head in the way that the three ball-race wheels do on the new device. In other words, the bolt tool is prone to (however slight) rotation relative to the direction of pushing across the Emery paper. This does not occur with the new tool.

The three wheels (sealed ball races) of the new tool are arranged so that the main carriage is always parallel to the Emery paper. On the other hand, this parallelism must be set up for each new screw in the bolt tool.

Downward pressure on the bolt tool carriage is transferred to the screw head and to the ends of the screw shanks, unnecessarily grinding away these ends (unless they are extremely hard), thus damaging the Emery paper. Of course, if the screw shanks are too soft they will be ground away, risking loss of parallelism of the carriage to the grinding surface. On the other hand, the main carriage of the new tool rolls across the surface of the Emery paper, with the only cutting being on the screw head that is being polished. This means that the Emery paper should have a longer life.

Another type of screw head polisher is made from a fairly sturdy triangular piece of aluminium plate about 18mm thick, or plastic polymer, with a height-adjustable foot near each apex. In the middle is a fixture that holds a watchmaker's collet including a small drawbar. This is essentially the same as the bolt tool, but the screw (the head of which is to be polished) is held more gently in a collet, and the adjustment of the height to make the main carriage parallel to the Emery paper is simpler. However, this tool also lacks the advantage of absolutely straight tracking afforded by the main carriage of the new tool that has three wheels (sealed ball races).

In the new tool, a watchmaker's collet with its small drawbar could readily replace the multi-faceted handle of a Lorch or Boley screw head polisher. However, one advantage of using the Lorch or Boley tools is that the (soft) brass collets they employ can first hold the screw in a 5mm collet on the watchmaker's lathe. The sides of the screw head are first turned down and simply polished in this, before transferring the screw-plus-brass collet to the screw head polishing tool, thus preserving alignment of the screw in the collet.

A traditional bolt tool, or for that matter the Horia tool, can have one flat edge simply run along a block laying alongside or clamped near the edge of the Emery paper. This can ensure perfectly straight graining; but then the straight edge must be moved to gain access to a fresh region of the sheet of Emery paper. This is tedious and cumbersome, compared with the new tool which can simply be lifted across to a new region of the paper and the tracking is intrinsically, perfectly straight.

I agree that it is important that as craftsmen, we need to develop our judgement and freehand skills. When myriad screws are required to be polished, however, it is best not to rely on continual applications of fatigue-prone judgement.

There have been observations that often the quickest way to a flat and scratch-free surface is to randomise the grinding/polishing action. This new tool applies the abrasion along one axis only. For the screws I am making, I decided to leave uniform graining as it shows up the flatness of the screw head better. This fine graining can just about be seen in **Figure 6**.

I would like to reassure the reader that the precision sealed ball races, which are a key feature of the new tool, are readily sourced on the internet. All the other components should be within the making skills of most home machinists/clock or watch makers.

Overall, it is both the ease of making the top surface of the screw head parallel with the Emery paper (this occurs automatically without having to use set-up screws), and the precision of the straight tracking of the screw head across the Emery paper (making for a finer finish), which sets the new tool apart from its predecessors. Its success rests on modern sealed ball-race technology and using three ball-race wheels on the main carriage.