A balance vibrating tool – 11

by Guy Gibbons

Making a 'scaffold'

If constructors of the vibrating tool are pleased with their work, they may wish to construct a 'scaffold' to allow them to experiment with bringing spring-balance assemblies to their approximate rate. A design for a scaffold is now described which, while it does not have the feel and sophistication of a professional tool, does allow the tool to be used for testing spring-balance assemblies.

The constructional processes are not representative of the core skills needed for an horologist, though clock students will find the ability to make highly-finished wood and brass parts useful in their future careers.

Materials required

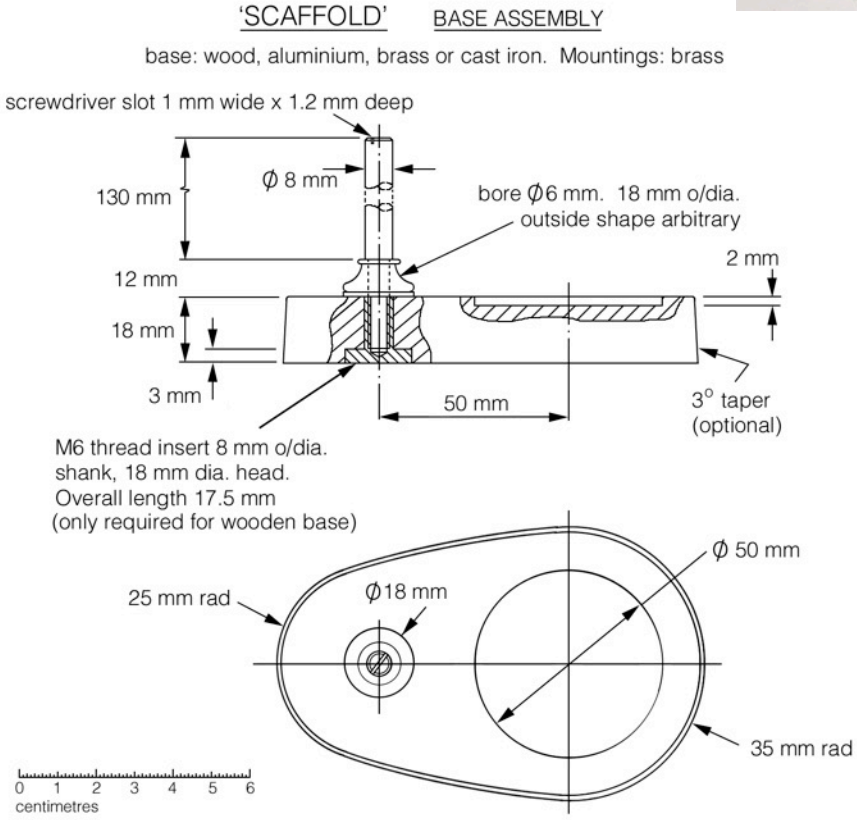
For the most part materials can be selected from oddments that you might have to hand as some variation is possible. However, most of the components can be got out of the material in the following list:

- 150 mm length of $^{3}/_{4}$ in. dia. (20 mm) brass bar
- 50 mm length of $^{1}/_{2}$ in. dia. (12 mm) brass bar
- 50 mm length of $^{3}/_{8}$ in. dia. (10 mm) brass bar
- 200 mm length of 8 mm dia. brass bar
- 150 mm length of 6 mm dia. brass bar
- Either: 110 mm length of 75 mm x 18 mm thick metal section (aluminium, brass or cast iron),
- Or: If a large piece of metal for the base is not available, a piece of mahogany or other hardwood is eminently suitable.

The 'tweezers' for gripping the balance spring would be awkward to make, so the design uses a modified ruling pen available from many artist's suppliers:

- Jakar ruling pen, Cat. 1191.

Other materials you may need include a short length of silver steel to make the 8 BA screw, a piece of baize, and paints or polishes to finish the base.



Design and drawings

As mentioned the scaffold does not require workshop skills unique to horology, and so it is optional. Consequently, no detailed drawings or description of how to make it are included; rather a general appreciation is provided, highlighting a few options for its manufacture.

Because the drawings are not fully detailed, a scale is included for information. Drawings should not normally be scaled, partly because draftsmen work to the stated measured dimensions and partly because one can never be sure how

much distortion has been introduced by the reprographics machine. Drawings should never be scaled for critical dimensions.

Construction – base

Making the scaffold will not be possible on a watchmaker's lathe, though that having been said, it is quite possible that some ingenious students will prove this statement to be wrong. In the drawing the base is shown pear-shaped with some taper and curvature to the sides, but a rectangular block would save quite a lot of sawing out, especially if starting from a slab of metal. Indeed, several of the shapes are primarily there for aesthetic reasons rather than functionality.

There are no particular features that need special consideration, though the 50 mm dia. recess for the vibrating tool should be a snug fit on the base flange, which means it must be bored in the lathe by holding it in a four jaw chuck or routed (milled out) on a rotary table held in the vertical milling machine.

upper two photographs: the wooden base to the scaffold showing the brass insert

right: the bottom surface after glueing-on and trimming the baize

It is possible to fit two diametrically-opposed screws to clip the base flange it into position, but these are not essential. If using wood for the base, a thread insert to take the post should be fitted and secured with an epoxy adhesive (e.g. Araldite). The loose shaped collar above provides a larger bearing surface to prevent crushing of the wood from above; note the bore of this shaped collar is 6 mm dia., and the post is 8 mm dia. to provide the clamping effect.

Once you are satisfied that the base is complete (and the recess is the correct size for the vibrating tool baseplate), the base can be finished in whatever way you want. However, there is always pride to be taken in using a well-finished tool so do not skimp on it. If using brass, bring it to an appropriate finish and lacquer it; if using aluminium of cast iron you will probably want to paint it. If you have used a piece of hardwood as in the prototype, rub it down with 600 grade wet and dry paper before finishing with an appropriate varnish or polish.

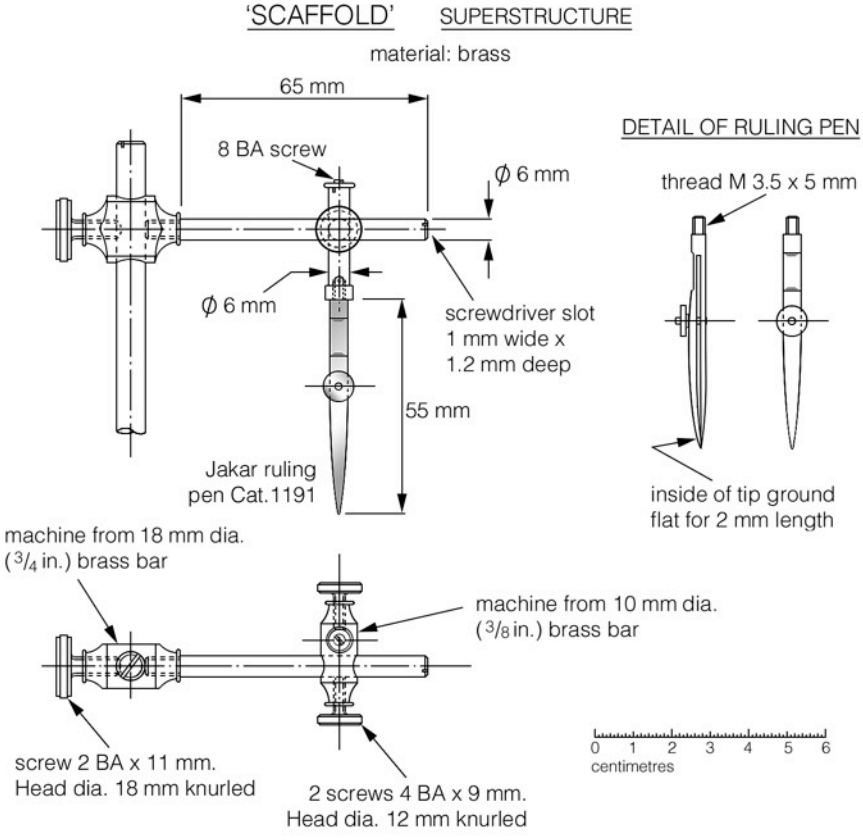
Once the base has been completed, a piece of baize (not felt – baize is woven, felt is not) should be glued to the underside. If wood, use a thin and even layer of PVA woodworking adhesive; if metal, an impact adhesive again spread in a thin and even layer may be more appropriate. Once set, trim any excess baize and whiskers off with a sharp pair of scissors, taking care not to damage the paint or polished finish.

Construction – superstructure

All components are made from brass bar or rod, and the more tricky items are the two right angle clamp blocks that support the rods. Round bar is suggested, but they could be made of rectangular or square section, which will make accurate cross-drilling easier, especially for the smaller clamp with its two cross-holes at 90 degrees. The outside shape of the clamp bosses is largely a matter of choice, but some shaping makes the tool look more professional. For the brass parts illustrated this was achieved by a combination of a shaped lathe tool held on a top-slide to remove excess metal and define lengths and diameters before finishing with a hand-held graver and T-rest.

The clamp screws are ideally knurled, which, because it involves high forces, should be done as the first operation. A good knurled finish is distinguished by the crests of the knurl being formed to a sharp V-edge. If you are knurling dry (i.e. without a copious supply of cutting fluid) you should stop now and again and remove any slivers of brass with a wire brush so they do not become embedded in and/or tear the knurled work. M5 and M3.5 threads are suitable alternatives to the 2 BA and 4 BA threads shown in the drawing. A screwdriver slot cut in the end of each rod facilitates tightening in the respective boss.

The clamp blocks are brought to a high finish before lacquering with a proprietary metal lacquer. The rods are



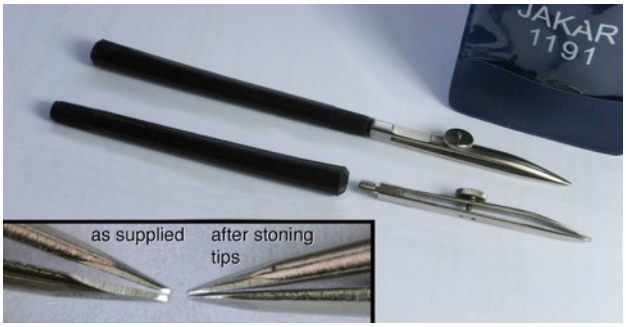
not lacquered as lacquer would both prevent the clamp blocks sliding easily and be scraped away; instead they are brought to a good finish and protected with a light coat of easily-repairable microcrystalline wax.

details of components of the scaffold

The ruling pen 'tweezers'

The Jakar ruling pen is a well-made instrument for its price but does need a little modification. Firstly unscrew the plastic handle, which is secured by a M 3.5 thread (3.5 mm dia., 0.6 mm pitch). You will need M 3.5 mm taper and plug (bottoming) taps to thread the brass rod to which it is secured. You may also need to clean the threads of the ruling pen with a 3.5 mm die; in the prototype the thread was slightly large in diameter, perhaps to ensure it was a tight fit in the plastic handle.

The tips also need some attention; as a ruling pen the two tips do not close up parallel but touch at a point. We need them to close parallel so they will grip the balance spring correctly, and this is best done by stoning then using a diamond slip; these are available in a variety of grits in the form of a thin card (the size of a credit card). Aim to get a 2 mm length to close parallel before removing any roughness to the edges by drawing them through wet and dry paper down to 1200 grade. Finish the tips so they are of equal length, and after assembling the work is complete.



The ruling pen head is screwed into the 6 mm dia. rod finished in the same way as the other rods. A stop washer held to the upper end by an 8 BA screw as shown in the drawing helps prevent the tweezers dropping through when being finally adjusted for height. If it drops down it may damage the spring balance assembly under test. If you fit a washer, make sure you tap the hole for its 8 BA securing screw before you cut the screwdriver slot in the end of the rod.
