

Hints on selecting bushes & broaches

We often get asked for assistance in selecting bushes and cutting broaches for clock repair purposes. This document assumes you are bushing by hand without the benefit of any outfit or depthing tool etc

Points to remember:

- Replace as little as possible of the original clock plate.
- Always bush from the inner face of the plate.
- Try to get the centre of the new bush where the *centre* of the original hole was before it became oval.
- Bushes need to be riveted in place when fitted by hand, so the inner hole will get slightly smaller.
- Attend to the pivot where necessary before contemplating bushing.

Cutting broaches are five sided, and tapered. The measurement given in the catalogue is the effective diameter of this 5 sided cutter, about 10mm from the shoulder. The taper is 0.01mm. so the diameter decreases about 1mm per 100mm in length. The length is listed in the catalogue, so you could, if you wished, estimate the starting diameter.

Select a bush simply by identifying the smallest one that can be used, and whose length is greater than or at least equal to the thickness of the clock plate. The outside diameter of this bush dictates which cutting broaches you will definitely need. You will need others to complete the work. Bergeon bushes increase in diameter in regular steps:

Bush diameter	Broach no.	Max. diameter.	M&P broach no.
2.00mm	42	2.33	0547 023315
2.50mm	36	2.69	0547 025615
3.00mm	30	3.22	0547 032215
3.50mm	26	3.70	0547 037015
4.50mm	14	4.70	0547 047015
5.50mm	2	5.94	0547 059415

The broaches listed above will enable you to enlarge a hole so that the bush is a tight fit. Broaches are tapered, so always work from the inside. This will prevent the broach from being able to work its way out in time.

Bushing by hand makes it much more difficult to start enlarging the hole from the original centre, and if you have a small bench drill you may find it more successful if you use a small twist drill to get started. Only use a drill to make a round starting hole from which to work.

Carefully enlarge the old hole with the broach. A useful way of holding a broach is not with a conventional wooden handle but a tap wrench. This will help you to keep the broach at right-angles to the plate. Check regularly that your hole is smaller than the bush you plan to use.

When the hole is just large enough for the bush to enter, consider carefully if it is now big enough to fit. This decision comes from experience, so always do your first bushing on a scrap clock plate.

When the hole is the right size, place the plate face down on a hard surface (protected in some way so as not to mark the surface), fit the bush with the oil sink downwards and rivet it in with a clockmakers hammer. The hammering process will spread the bush to make it a tight fit, and also help harden the brass.

With a bulls foot file, remove any surplus bush. You can also use a burr remover, with a clock pin inserted in it to act as a centring device.

Assuming you have attended to any wear on the pivot, measure the diameter and select a suitable cutting broach. Broach out the new hole to match the pivot. Smoothing broaches can be used to polish the inside face.

The oil sink can be improved dramatically by using a roller sinker. This will cut a neat oil sink and help disguise the fact that the clock has been bushed at all. In fact, well done re-bushing is almost invisible to the inexperienced.