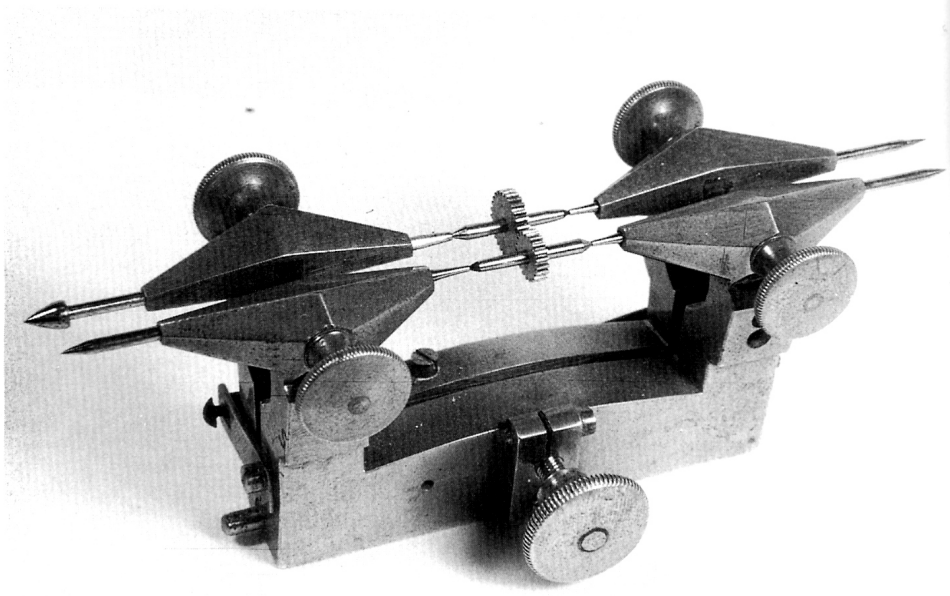
ELEGANT ANTIQUE GEAR MESHING

TIM WATSON, who knows a thing or two about teeth, found an invaluable modelling aid on the second-hand market. Similar tools are still available – at a price – and, as Tim demonstrates, may be worth the investment:



The rather elegant device shown in the accompanying photograph is used in the watch and clock-making profession for determining the depth of mesh of gears. So what use is such a gadget to an MRJ reader? With the advent of the many superb gearboxes now on the market, probably not as much as once would have been the case. Not all situations will allow a large gearbox, especially in models smaller than medium-sized prototypes in 4mm scale. As every modeller who has tried it will vouch, nothing is easier than setting up the correct distance between fine gears than by using the known meshing dimensions of the gears in question. All one then has to do is to accurately transfer these measurements to the bits of metal, drill the holes and ... who needs a Portescap gearbox? Unfortunately, life is not really that simple, with annoying little problems like eccentric gears, slight irregularities in tooth form (a dentist might call it a 'malocclusion') and many others which conspire to jam up our gearboxes. The reason our professional colleagues use the device illustrated is that it is far better to set out gears using their actual meshing distance, determined with the gears in action, than to rely on theoretical doodles on the backs of envelopes.

Most readers can probably see immediately how the depthing tool can be made to work. To state the obvious, the relevant gears are set up on little mandrels (rather like pin-point axles with a taper on them). These are placed between the four bearing 'rods' which have cupped housings for the pin points in one end. The rods pass through lockable brass bearings in two jaw-like structures and end up as sharp scribing points. The distance between the gears is adjusted until they run sweetly, by tweaking the knurled knob (at the bottom) on the side of the instrument. This has the effect of opening or closing the two brass jaws up to about an inch, along with the parallel sets of bearings and scribing points. Marking out is easily achieved, if one simply wants to see if a particular scheme of gears looks as if it might work. If it is being set out for real, however, a hole at some important part of the gear train is marked and drilled to a smaller than final size. The larger cone-shaped rod end is then centred in this hole and the arc of the meshing distance for the first set of gears marked out. The second hole is then cross-marked, drilled and the process continues. Laying out a quite lengthy gear train is relatively easily achieved, the only worry now being how accurately the holes can be drilled.

All twist drills will require some form of depression or dimple for the drill tip to run in, otherwise they have an annoying little habit of skidding off across the workpiece. The classic method for starting a drill is to take a centre punch, run it along one line until it clicks in the cross line and then wallop it, to make the required indentation. More refined individuals may use a sprung punch or, if they are working on big enough sheets of metal, an optical centre punch. A method which someone showed me (I can't remember who) uses a ground up steel gramophone needle to cut the dimple for the drill. The end of the point is converted into a three or four-sided pyramid using a fine carborundum stone. This has the effect of making the point into a cutting tip. If rotated in the intersection of the two cross lines on the sheet of metal a beautiful little dimple is produced; I have found this method gives much more control of marking out for drilling operations than any other system tried.

Actually drilling the hole can still be a problem, in locating the drill end in the dimple. With a small drill held in a drill press, it is possible to bend the drill shank by not having it truly located over the dimple. Carefully rotating the chuck by hand with the drill held in the dimple, but with the sample free to move, will enable the drill to automatically find the true centre. Once this has been achieved, the work piece is held more firmly and the drill can then be used to cut the hole at full speed. Of course, some erudite reader will observe that steel gramophone needles are about as common as watchmakers' depthing tools these days. An easily found alternative is a small masonry nail. Even so, does anyone know a source of needles, because they are jolly sharp and very useful?

It is almost inevitable that this little article will spawn correspondence describing a whole host of alternative techniques for achieving a similar result. At the end of the day the holes may still be a bit out of position and so the botcher's technique of stretching the hole one way or the other with a needle file, and then reaming to size has a lot to commend it. Reamers and broaches are very useful items, because they enable an undersize hole to be brought up to the correct size. How many times have you found the drill required languishing in two halves in the tool box late on a Saturday night?

The depthing tool is undoubtedly an elegant way of assessing gear meshing centres. The sting in the tail is the price. Recent research has revealed that the going rate for one of these devices is around the £250 mark. The smallest, new, versions I have been able to locate have a 2½in capacity, which is quite a bit bigger than most modellers would need. The depthing tools are virtually made to order, which is obviously reflected in the price. My version was purchased secondhand in the early 1980s and cost about £20 – quite a lot of money then, but it has certainly earned its keep, being passed around various members of the 2mm groups in the MRC. It is the sort of thing that a group of modellers might consider clubbing together to buy and share. I suspect that the smaller versions may be quite plentiful on the secondhand market, because of the virtual non-existence of the mechanical watch-making industry (clocks being much more plentiful). It's an ill wind that blows nobody any good and so who knows, modellers may be able to outdo Portescap. Happy gnashing.