MICROSCOPE on the lathe-7

optical tailstock

ANY tailstock which has a reasonablv lage bore can be fitted with an objective lens and an ocular to make a microscope by which work can be set up precisely in the chuck and on the faceplate.

This is an interesting project which can be tackled with confidence by all turners, even beginners, for there are no awkward machining operations to cause doubt about the outcome. Cost is small. The job can be done in a few hours.

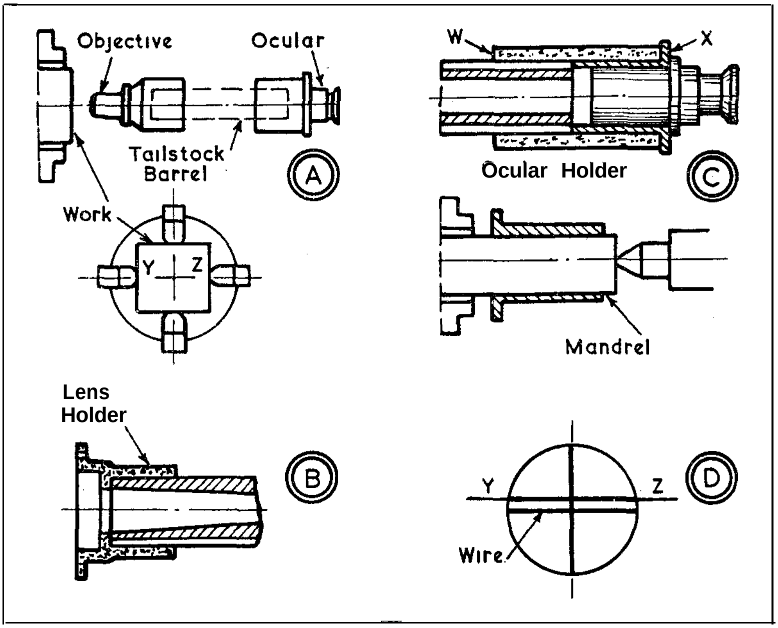
The idea is to look right through the tailstock at scribed lines or centre punch dots on work which is clearly seen at a magnification depending on the power of the lens and the ocular.

The ocular, Huyghenian or Ramsden, should have a cross wire, the fitting of which has been described in recent articles. The objective (lens) can be a low-power microscope objective, with the front glass removed to increase working distance. This gives ample magnification.

Alternatively, you can use the lens from a small camera (not the bubble or meniscus lens of a cheap box camera): or the lens from an enlarger will do as well. Either gives sufficient magnification for accurate setting-up. The hole through the tailstock should be about 3/8 in. for a good field of view. There is no need to blacken its surface, as I find that reflections are not a problem.

Using a microscope for fine measurements is an old principle with wide applications in modern times. Our English unit of length comes from the Imperial Standard Yard, which *is* a bronze bar 38 in. long, with two gold plugs at 36 in. spacing. On the plugs are transverse fiducial lines to which microscopes can be set. In the Eden millionth comparator, which is NPL design, an optical system projects the shadow of a cobweb on to a Iong scale, giving very large magnification for small dimensions. These examples show us that our methods are firmly based.

Diagram ***A*** shows the method with a tailstock. The objective is attached to a fitting which is slipped on the nose of the barrel. The ocular is mounted in another slip-on fitting at the tail end. The work, which is shown in an independent chuck, is marked with cross-lines. We need to bring the intersection of the lines to the spindle axis.



We begin with a rough setting by normal methods. Then we bring up the tailstock and clamp it. While looking through its bore, we advance the barrel until the cross lines are clearly visible. We bring one line, YZ, level with the cross wire in the ocular, diagram ***D.*** then we turn the chuck 180 deg. and observe again. The movement of the line, up or down,. indicates how the work must be adjusted to bring it true. We set the other line in the same way.

It may happen that the cross-wire is on the axis of the spindle at the first setting; but we can correct this initial error through our ocular holder. It includes an eccentric bush, so that by holding the ocular and turning the bush we can lift or depress the line. Then we dot mark the parts for future fitting.

Aluminium alloy, duralumin or brass can be used for the lens and ocular holders. All give minimum trouble in turning and screwcutting -for a thread must be provided to fit a microscope objective. For other lenses, it is all plain turning, unless your camera lens is a screw-in one, when, again, a thread must be cut.

Diagram B shows a holder for a camera lens with a flange fitting by three small screws. The billet is rough-turned and finished in the bore for the tailstock. Mount the work on a mandrel by this bore for turning the flange and boring the recess.

Diagram C shows the ocular holder. Part ***W,*** which fits over the thread of the tailstock barrel, is a plain inside-outside turning task, finished on a mandrel. Part X, the eccentric bush, has a flange for rotating. If required, its edge can be knurled. It is finished on a mandrel, off-set and centred for support by the tailstock.