MICROSCOPE ON THE LATHE-12 :

Adapting a star diagonal

BY USING a star diagonal, a right-angle microscope can be made to fit into the tailstock barrel, like a centre. It is used, like other microscopes which I have described, for setting work in the independent chuck and on the faceplate.

Besides the star diagonal you need a microscope objective, or a camera lens, and an ocular. The remaining parts can be made from stock material, all by straightforward operations on the lathe.

A star diagonal is a right-angle tube containing a 45 deg. prism, which turns a line of sight through a right-angle. When it is used for a microscope on the lathe, you look down into the ocular, .or from a convenient angle at the front of the machine, through the prism and the objective lens, and along the lathe axis at the work.

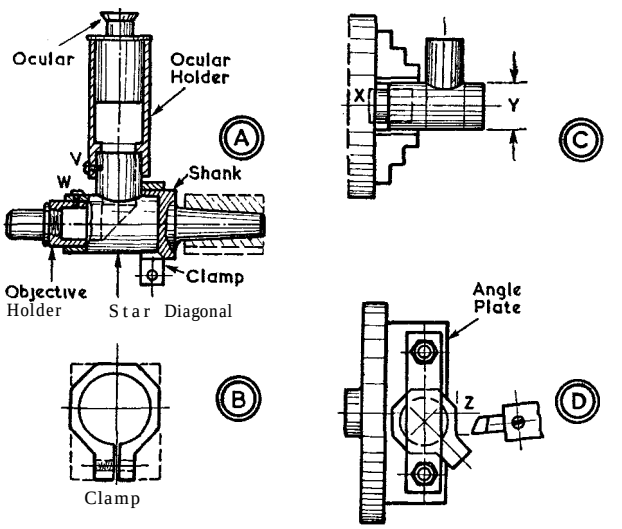
Amateur astronomers use the gadget to make a star-finder for a large telescope, or in a camera by which to photograph objects in the night sky. For lathe users, it provides the basis of a handy microscope, as it is of substantial proportions and just the right size. Mine was obtained from Charles Frank Limited, Glasgow.

Parts which must be added to the star diagonal to make a lathe microscope are shown in diagram A. The ocular and objective can be taken from another microscope, and the objective be fitted with an optical micrometer. The ocular holder is a long sleeve which is bored at one end to take the ocular as a sliding fit, and at the other to fit over the smaller tube of the diagonal. It is fixed by a small screw V. The objective holder is a bush for the front end of the larger tube, into which it is pushed to be held by another small screw W. The front end is screw-cut for the microscope objective; for a camera lens it would have a flange. The shank-as I have called **it–** is like a large pad centre for the tailstock barrel. It is bored a close fit for the back end of the diagonal, and is slit in three places for a flat clamp, which is secured by a screw. A front view of the clamp appears at ***B.***

Materials required are a piece of duralumin 1 1/4 in. dia. X 1 1/2 in. long for the objective holder; a piece of mild steel ⅜ in. dia. X 3 in. long for the shank; a piece of duralumin 3/8 in. thick X 1 5/8 in. X 2 in. for the clamp; and a piece of duralumin about 3 in. long for the ocular holder. This last piece must be 1 1/4 in. dia. to fit over the small tube of the diagonal; whether or not it must be larger, depends on the ocular which is used. Alternatively, the ocular holder can be made from tubing with a bush for the diagonal; as no dimensions are binding, it can be much longer than the 3 in.

To be a perfect fit in the end of the shank, the star diagonal should be lightly skimmed and faced in the independent chuck by a set-up as at C. Inside and outside burrs should be removed first, and a plug X be turned to fit in the open end, so that the grip can be firm without risk of distortion. At the other end, diameter Y after the cleaning cut can be 1 5/32 in. for a length of 13/32 in.

To machine the shank, first face and centre the 3 in. length of mild steel. Then hold one end in the chuck, with the other supported by the tailstock centre, for roughing to the top diameter of the taper. The topslide setting for the taper can be taken from one of the lathe centres, which.. also provides the diameter to which callipers are set. After the last cut with the tool, a fine finish can be given with a Swiss file. Then the shank is



fitted in the spindle, by its taper, for the remainder of the machining. The three slits can be cut with a fine handsaw.

Making the clamp for the shank is a task whose main interest concerns the finishing of the outside. It looks quite neat as a quasi-octagon, whose flats can be machined on a set-up as at D, with chopping cuts from centre Z.

The ocular holder is made to suit the ocular to be used. The objective holder is screwcut in the chuck, 36 t.p.i., Whitworth form. The hole is bored 0.767 in. If you are doubtful about picking up the thread, stop the lathe and turn it back to begin another cut.

* ***To be continued***