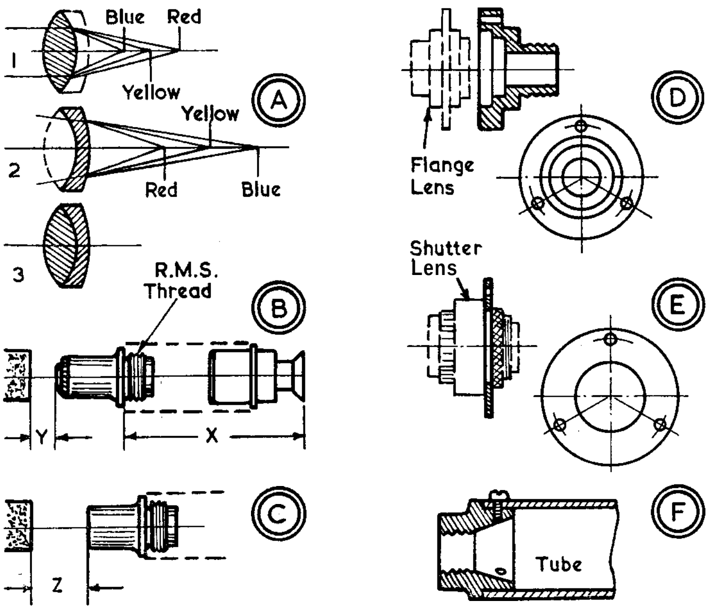
MICROSCOPE on the lathe – 6



IT is true that fine work can be done on the lathe without the aid of optical instruments which, by themselves, cannot produce anything.

The same may be said of micrometers, whose functions are similar -to impart information and help decisions. With micrometers you check dimensions very precisely. With microscopes you go a stage further and verify shapes, alignment, finishes, and so forth. The result is a better understanding of matters which many craftsmen who have been trained in traditional ways tend to forget. They look on optical instruments as luxuries. Our grandchildren may well regard them as necessities.

We all know how important it is for parts to be properly designed and precisely made with good surface finish. We do not neglect their lubrication, but we sometimes forget some rather elementary facts.

By a simple calculation we arrive at the theoretical surface area of a journal on a shaft. Suppose we finish the surface with a Swiss file. We place a piece of clean paper under the work and collect the swarf. Then we examine the fragments under a microscope, noting their intimidating roughness. The surface from which they have been torn is similar.

We can imagine this surface in contact with another like it, the two touching at the high spots. It makes nonsense of our calculation of surface area ! We see that finish governs contact area.; and we realise that to prevent keymg and seizure, lubrication is all-important. In fact, the rougher the finish, the smaller is the area of contact, and the greater the burden on lubrication.

Tools provide other shocks. Under a microscope we see the Stone Age caricatures of “ points ” and “ cutting edges ” on our worn scribers, centre punches and lathe tools. As never before, we appreciate the need for us to give time to their upkeep and care to their use.

Knowledge of a few facts in optics equips the practical man to make the most of his own instruments, now that optical components are obtainable in variety. Oculars can be bought for about 50s. and for objectives we can chose according to our needs.

A simple magnifying glass does not give good results, for the reason shown at *A1*. Rays of different colours focus at different distances; but when a lens of this type, in crown glass, is supplemented by the type shown at A2, in flint glass, to make the lens at A3, the aberration is corrected at one distance and is very small at others. In a microscope, it is usually a set distance, but the draw-tube allows for adjustment here as well as for altering magnification. For workshop use, exact correction is not essential as we are looking at a narrow range of yellows and greys. A 60-watt lamp is all that we need.

The set distance of a microscope, X in diagram B, can be varied through the tube; and the working distance Y for the objective can be increased to Z, diagram C, by removal of the front lens. Working distance is less than the focus. I mostly use a 1 in. objective, which has a normal working distance of 13/32 in. This I increase to 7/8 in. by removing the front lens. By using the lens of a small camera,. I get 4 in. working distance, and the Ross lens of a Selfix I get about 6 in. These longer distances are a help in looking into things like clocks and speedometers.

A microscope objective has an RMS thread which can be easily cut on a lathe. It is 36 t.p.i., Whitworth form. The maximum outside diameter is 0.7982 in., and the minimum 0.7952 in. The corresponding root diameters are 0.7626 in. and 0.75%.

My small camera lens has a flange mounting, and I use it in the ordinary microscope with a duralumin adaptor, as at *D*. This has the RMS thread. A lens with shutter can be mounted on a ring, as at *E*, and then in a similar adaptor.

When you make your own microscope tube, the end for the objective can be as at *F*, in brass or duralumin. This inside RMS thread has a maximum top diameter of 0.803 in., and a minimum of 0.800. The maximum root diameter is 0.7674, and the minimum 0.7644. ❑