

# Using the PROFILE PROJECTOR

By GEOMETER

ONCE you have a profile projector, getting the best from it is usually a straightforward job. By understanding a few easy principles it is hardly possible to go wrong. It can be used to verify angles on small tools and parts, and it will give a good general check on profiles to the eye alone. Generally, it can also be used for actual measurements by setting up from a simple reference gauge.

First, a check should be made on the lens itself to see if it has a "best" setting. It may have if it is one with an adjustable front cell for focusing down from infinity. But usually it can be left on infinity. If a separate camera is used rather than a lens in the end of the box, it may be possible to get best results by slight sideways adjustment on the mounting.

## Checking plate

With a plate or film carrier, a checking plate to set up can be made from a clear photographic plate or a piece of glass. Some small washers, all the same size, can be laid on it in a pattern as at A, and each fixed with a blob of adhesive in the bore. The plate can then be set up, washers towards lens, for their sharp projection at various distances. It will be seen if all focus at the same setting; and the shadows, magnified enough, can be measured as a check to ensure they are the same size.

In the centre of the field a lens is most accurate, though all-over definition is usually improved by stopping down—which may mean turning off the room lighting to maintain sufficient contrast.

Without a plate or film carrier, a check can be made in another way. The carriage for tools should have a stop fixed across it in front of the condenser, as at B. A piece of rod in a block can then be pushed across the field from S to T, as at A, and its shadow checked for sharpness and size.

A stop on the carriage is necessary for quick repeated checks on tools like drills when grinding. The checking diagram can be drawn in ink and clipped up for the shadow to be

projected on it. The standard included angle is 118 deg. for drills, but this may be varied for different materials.

A wood supporting block should be used for the drill which can be focused sharply and the diagram adjusted to the shadow. The block with drill can be drawn out and re-inserted, the drill returning to focus and only needing slight sideways adjustment to re-align to the diagram. Naturally, it is in the block with its cutting lips reasonably square to the lens axis. A centre punch at an angle of 60 deg. can be set up in the same way—and likewise other tools can be fitted into or clipped to a block.

On a circular threaded part only one side should be examined with the part tilted, as at C, for the light rays to pass straight across the profile. On the other side the light rays will be obstructed with the shadow ragged from reflections. There is a correct angle of tilt for each diameter and pitch of thread, but setting by eye is satisfactory. Each "designated" profile is the same in all sizes (Whit, for example); so an actual large thread gauge can be shown into the shadow of a small profile.

## Profile checking

Measurement of a tool, as when grinding, can be made, as at D. The carriage has a vertical piece, U, in front of the condenser, for a block, V, to be placed up to it to support first a gauge, W, then the tool, as shown.

The gauge is filed and micrometer checked at the end to the pitch of the thread (t.p.i. divided into 1 in.); and the thread diagram, as at E, is marked with the pitch, for the shadow of the gauge to be adjusted to fill it, X. At the same setting, with the tool in place, its shadow, Y, should fit the profile—or be slightly narrower to permit sideways adjustment and avoid "hogging in."

This principle is applicable to any shape, as at F, if some scale dimension, Z, is marked on the diagram, to fill with the shadow of a gauge of actual size.

