ACCURACY IN DETAILS *BY GEOMETER*

A GOOD standard of workmanship springs from unrelaxing attention to details in tools, equipment and parts of models. Without it, major components will not fit properly and function efficiently. Variations in numerous small parts detract from the satisfying impression which is created by uniformity. This becomes plain when you consider a few examples.

An unchamfered bore will not allow the spigot of a cover to enter fully. A drill which is badly ground and wrongly used will not make holes of required size. You have loose fits on bolts and reduced depths for threads in tapping. These are faults in the fitting and functioning of parts-faults which can be avoided by attention to details.

The importance of looks can be appreciated when we consider a bad case-a brass nut for electrical work among five steel nuts in the circle of six on a cylinder cover. Here the difference is obvious; but consider other variations.

Nuts may be steel, but may vary slightly in depth of chamfer: and so may the washers used with them. Studs may vary in length, so that different amounts of thread project through the nuts.

In all this, mechanical function is not involved. The nuts, washers and studs may be right for the job, and acceptable individually. It is when they are brought together in an assembly that their differences can be seen.

To note such things is not necessarily to act the critic, the quibbling perfectionist. It is to exercise faculties that we begin to stimulate on taking up a craft. We all know the difference between tea and coffee, as between brass and steel nuts. But without being told, a wine-taster may know the year, the district, the vineyard, of what he savours.

A basic job in the workshop is drilling, which must be followed by burr removal and chamfering for neat efficient results. The sharpest drill leaves a small burr as it enters most metals, and a larger burr on breaking through, Al. Blunt drills leave larger burrs than sharp ones. Break-through burrs can be reduced by slow final feed.

Burrs can be filed from holes-with reservations for machined surfaces, and holes may be chamfered with a drill, A2. The drill can be twisted in the fingers for small jobs and run in a drilling machine for large ones. It must be big enough to have no tendency to drag into holes.

You often find that a drilled hole is largest in the mouth, especially when the drill has wobbled, or has been off-axis on the lathe. Wear occurs until the drill steadies and centralises. In lathe work, you follow the drilling with a facing cut on line *TU*.

In running into solid metal, a drill is guided all the way by its tip. When this is off-set, R, because one of the cutting lips is longer than the other, the hole is made oversize V as far as the break-through end, where the tip clears and the drill cuts nominal size W. It will do this all the way and produce a good parallel bore, if a pilot hole is drilled first.

Drilling a biggish true hole in thin strip metal is difficult unless you go the right way about it. With free drilling the hole is ragged, C. For accuracy, drill a small hole in the strip and in each of two pieces of thicker metal. Clamp the strip between them, aligning the holes with a parallel pin, and drill to the required size. A small washer can be drilled larger in the same way. Subsequent washers must be aligned by a stepped pin, D.

The action of tapping a hole pulls up a small burr, El, which should be removed with a drill to leave a chamfer 2. A stud, 3, can then be tightened without the lifting of any part of the surface round it-an important detail, as a stud tightens by binding at the surface. A substitute on occasion is a cut-off screw, 4, which tightens at the bottom of the hole. You can level by filing, on line XY, using a block with a nut.

A centre in a shaft is an eye-catching detail which should be neat, Fl. As this is not large enough for heavy turning operations, you make the shaft overlength, 2, and machine off the surplus at Z, 3, using a half-centre.