ACCURACY

in awkward drilling

By GEOMETER

THERE is always some risk in drilling relatively small holes, and when the process follows important machining operations precautions for its success are obviously worth while. A small drill is so easily broken that, in a twinkling, one may be faced with the awkward problem of removing the broken end, or even with the alternative of scrapping the whole part.

Drilled holes usually have to be accurately positioned and spaced. This can be done by careful marking-off and centre-punching. Then, with the line of the holes at right-angles to the surface, drilling can proceed.

It not infrequently happens, that holes are at an angle to a surface, and added to the normal hazard of drilling is the chance of misalignment. Again, half-holes may be needed for fitting pegs, holes crossing others at tangents for fitting cotters, or lines of holes to finish as slots All are reasonably straightforward, given preparation.

To reduce the chances of faults in important drilling, it is advisable before starting to examine a drill for sharpness and lengths and angles of cutting lips. If it is not satisfactory, it should be reground. When this is done by free-hand grinding, the drill can be tested afterwards on a piece of material similar to that of the job. It should be chucked firmly and run without wobble. Freeness of cutting is important, as is easy clearance of the drill in the hole if it has to go to considerable depth. Frequent clearing of swarf is necessary and lubrication is helpful, according to the material.

When rows of holes are placed straight and close together to form slots or ports, small errors in spacing have exaggeratedly adverse effects on results. Some holes may. break into neighbouring ones, while others are separated by substantial webs of metal. If all are not in line, the width of the slots or ports is increased. Careful centre-punching helps to avoid the faults. It is obtained, ***A,*** by using several centre punches of suitable-diameter silver steel, pushed through tight-fitting rubber bands and gripped in a toolmaker's clamp.

Running holes together to form a slot or port can be done with preparation and a suitable set-up, B. Normally, a drill would run off-course, or jam and break; but by pluggmg the first and each subsequent hole (except the final one) with rod of the same material as the job, the drill is given support. The rod should fit well-not tightly or loosely-and be filed to a step at the surface. It can be bent over, packed, and clamped. Careful centre-punching will position following holes, or a jig plate will guide the drill. Final truing and sizing can be done with a punch.

A similar principle of support admits of producing half-holes at the edges of faces? an example being the fitting of a ring locating peg in the groove of a small piston, C. The groove is filled with a push-fit piece of material, and the hole is drilled and tapped at the joint line. Then, with the material removed, the peg is screwed in and filed down just beneath the surface of the piston.

Drilling holes at angles is best performed with a guide or jig for accuracy. The need is particularly apparent if there is risk of spoiling important work. Typical examples are drilling a steam passage from the end of a cylinder to a port, ***D,*** and drilling the lubrication hole in a crankshaft from the crankpin to the main journal, ***E.*** For a guide, a metal plug is machined to clamp to the cylinder, and its head is cut off to angle. For a jig, two blocks are bolted together and bored for the crankpin, and the guide hole is drilled at their abutting faces.

Central drilling of pins at a given distance from the heads-an awkward job-can be performed in a machine vice, F, using a shouldered bush which is slightly smaller than a pin and is fitted in a plate over the jaws of the vice. ❑