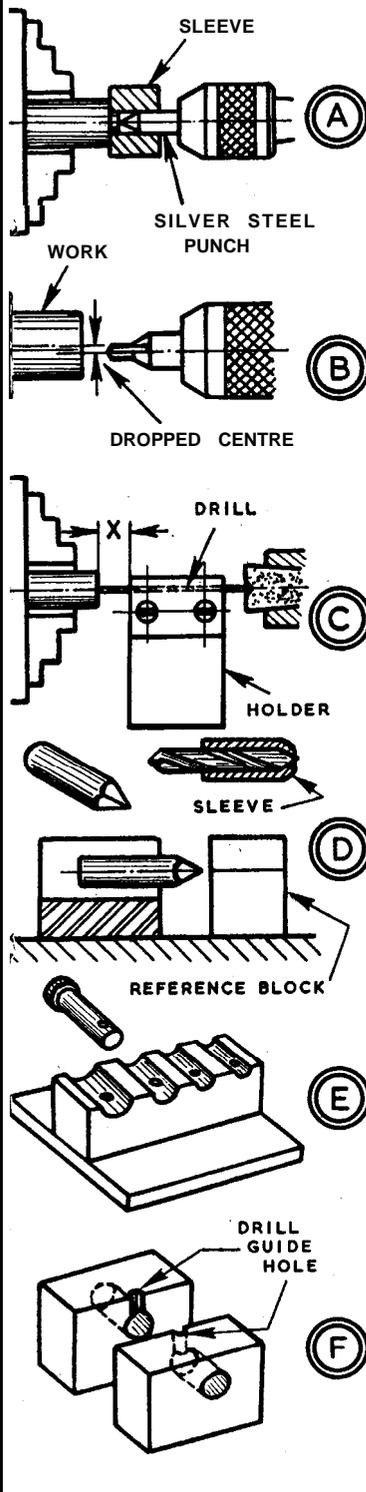


Small-size centring and drilling

By GEOMETER



WHILE equipment in good condition and dimensions of parts not too small, centring and drilling in the lathe and cross-drilling on the drilling machine are normal straightforward operations. Outside these conditions, however? difficulties can arise, often leading to poor results or broken drills. Nevertheless, with preparation and care, there are easy solutions to most of the difficulties that arise when equipment is past its prime, or not adapted to the work in hand.

Difficulties may occur, of course, at all stages of the work, from making the centre to using the drill—as in the following examples. On a lathe with malaligned headstock and tailstock centres, a centre drill has to “find” the axis of the work by pulling to it, sometimes under extra pressure from the feed; and at times a false start results with the centre wobbling. While the method works, it is acceptable for a centre drill of substantial size—but there is a great risk of a small one being broken. The tip of a centre drill or twist drill, not being pointed, leaves an indentation which is flat or radiused in the end. Normally, the following drill starts in the end of the parallel hole, or on the larger cone, after deep centre drilling. But a very small drill must start in the indentation—and not necessarily centrally.

Sometimes there is a chucking error—the chuck not holding the centre drill or twist drill truly; and if its jaws have gripping flats or are worn out of shape, they can fail entirely to grip small drills. Similarly, a carrier which will hold larger drills may be unable to grip small ones without special packing; and in addition the end of a pressure screw on a small drill shank can cause considerable bending. As to small drills, they are, by comparison with larger ones, disproportionately long and unstable—with most of their length often unused. A little inadvertent pressure and they bend and break.

Whatever the condition of the lathe, true centring in small sizes follows as

at A—overcoming dropped centre trouble as at B. A centre punch is made from silver steel which is long enough to push right back in the chuck or holder. It is hardened and tempered, and a sleeve made to slide without play on the front end. If returned rod cannot be centred to ensure a central point, it should be turned for the sleeve to slide on, and the point finished at the same setting. Alternatively, a central point can be ground by rotating the rod at an angle to a grinding wheel, through a hole in a block.

The work is turned with a short locating diameter for the sleeve; and the punch, thus aligned, is gently bumped from the tailstock, the barrel not being clamped. However small the drill to be used, it will then centre in the indentation as in any other from a centre punch; and once the hole is beyond the locating diameter this can be turned off.

A holder or carrier which will safely grip any small drill is as at C, made from two pieces of sheet steel, to clamp to the drill using commercial screws and nuts. Its width gives maximum support and stiffness to the drill, with X settling depth of penetration the holder being just clear of the work. To locate and advance the drill, there is a plug in the tailstock barrel indented from the headstock using a hardened diamond point. This can be made from silver steel rod with filed and honed flats, tested to a central point, as at D, to a line on a reference block, with the rod in a V-block. A broken centre drill or piece of twist drill soldered in a sleeve will also serve.

For cross-drilling small pins or rods on the drilling machine, a support block as at E is more convenient than the conventional V-block, as the job is above its support. Such a block is made by clamping another to it, and drilling in “popular” sizes at the joint line. Countersunk screws fix the plate base.

Accurate cross-drilling may also be done in a jig, as at F. Two blocks are clamped, drilled horizontally for the job, and vertical nicks made at the joint line for the drill guide hole. They can be used temporarily clamped together, or may be permanently fixed by screws.