

CONTRA - ROTATION

By GEOMETER

DRILLING

WHETHER a drill is rotated as on a drilling machine, or the work as on a lathe, there is usually some risk in drilling to depth that the resulting hole will be off its intended axis.

Of course, precautions do help in reducing the chance of error and spoiled work when holes must be true. Among them are accurate grinding of cutting lips on the drill, true centring (often by centre drill), and careful feeding and clearing.

In starting, a firm smooth action is desirable, for a sudden advance may cause a drill to bite in a centre, "kick" and begin to wander. And

the work is greatly increased, which helps to free cuttings and by itself tends to promote truth.

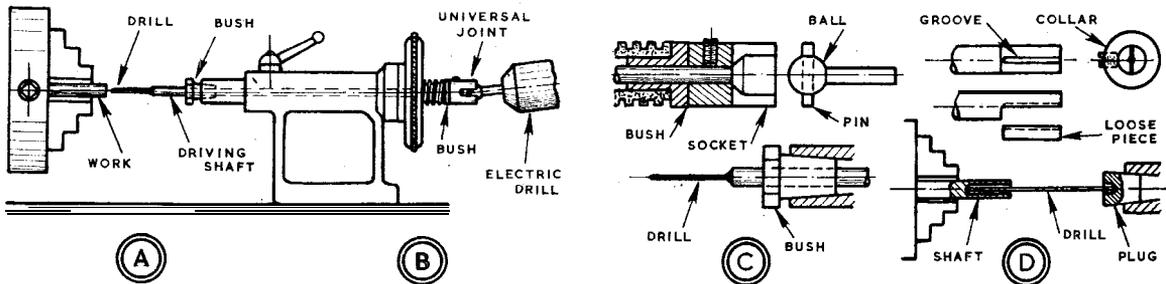
The driving shaft for the drill is a piece of mild steel rod, and the socket of the universal joint, likewise of mild steel, is attached by a grubscrew. Bushes for the shaft are brass or bronze, the front one tapered to tap in and hold like a centre, the rear one parallel and a light force fit. The face of this takes thrust from the socket, which is forced up by the ball (fitted with silver steel cross-pin) in the electric drill. This last is held in one hand, while the other regulates feed through the tailstock handwheel.

Removing the electric drill naturally

free and permitted advance from the handwheel, or clamped to advance -and discretion used in pressure applied to the universal joint.

Details of the driving shaft with bearing bushes, universal joint and drill are as at C. The bushes involve only drilling, reaming and turning, and if hexagon material is used, the front one can be twisted true with a spanner, then the rear one bumped out with a brass rod. The slot in the socket can be milled or produced by drilling a cross-hole, hacksawing into it from the end, and finishing by careful filing.

Free-hand turning with a round-nosed tool, followed by filing to a



once that has happened the error is likely to continue and increase, with the drill fluting so well able to accommodate "longitudinal sinuosity."

Because of this, even after a true start and with every reasonable care in normal drilling, a hole may diverge slightly from course or bend in its length; and the best way of combating the possibility is a contra-rotating set-up with the work and the drill running in opposite directions.

Such a set-up can be easily effected, as at A and B, when a lathe has a hollow tailstock barrel and an electric hand-drill is available; and where wobble and error might otherwise occur, accuracy follows from the axis of the work and that of the drill spinning end to end. In the case of a very small drill, there is the additional advantage that its speed relative to

stops drive to the shaft-and then holding the socket and sliding the shaft to and fro, swarf can be cleared effectively from the hole and the drill. To recommence cutting, the socket is held up to the face of the bush while the ball is engaged and the drill started. Feed is taken up from where it stopped, and there is no danger of a small drill being bumped to the end of the hole and broken.

In drilling a very small hole, a point to be watched is the backlash that may be present on the thread of the handwheel and barrel. With the barrel partly clamped, it is advanced as in normal drilling. But a heavy push on the universal joint can take up the backlash, and if this is noticeable, a small drill may be sufficiently overloaded to break it. A barrel with backlash, therefore, should either be

drilled gauge, will produce the ball on its shank, ready for drilling to take the cross-pin.

The drill can be soldered in the driving shaft or clamped so it can be easily removed for sharpening. The two methods are as at D. For soldering the drill, the driving shaft can be drilled with a larger drill, then a plug in the tailstock indented by drilling from the chuck. The ends of both holes should be sharply conical to centralise the drill while it is soldered through a side hole in the shaft.

For clamping the drill, the driving shaft should be filed half through, held in the chuck and grooved with a V-tool so that the drill lies centrally. Then a similarly made loose piece and collar with grubscrew will clamp the drill firmly when the shaft has been pushed through the bearings. □