Machining cylinder covers and glands

By GEOMETER

ALTHOUGH a double-acting steam engine cylinder is simple in principle, a high degree of accuracy is called for in machining and alignment to avoid waste of power in friction and leakage. It is particularly so in small engine sizes where losses can easily become disproportionately large.

The need for high accuracy arises because of the closed cylinder, with the piston rod running through a gland in the front or main cover, and carrying the cross-head in guides at its outer end. Misalignment on the cylinder end face, or eccentricity of the cover or gland, can lead to binding-which can occur, too, on the cross-head if the cylinder is mounted on an out-of-parallel cover on standards or a bedplate.

In a single-acting engine, of course, conditions are far less demanding. The i.c. engine type piston and the open cylinder form together the cross-head and guide; and minor errors of alignment to the crankshaft are accommodated by the connecting rod.

Accuracy of alignment between the bore and the main end face of a cylinder can be ensured by performing both the boring and the facing operation on one set-up of the cylinder in the lathe. It can be either in an independent chuck or on an angle-plate on the faceplate. Accuracy is likewise achieved with the cylinder mounted by its bore on a mandrel, either a stub mandrel held in the chuck or a centred type running between centres.

The mandrel fitting diameter should be such that the cylinder just fails to push on. If the cylinder dimension is known, about 0.0015 in. plus is sufficient. Then the mandrel can be eased down with a very fine file and emerycloth until the cylinder can be pushed on tightly with oil. Small cuts should finish the facing, and a tiny radius can be made at the end of the bore with a scraper or emery-cloth.

On the main cover of a small cylinder, operations as at ***A*** ensure concentricity and parallelism. If a casting is used, it can be held in the chuck, the gland boss turned, faced and centred, then drilled from the tailstock just for tapping to take the gland nut. In this, exercising all care, good second and plug taps should each be supported by a pointed or hollow centre, and turned by carrier or tap wrench. If rod is used for the cover, it can be roughed, drilled, tapped, then parted or sawn off.

For the second set-up, a mandrel can be made, threaded with the tailstock dieholder, and the cover screwed on. Facmg, turning, and drilling operations as indicated can then be performed-and the piston rod hole bored if required.

For a larger cover, the procedure can be different. First, the cover can be faced and turned as at ***B,*** then the holding stud holes can be drilled from a washer template marked off as at C.

Set up spinning truly, the washer should be bored to take the cover spigot, and a pointed tool can be used to scribe the pitch circle for the holes. The washer can then be placed in the centre head of a combination square, and diametral lines scribed across the pitch circle, the intersections being lightly centre punched at S and ***T.***

If six holding studs are used, dividers can be set to pitch circle radius, and intersections marked for holes U, V, W and X. If four holding studs are used, the dividers should be adjusted for arcs to be described from S and ***T*** to cross close to or on the pitch circle at Y and Z.

With the washer drilled, the cover can be drilled from it, then set up as at D and ***E.*** A piece of flat material is bored and faced for the cover to be held by a ball centre and driven by dowel pins for the main facing and turning operations. Then clamps are substituted for the cover to be faced on the boss. drilled. bored and tapped.

Machining a gland screw from rod, concentricity follows from performing all essential operations without un-chucking. Careful parting off leaves a finished component, except for removing a burr in the bore. But if required, facing can be done by fitting the gland screw into a threaded mandrel as at ***F.***