

# Machining monobloc castings

By Geometer

**T**HE monobloc type of cylinder and crankcase construction for a twin-cylinder single-acting steam engine-for which pattern and core box have been described-provides a casting on which the main faces and bores are parallel and/or at right-angles. And given a reasonably clean casting and a lathe of sufficient capacity, machining should occasion no insuperable difficulties, as faceplate and angle plate can be employed for set ups for the major operations.

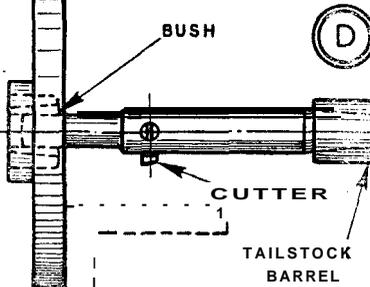
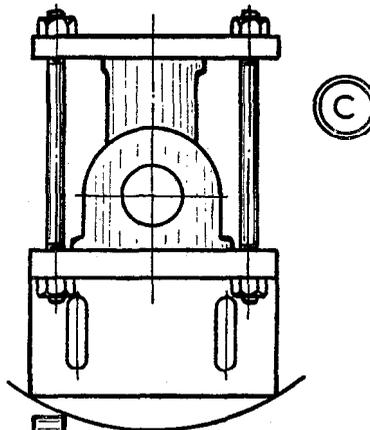
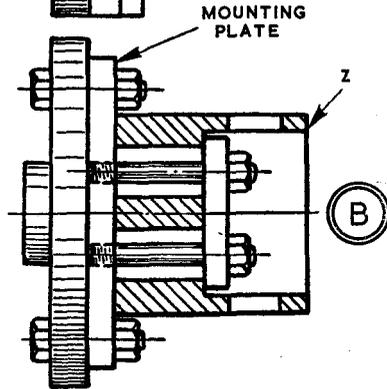
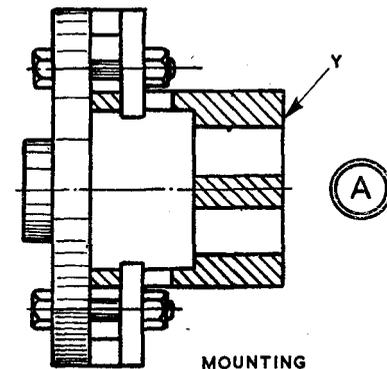
These operations are: facing the top face for the cylinder head; facing the bottom face for the base or mounting plate; boring the cylinders to take either pistons or liners; facing the front and back end faces for the main bearing flanges; and boring at these positions to receive the spigots formed on the main bearings.

First, the casting should be cleaned up with a file, -then checked for machining allowances, noting if there is any sinking at any face which might reduce the machining allowance-or if the casting is out of shape in any other manner.

With the bottom face smoothed and the casting stood on a surface plate, lathe bed, or piece of plate glass, the scribe of a surface gauge can be moved about over the top face to verify parallelism. A check can also be made to the centres of the cored holes which will be bored for the main bearing spigots.

A small steel square presented to the end faces will show if these are at right angles to the top and bottom faces. Some variations are, of course, to be expected with the casting in the rough state.

The first machining operation may well be to true off the top face, Y,



on a set-up as at A. The operation can be merely to true the face and not to finish it to position, since this can be done after the cylinders have been bored.

To prepare for the set-up, the casting should be trued on the bottom face by filing across the high spots; testing by standing the casting on the surface plate and using a feeler gauge in the low places; and finally smearing marking blue on the plate so that by rubbing the casting the high areas are revealed.

When the casting stands firmly, it can then be set up using clamps slightly radiused at the ends to fit in the cored holes. On early machining cuts, speed of rotation should be moderate, and the saddle and slide should be firm because of the intermittent cut and chopping action.

For the second operation machining the bottom face Z a set-up can be made as at B. A piece of flat steel, cast iron, or other material can be used as a mounting plate, holes being drilled and tapped to take studs through the cylinder core holes, with a clamping plate and nuts inside the crankcase. The plate can easily be attached to the faceplate by bolts and on this set-up the face can be machined to position.

Following this, placing and weighting an angle plate on the surface plate, the casting can be clamped horizontally to the vertical face so that using the scribe and surface gauge, the main bearing centres can be marked on the end faces and the cylinder centres on the top face of the casting.

The lines at the ends serve for longitudinal location on the angle plate mounted on the faceplate for a set-up as at C. On this, the outer face can be trued and the bore machined. With a stiff boring tool, the further bore can also be machined. But an alternative is a cutter bar as at D. This can be of mild steel, reduced to slide in a bush in the spindle and tapered to fit in the stock barrel.

To true the opposite end face, the casting can be reversed on the angle plate or located by the bores on a mandrel held one end in the chuck, the other by the tailstock.