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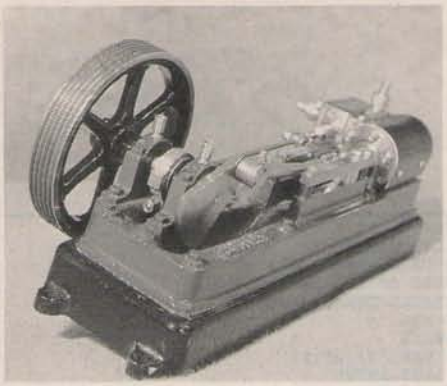
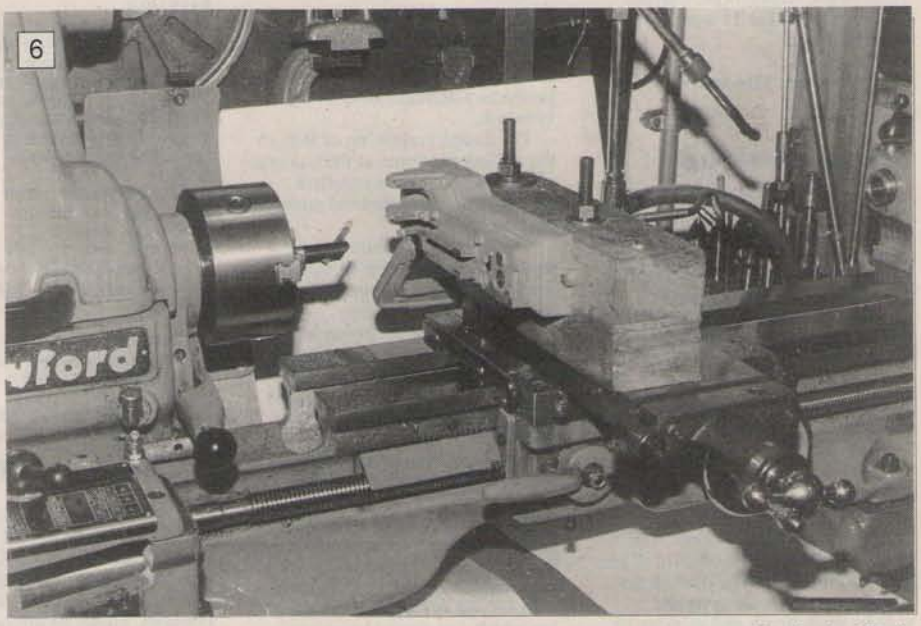


SALLY

Bedplates & Main Bearings

Tubal Cain has described the preliminary steps with this engine – given some very sound advice on lathe tooling and made a start on the bedplate.

● *Part II from page 212 (21 August 1992)*



6: ***Machining the bed, using a block of wood as an angle plate. The cutter is a normal boring bar fitted with a long tool-bit.***

The problem here is holding the workpiece. It was designed for machining in the factory, where it would have been held in a fixture on a milling machine. If you have a vertical slide, well and good; you can use that. Alternatively it can be mounted on an angle-plate and fly-cut. But if you have neither – or your angle-plate is too small – what then? Don't despair – look at **Fig. 6**! This shows a casting being machined on a block of wood. The block could have been ½ inch taller with advantage – say 3½ × 2½in. thick at least. Plane the bottom flat, and clean up the face. Then drill the 3 holding-down bolt holes in the casting and fix it to the block temporarily with ½in. tacks, setting the cross-head guides at about centre-height. Set all on your cross-slide and find out where the block must be put so that a fly-cutter can sweep clear of both the cylinder pads at one end and the crosshead guides at the other. Mark where the cross-slide slot will come, and drill for holding down bolts accordingly. (Mine were ⅜in. dia.) Remove the casting, bolt the block down firmly, the front face as square across as you can manage, and then machine the wooden face with a fly-cutter. (**Fig. 7** shows a suggested holer; the tool point should have 45 deg. top rake, and a rounded point). Don't take off more than you have to, for it will make a terrible mess! The surface will be a bit rough, so just smooth it gently with sandpaper.

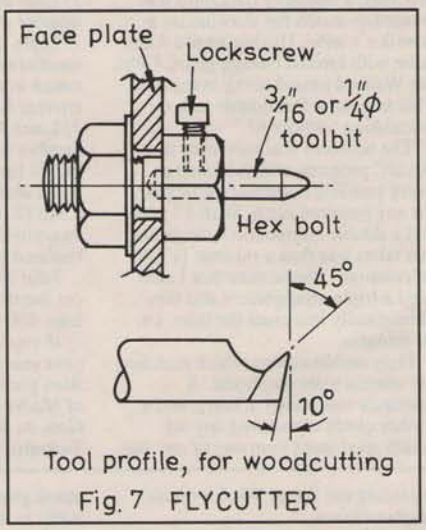


Fig. 7 FLYCUTTER

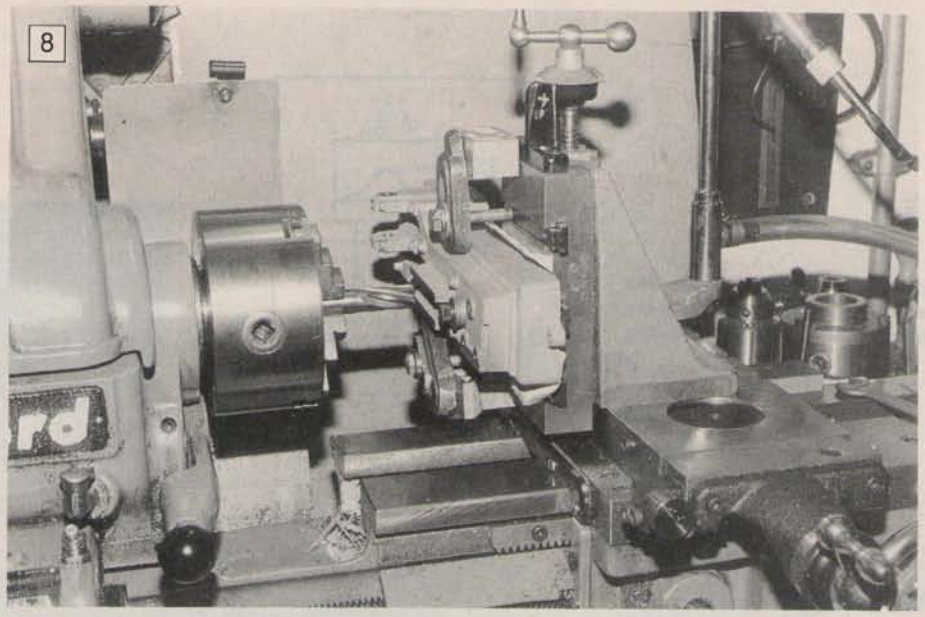
To secure the casting you must drill two auxiliary holes, one central between the three "7BA clearing" holes, and one between the crosshead guides, about ⅜in. away from the rib you will see underneath. These won't show, but you can always plug them later. I drilled mine 5.7mm, which will clear a No.12 woodscrew and tap to ¼in. x 26TPI. The hole at the cylinder end must be countersunk, so that the screwhead is not machined away. And you will need to file down the head of the screw for the other hole, or it will bind between the ribs. Offer up the casting and drill pilot holes 2.8mm dia. for the screws, which should be 2½in. long. Get these really tight, and then fit a small screw through the end H/d bolt-hole – 1 inch × No.4 or 5.

The flycutting operation is seen in **Fig. 6.** I am using one of my boring heads as you can see. Take a trial cut, say 0.020in. for a start, from the top of the crosshead guide ribs, running at not more than 90 rpm with a feed of 0.003 inch/rev. Remember this is an interrupted cut, and keep an eye open for the slightest sign of movement, but provided your screws are reasonably tight this is not likely. (However, if the block moves *on the cross-slide* it is vital that you take all down and re-machine the face before refixing the casting.) Machine down to the scribed line, using the leadscrew handwheel to put on cut, and locking the saddle each time. If you have no such handwheel, fit an 80-tooth changewheel to the end of the leadscrew. Then a movement of ten teeth gives 1/64in. travel to the saddle, and one tooth = 0.0016 inch. When you get down to the scribed line, mark either the handwheel or a tooth on the changewheel with a felt pen.

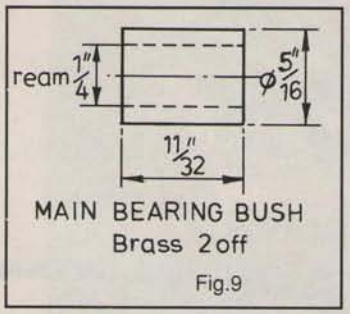
Unlock the saddle and feed forwards to machine the bosses of the cylinder fixing screws. Check very carefully that the flycutter will clear the adjacent cast-on "nuts"! Machine these faces, again with about 0.03in./rev. cross-feed, until you are almost to the line – by then you will have fed in about 0.325 inches – two turns and 46 teeth if using that wheel. Finish with a fine cut to a total depth of *0.328in.* or 2 turns and 50 teeth. I found no problems with this "block of wood' approach, other than that always associated with flycutters – making sure that the cutter does not foul anything at the end of the cut.

The procedure is the same when using an angle-plate, but instead of machining the face you must take care that this face sits truly square across the lathe. However, you will almost certainly find that you have to drill and tap some holes to take the fixing screws – ¼in. x 26 TPI (BSF) at the cylinder end, a countersunk screw as before, and a 3/16in. socket-head screw between the crosshead guide ribs, as it is not likely that both will coincide with a slot in the angle-plate. You *may* be able to fix a clamp at the far end for added security. Set a piece of paper between the base of the casting and the plate, of course.

If you have a vertical slide the problem is eased, as you now have two planes of movement and can use a normal endmill, allowing you to weave your way round any projecting screws or clamps. See **Fig. 8**. I used a ¼in. screw through the cast hole adjacent to the cylinder pads, a 3/16in. Allen screw through a hole between the crosshead guide ribs, and clamps as well. The cutter used was ½in. dia.,



8: *Machining the bed, using a vertical slide and an endmill.*



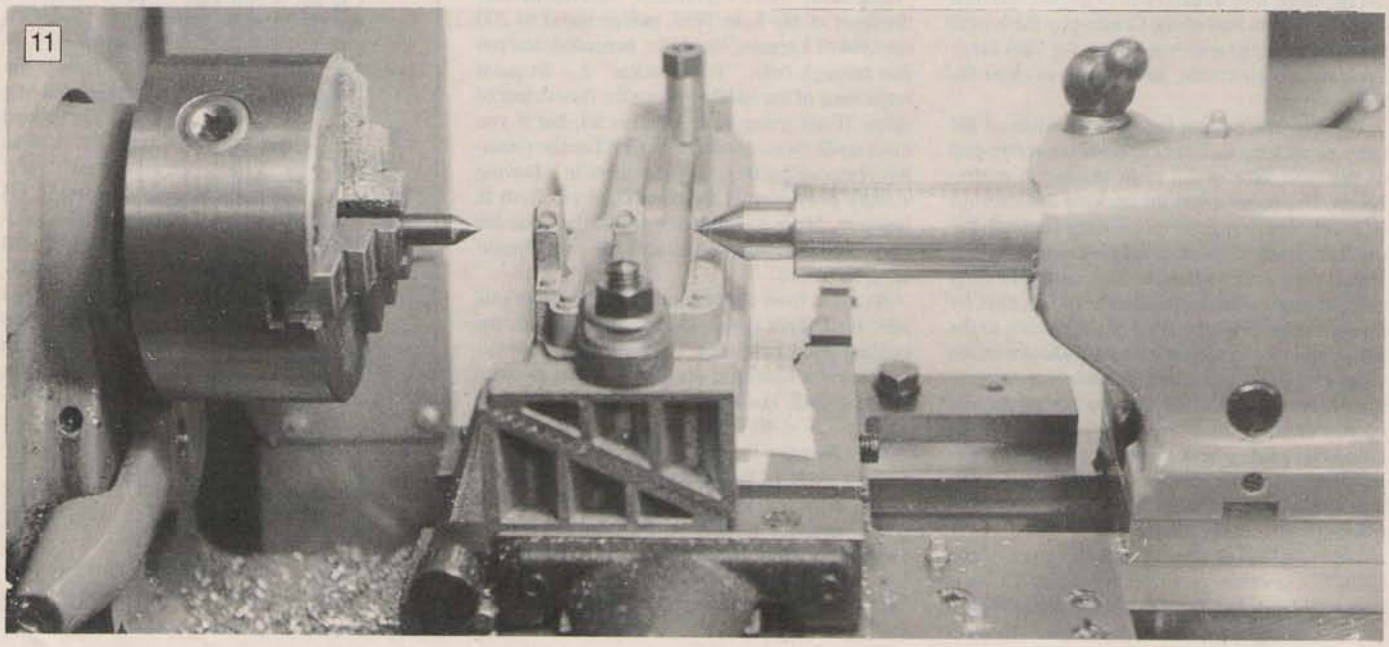
run at 420 rpm, fed at about 1½in./min. with one roughing cut followed by a finishing cut about 0.005in. deep.

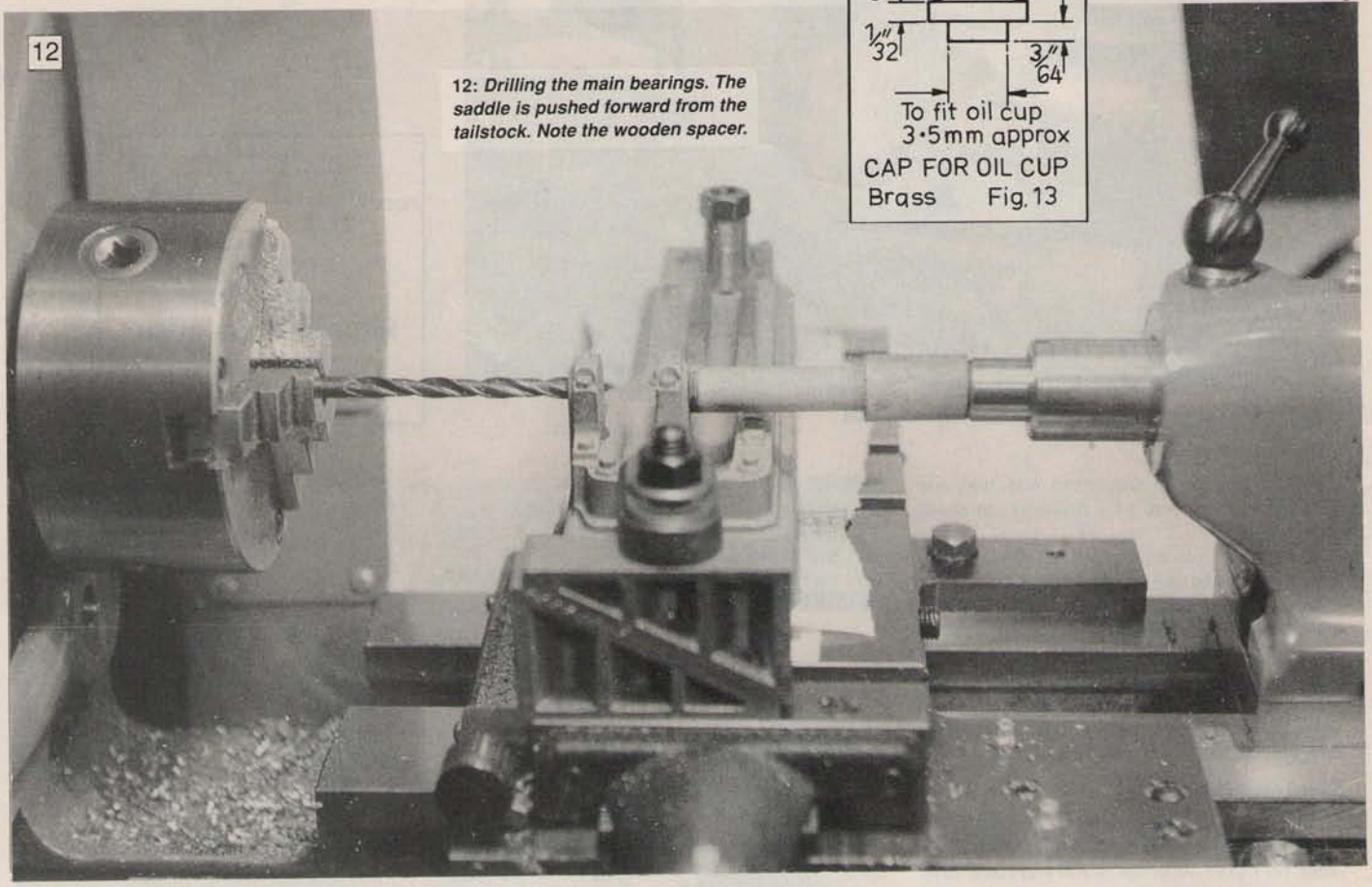
The finish from an endmill should be good enough as it is, but you may find the rubbing face of the crosshead guide needs attention if you had to use a fly-cutter. If so, rub it with a very fine flat file, set across the guides, with the minimum of pressure. Make sure that the file cuts on **both** of the guides at the same time, and drawing the file along the length of the guides. Take off no more than is necessary to get a smooth surface.

Main bearings

As drawn, these are unbushed, the steel shaft running on the cast iron of the bed. This is quite in order, but it does mean that in 100 years time there may be quite enough wear to cause slobber. It is not difficult to avoid this. Make up two bushes as shown in **Fig. 9** – brass or cast gunmetal, depending on what you have available. Do NOT ream them – this will be done after assembly, but make them now if you wish to bush the bearings. Then alter the drawing to show 5/16in. ream in place of ¼in. diameter. The next step is to mark out longitudinally – see **Fig. 10**. First establish the true centre of the main bearing, marking only one side,

10: *Marking out for the cylinder retaining bolt-holes, the casting clamped to an angle plate.*
11: *Initial alignment of the casting, before drilling for main bearings.*





12: ***Drilling the main bearings. The saddle is pushed forward from the tailstock. Note the wooden spacer.***

midway across the face. Set up the casting truly vertical, and with your scribing block transfer this mark to the opposite side. Then add 5⁷⁄₁₆in. to the elevation and scribe for the single bolt-hole at the cylinder end, then for the other two, moving ½in. each time. Unclamp the casting, and hold in the vice to mark out these holes cross-ways. There is no natural centreline, but extreme accuracy does not matter, as the cylinder can be drilled to suit. Set the single hole in the centre of its pad, and then mark the others ⅞in. away. Centre-pop these (and the main bearing) and drill 2.7mm for 7BA clear. Spotface the underside, just enough to clean the face.

Now set the casting on the cross-slide of the lathe, or packing sufficient to bring the centre-pop of the outer face of the main bearing to centre-height. Use paper under the packing and castings as usual. You may have to use shims as well, but exact accuracy is not essential give or take 5 thou. However, it is important that the casting lie truly at right angles across the machine. Set first by measurement from the edge of the casting to the side of the slide. Then set up a dial indicator on the tailstock poppet and adjust to achieve a compromise between truth when checked against the side of the casting, and truth to the side of the crosshead guide rib. A rough check can be made by checking with centres in both head- and tailstock; the points should align with the centre marked on the casting, both sides.

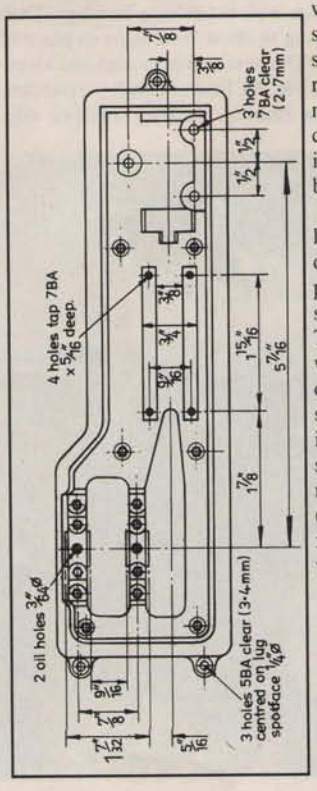
Now for the drilling. Lock the cross-slide. DON'T use either rack handwheel or the leadscrew to feed, but push the work along with a piece of dowel between the casting and the tailstock poppet. See **Fig. 12**. Centre with a 5⁄16in. Slocumb drill, and then follow with 7.8mm for the bushed bearing, or 6.2mm for ¼in. ream. As soon as the drill passes through the first "ear", withdraw the saddle, change for a Slocumbe bit again, and re-centre the inside of the second ear; no need to go deeply, just enough to guide the drill. Then pass the drill right through. Run at about 1000 rpm and feed gently. Change either to an endmill or a spotfacing cutter – ½in. if available – and lightly face the front of the hole. Now reduce speed to 200 rpm and fit a reamer, 5⁄16 or ¼in. as needed, and run this through both. "Woodpecker" it – frequent retractions of the saddle to keep the flutes clear of chips. If not using bushes that is all, but if you have made them, anoint each with Loctite retaining compound (601) and press them in – leaving a slight projection at the outer faces but flush in between. Have a cup of tea whilst the adhesive cures, and then ream the bushes ¼in., woodpeckering as before.

Remove from the machine and deal with odd jobs. First, if not already done, lightly spotface the holding-down bolt holes. Then see to the oil-holes in the main bearings; these are shown as 3⁄64in. (1.2mm) drill, but I suggest that you drill 3.4mm and tap ⅛in. × 40 TPI for Stuart oil cups. I always make a little cap for these – **Fig. 13**. The spigot is made a good fit to the cup, and the little "hat" shape achieved by parting off with a narrow round-nose tool. In the case of the bushed bearing I suggest you drill and tap only 3⁄16in. deep and follow with 1.2mm, to reduce the rate of oil flow. You can now set the bedplate aside.

● *To be continued*

ADDENDUM

In the first section of this series there were two small errors. The drawing of the bedplate had a wrong dimension, this should have read 1⁷⁄₃₂in., not ⁷⁄₃₂in. the correct version is shown below.



Under the large drawing on the second page it was stated that Toolform (i) was the recommended shape for finishing. This should have read tool form (ii). Apologies for any inconvenience.