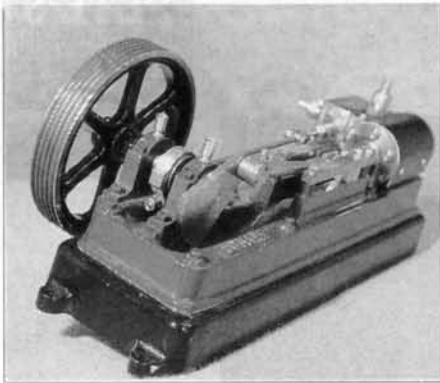


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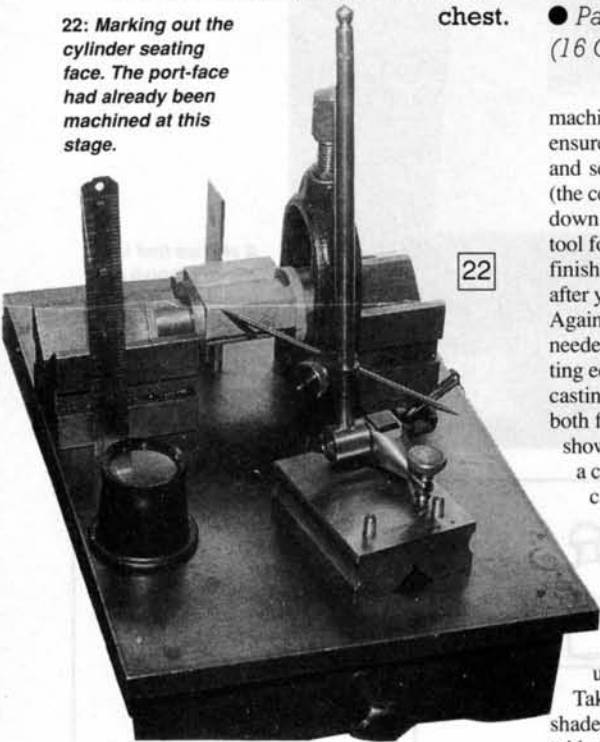
# SALLY

## Continuing work on the cylinder

● Part IV continued from page 476  
(16 October 1992)

**Tubal Cain** continues his description of work on the cylinder and deals with the machining of port and mounting faces, steam passages and steam chest.

22: Marking out the cylinder seating face. The port-face had already been machined at this stage.



machined flanges. Use a square on the lathe bed to ensure that the scribed lines are square both ways and set the casting so that the exhaust aperture (the centre hole) is at lathe centre-height. Machine down to the lines at about 200 rpm, rehonng the tool for the final cuts, for you do need a first-class finish here. Now for the awkward mounting face after you have marked out as described previously. Again mount in the 4-jaw chuck, using packing as needed, as shown in Fig. 23. Set a knife-tool, cutting edge **outwards**, in the toolpost and adjust the casting so that it will align with the inner edge of both flanges. Set the casting in the other plane as shown in Fig. 24 so that your tool will sweep out a circle about 1½ in. dia. on the work – this will cut into the two flanges a little. Machine down to the marks, 200 rpm, 10 thou cuts at first, and perhaps 0.005in./rev.; finishing cuts should be finer, but a “good” finish is not important. As to measurement, it is better to go a trifle too deep than not far enough, as you can always put shims under the cylinder later.

Take from the machine and set out to file the shaded parts shown on Fig. 25, down to be flush with the machined face. Note that those marked B

need not be taken right down, provided they clear the bedplate casting, but you **will** have to file the inside of the flanges. This operation is much easier than you may anticipate, provided you use a sharp, flat file with a “safe” edge and take some care, for there is very little to take off. Note that it is better to take off a little too **much** at AA than too little.

### Steam passages

Again, these present no problem for those with vertical slides, but the drawing calls for a ½ in. slot drill, not a common size. However, the little 3-flute “throwaway” cutters (so called because, in industry, it costs more to sharpen them than to buy new) are not all that expensive. However, if you have one ¼ in. or 6mm dia., this can be used, or even ⅜ in. at a pinch. The important dimension is the ⅜ in. (0.109 in.) shown on the drawing. Mark this point, and also take care to mark the true centreline of the cylinder across the face. Then set up in the vice, facing the chuck, set carefully to the marks, and plunge in 0.094 in. **Note**, you must use a slot drill here, not an endmill; look at the end of an endmill to see why!

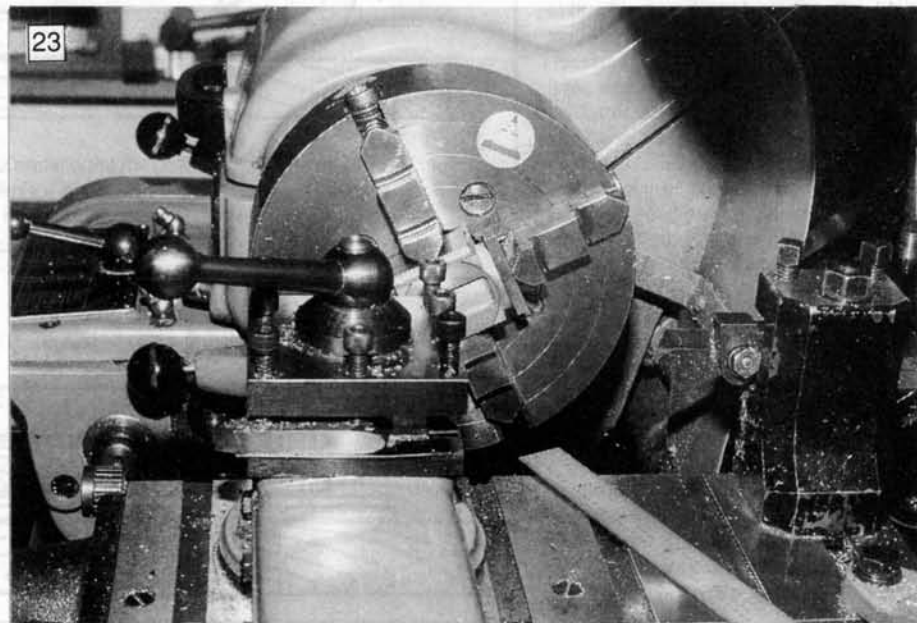
Fig. 26 shows the set up for those without vertical slides. The casting is set up in the 4-jaw as

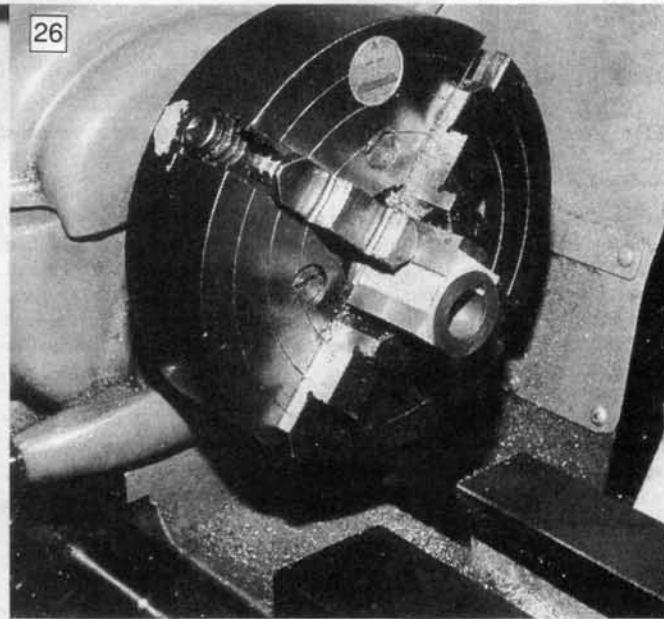
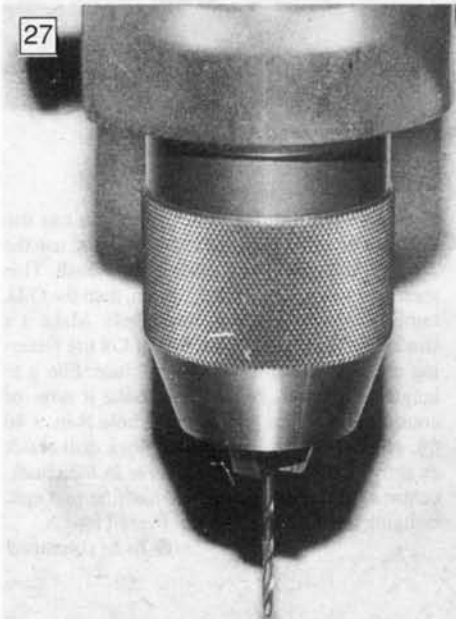
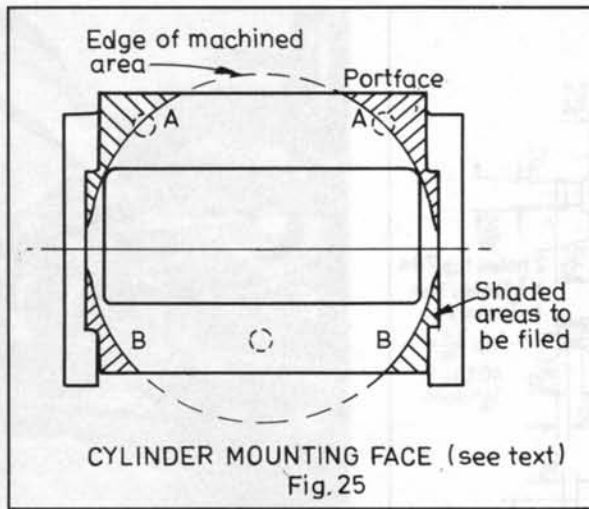
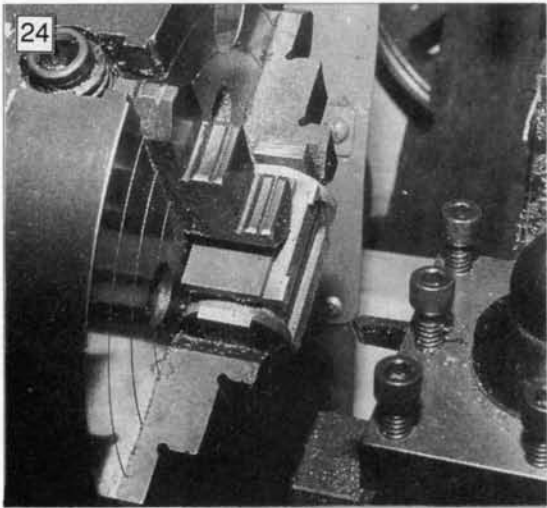
### Port- and Mounting-faces

These must first be marked out. Set the casting on a mandrel and vee-blocks (the previously used piece of bar will serve) on your lathe bed and check that the portface is level. Pick up the top of the mandrel, set your scribing block to ⅜ in. above this, and scribe right around the casting. Set light pop-marks on the scribed lines. You will later repeat this procedure for the mounting face after machining the portface, but this time using a square to set the latter vertical (Fig. 22). If you have a vertical slide (if not, see later) there is no problem. Grip the casting in the vice, preferably by the cylinder flanges, but otherwise using packing, and check that the scribed lines are square both ways. Then, using a facing cutter, machine down to the marks. Having done this, mark the lines for the mounting face, this time ¼ in. above the mandrel. Reset in the vice, portface parallel with the lathe axis, and machine down to the lines again. Note that you may have to take off a trifle from the inside of each flange, leaving a space 1½ in. wide. But what if you have no vertical slide? Read on!

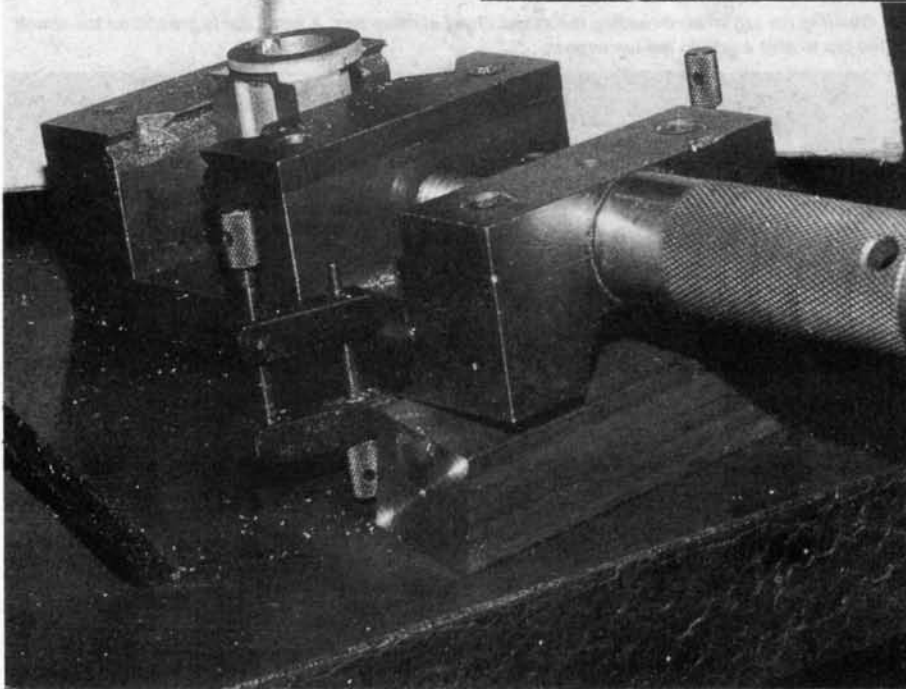
The portface is readily machined from the 4-jaw chuck, but use packing to protect the

23: Showing how the cylinder is gripped to machine the seating face. Note the packing to protect the machined faces.





**24:** Machining the seating face, the turret had been rotated before the photo was taken - the tool should be an outward-facing knife tool.  
**26:** Set-up for milling the steam entry passage using the 4-jaw chuck. In this case a  $\frac{1}{8}$ in. cutter has been used.  
**27:** Drilling the steam passages. The vice is tilted on a piece of square brass, held against the small clamps, to give a slope of 1 in 4.



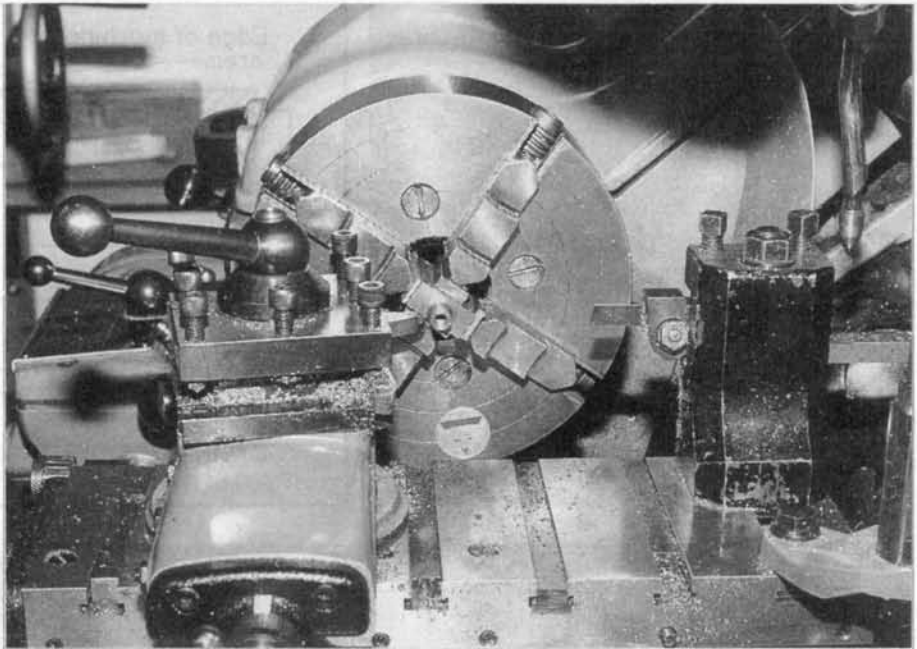
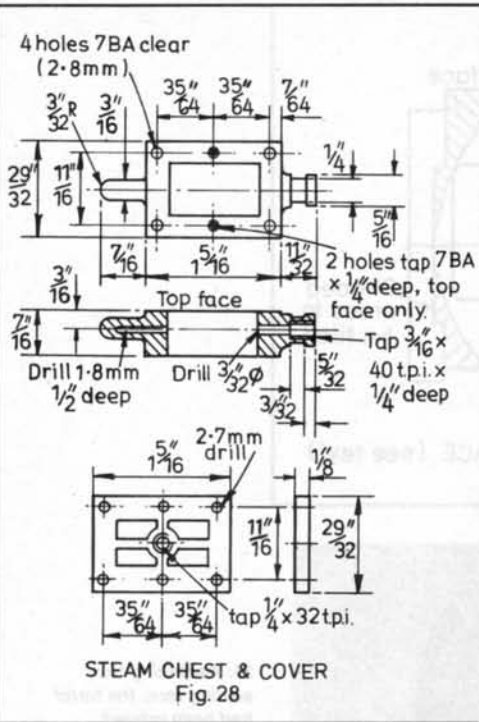
with the cutter mounted in the tailstock chuck, plunge in by  $\frac{1}{2}$ in. Then reverse and set up to do the other end.

The drilled steam passages shout out for an angle-vice, but you can manage without. The angle is very nearly 14 deg. (but check this for yourself) and that is a slope of about 1 in 4. So, make your drilling vice into a "sine vice" as shown in Fig. 27. There is an arrow which you cannot see which I marked on my vice, 4in. from the front end, and a piece of 1in. square stuff (could be a piece of wood, but I am using brass) set against this mark. Two little clamps act as stops. The casting is gripped in the vice as you see, and then drilled 2.3mm; clear chips fairly frequently, and when you have gone down  $\frac{3}{8}$ in. go steady so that you do not over-run when you break through. Hold the vice very firmly, for a slip may break your drill.

There remains only the exhaust passage to drill. This is called for at  $\frac{1}{4}$ in. x 32 tpi; this will fit a  $\frac{3}{8}$ in. steam union, but if you are happy with no more than a length of screwed pipe, then  $\frac{3}{8}$ in. x 40 tpi is more in proportion. Centre the hole to align with the centre exhaust port cast in the face, not to the centre of the cast boss. Drill tapping size (4.2mm for  $\frac{3}{8}$ in. x 40 tpi, or 5.7mm for  $\frac{1}{4}$ in. x 32 tpi)  $\frac{1}{4}$ in. deep, then follow with 3.5mm to break into the port. Take this drill a little way into the port. All other holes are left until we are ready with the mating parts - the three fixing holes will be dealt with much later, when a trial erection is made.

shown. You will need packing all round in this case, as the jaws won't bed otherwise. Set a centre in the tailstock and adjust the position until the casting rotates about the nominal centre of the cavity. Take great care over this. With a  $\frac{1}{2}$ in. cutter

this centre lies exactly on the edge of the bore, and exactly on the centreline of the casting. With a  $\frac{1}{4}$ in. cutter the centre lies  $\frac{1}{4}$ in. inside the edge of the bore. This done, run at between 380 and 400 rpm (the out of balance won't do any harm) and



29: Machining the stuffing box on the steam chest. Note the protective packing.

The final piece of work is to fine finish the port face. With a cast iron slide valve this can usually be left as machined, but this model has a hot-pressed hard brass valve, which would wear rather fast. You need a sheet of fine emery cloth, of good quality, and a dead flat surface. Lay out the cloth and rub the face diagonally, across, first one way then the other, **taking great care not to rock the casting**. Persist until no machining marks show at all. Don't try to expedite matters by using heavy pressure, for this will ruck up the emery cloth in a little wave, and the surface will not be flat. The end result should be a nice matt grey surface, free from marks and scratches, and that is what we want, **not** a mirror finish. That done, oil the machined faces and set aside.

### Steam chest Part 22, Fig. 28

For those with vertical slides the initial work presents no difficulty. I shall, therefore, describe how to do it without this accessory. However, if you are using a milling slide I recommend that you first machine the sides to the 29/32 in. dimension, taking an equal amount off each, then deal with the faces. Note that the bosses are offset, and you should work to the centres of these when setting up. Subsequent operations are the same for each method.

To do the job in the lathe, first file the sides to get them reasonably flat, but not down to dimension, then mount in the 4-jaw chuck with packing behind and machine the face. Work to the centre of the bosses - 3/16 in. or 1/4 in. depending on which way round. Rule dimension will serve. Then reverse in the chuck, tap well back against the packing, and face the second side to 1/16 in. overall thickness. Run a little slower than usual as it is an interrupted cut - say 150 rpm - and if you are using your normal turning tool, work from the inside outwards. Then file the sides to dimension; finish by "draw-filing" - set the file **across** the work so that it cuts sideways. Use a fine-cut flat file and let it cut only as you draw it towards you.

To deal with the bosses, first use a file in the inside end face to smooth it - just remove the surface. Then mount in the 4-jaw as shown in my photo, **Fig. 29**, with packing to protect the surfaces. Set true to the boss, face the end, and then machine to 3/16 in. O.D. and clean up the front rectangular face; there is about 1/32 in. to come off here, no more. Reduce the length of the boss to 1/32 in.

and decorate to suit your taste! The 1/4 in. shown is not important. Centre with a slocumbe drill then drill 4.2mm x 1/4 in. deep. Recentre with a small slocumbe and then drill through 2.4mm or 3/32 in. Take the drill right down and **gently** stab it against the back face to form a little dimple to start the next drill.

Now we have a problem! You will find that the normal "jobbers" length 1.8mm (No. 50, for 0.070 in.) drill just won't reach far enough to make this hole 1/4 in. deep! (If you look at the valve-rod on the Stuart drawing, Part 20, you will see that the end is turned down to act as a guide in this hole.) If you happen to have a longer drill this size,

or smaller (but not less than 3/16 in.) you can use that, and alter the valve rod to suit. If not, use the 2.4mm (3/32 in.) drill and make a little bush. This should be brass, first drilled 1.8mm, then the O.D. turned down to a slide fit in the hole. Make it a shade overlength, apply a touch of Loctite retaining compound and then set it in place. File it to length afterwards. No need to make it now, of course. Back to the boss. Tap the hole 3/16 in. x 40 tpi, guiding the tap from the tailstock drill chuck as shown in **Fig. 30**. Then reverse in the chuck, centre to the boss again, and machine that end, bringing the casting to 1 1/16 in. overall length.

● *To be continued*

30: Guiding the tap when threading the steam chest stuffing box. A small flat is ground on the shank of the tap to give a grip to the tap wrench.

