# Virtual Work on the Table 04-Dec-20

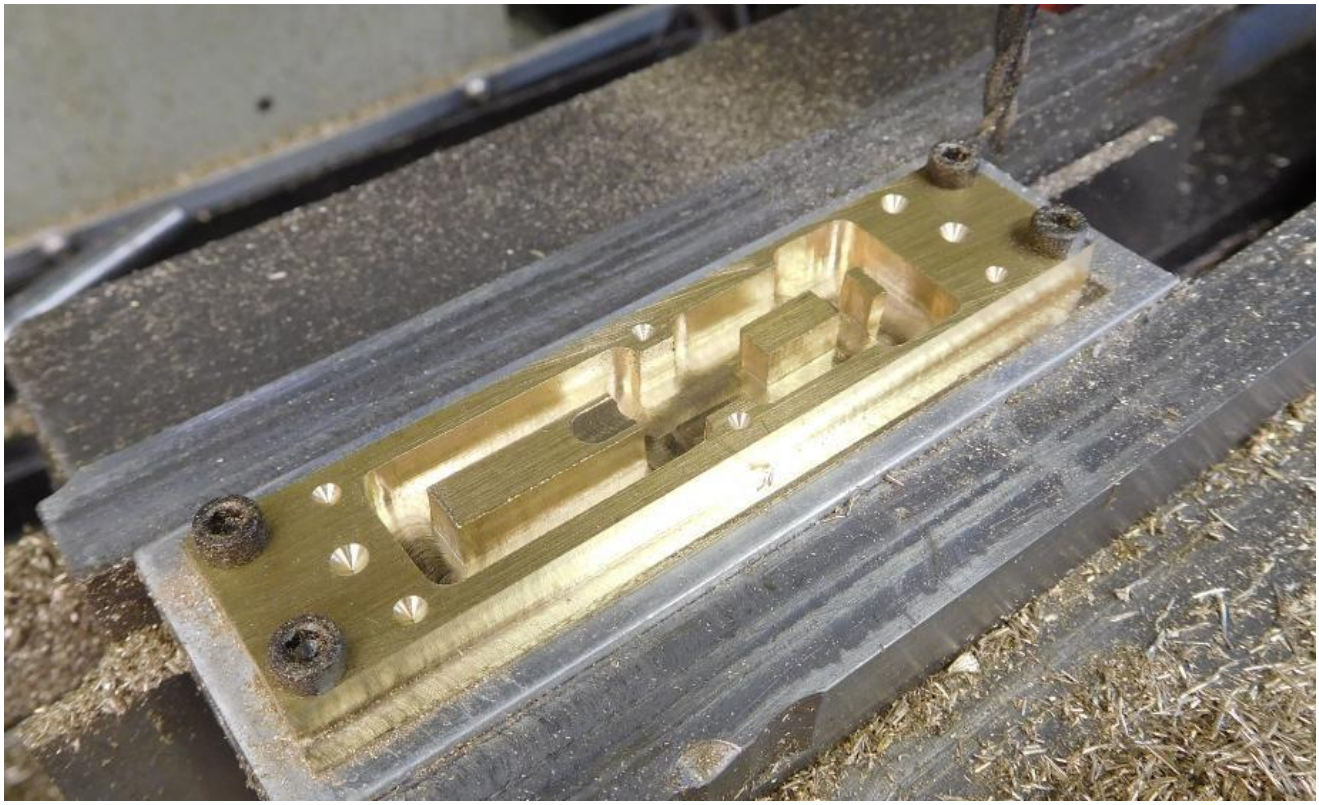
Well, I don't expect anybody was expecting some more model engineering guff from me so soon after breaking my wrist! Neither was I, come to that, but the wrist has improved a lot over the last week and I'm not having much pain with it. Karen and I went for a nice walk on Tuesday (Glorious weather!) and I had had no real problems with awkward stiles and things. I can even put my socks on by myself now...

On Wednesday Karen was out, so I sneaked into the workshop to see if I could achieve anything sensible other than putting a few tools away. I started re-making the top piece of *Ashey*'s lubricator. I'd originally made it more or less to Don Young's drawings and had then discovered that the only way to assemble the lubricator to the loco was to remove the front buffer beam first. Not acceptable! I'd chewed away as much of the lubricator as I could to get it to fit but it was a bad fudge and I was most unhappy with it.

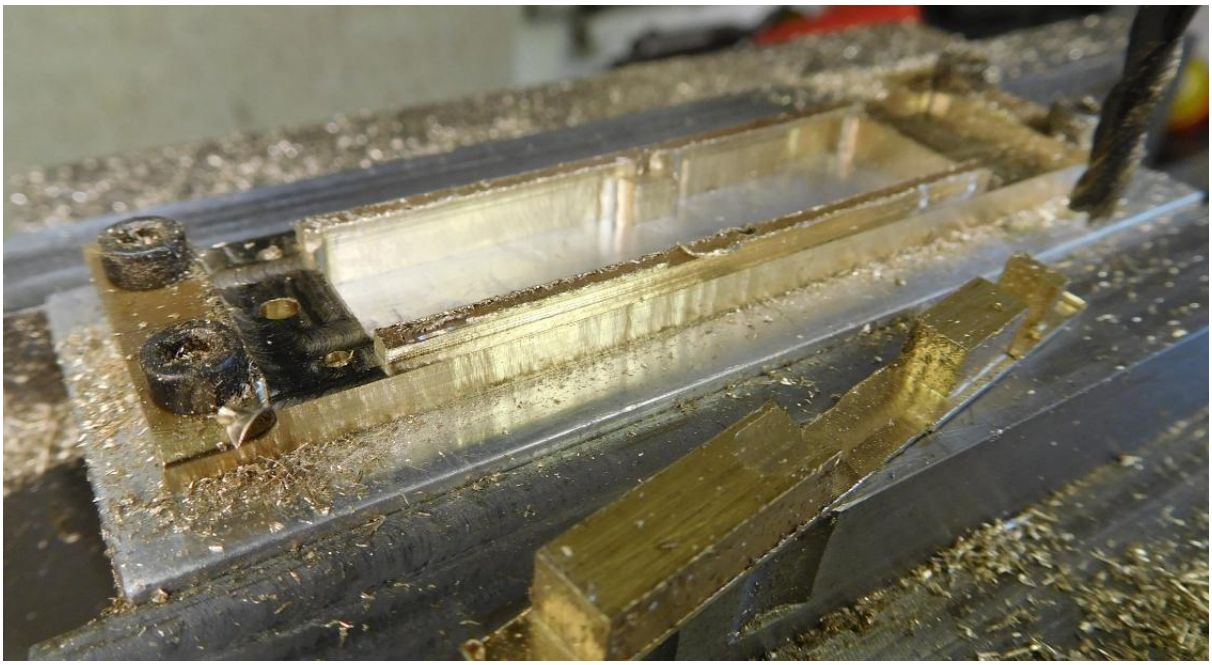
I had had a fiddle with it on the CAD, discovering that one of the reasons for not spotting the clash on my CAD model was that I'd forgotten to include some rivet heads behind the buffer beam. These were protruding into the lubricator space, so I'd schemed out a new arrangement, requiring the remaking of the lubricator top section only, and this is what I was amusing myself with on Wednesday.

I screwed an over-long piece of brass bar to a chunk of aluminium; I had previously coordinate drilled the four holes in the corners of the blank to attach it to the fixture. I set the X=zero, Y=zero coordinates to the middle of the part and machined it all out and coordinate drilled the holes; two were for securing the lubricator assembly to the underside of the buffer beam, and the other six were to be tapped M2 for the cap.

Almost done:



...and then the centre piece, which had been providing valuable support for the thin side pieces during machining, was removed during a final light cut inside. The cutter was rather past its best; I'd a fair bit of deburring to do afterwards!



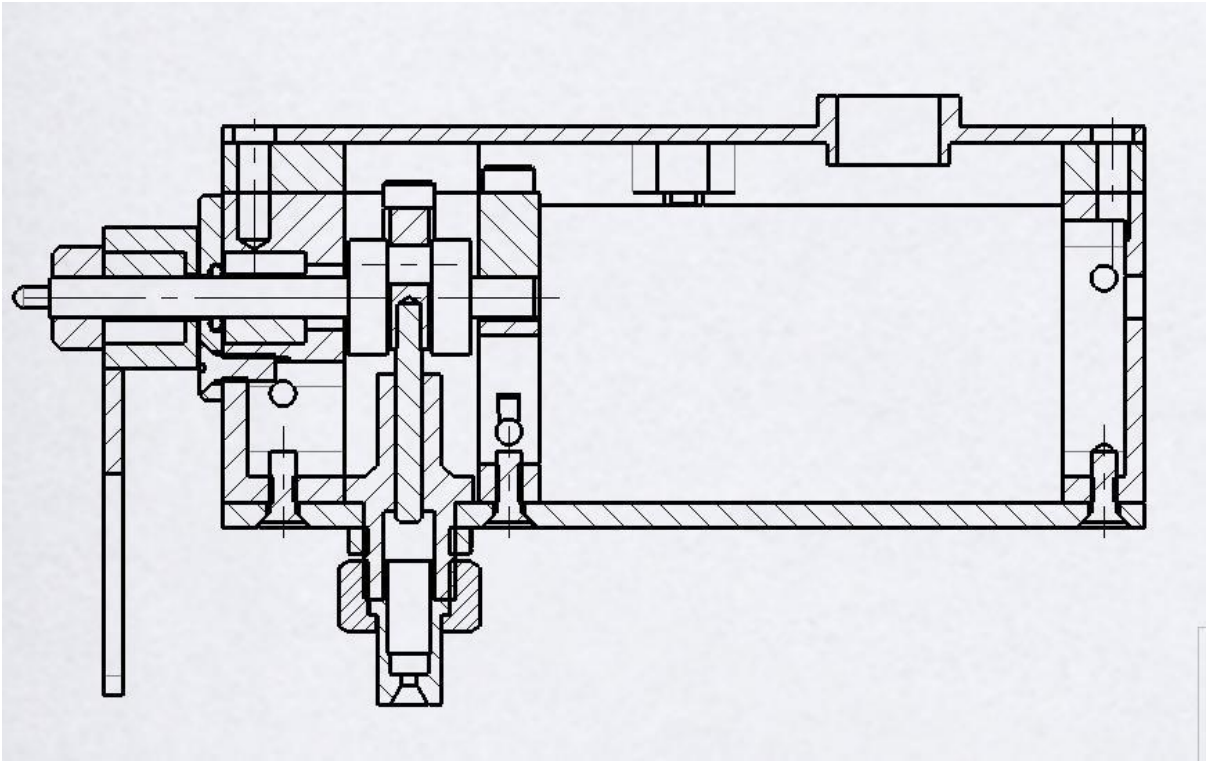
The over-long bits at each end (with the holes for the cap-head screws securing it to the fixture) were cut off slightly oversize for machining back to match the rest of the lubricator after final brazing. Besides, having the ends stick out a bit helped with feeding in the solder during brazing.

It all worked out well, and on Thursday I determined to braze up the lubricator body. It was all held together with M2 brass countersunk screws to hold all the pieces together during brazing. That went well too, and I cleaned it up and then drilled and reamed for the non-return clutch and pump crank. I'm glad I checked on the non-return clutch dimensions – I was *just* about to bore it 5/16" when I picked up the actual clutch and noticed it was 9/32" OD. I scratted around for a 9/32" reamer... none that size. Slot drill? No; none of that size either; I was just closing the drawer and my eye suddenly caught on a little blue box. It contained a brand new 9/32" carbide slot drill! Where on earth had that come from? It did a brilliant job, though, after using a 7mm slot drill first, so that the 7/32" was just acting as a reamer to achieve an accurately-sized hole.

I assembled the empty lubricator to the loco – absolutely fine; no fouls. I just had to drill a couple more holes in the buffer beam to secure it, and plug up the old ones. They're all going to be out of sight, hidden under the front valance when I get that made.

Don's *Fishbourne* drawings don't include the lubricator internals; a note on the drawing suggests using an LBSC oscillating arrangement. I was always going to fit a Jim Ewins version anyway, so it didn't matter. Here's a section through the lubricator as I dreamed it up; the internals are based on the one I fitted to *Cudyll Bach*, which has two pumps on the one crankshaft. *Ashey*'s is simpler, just feeding into the adjacent steamchest.

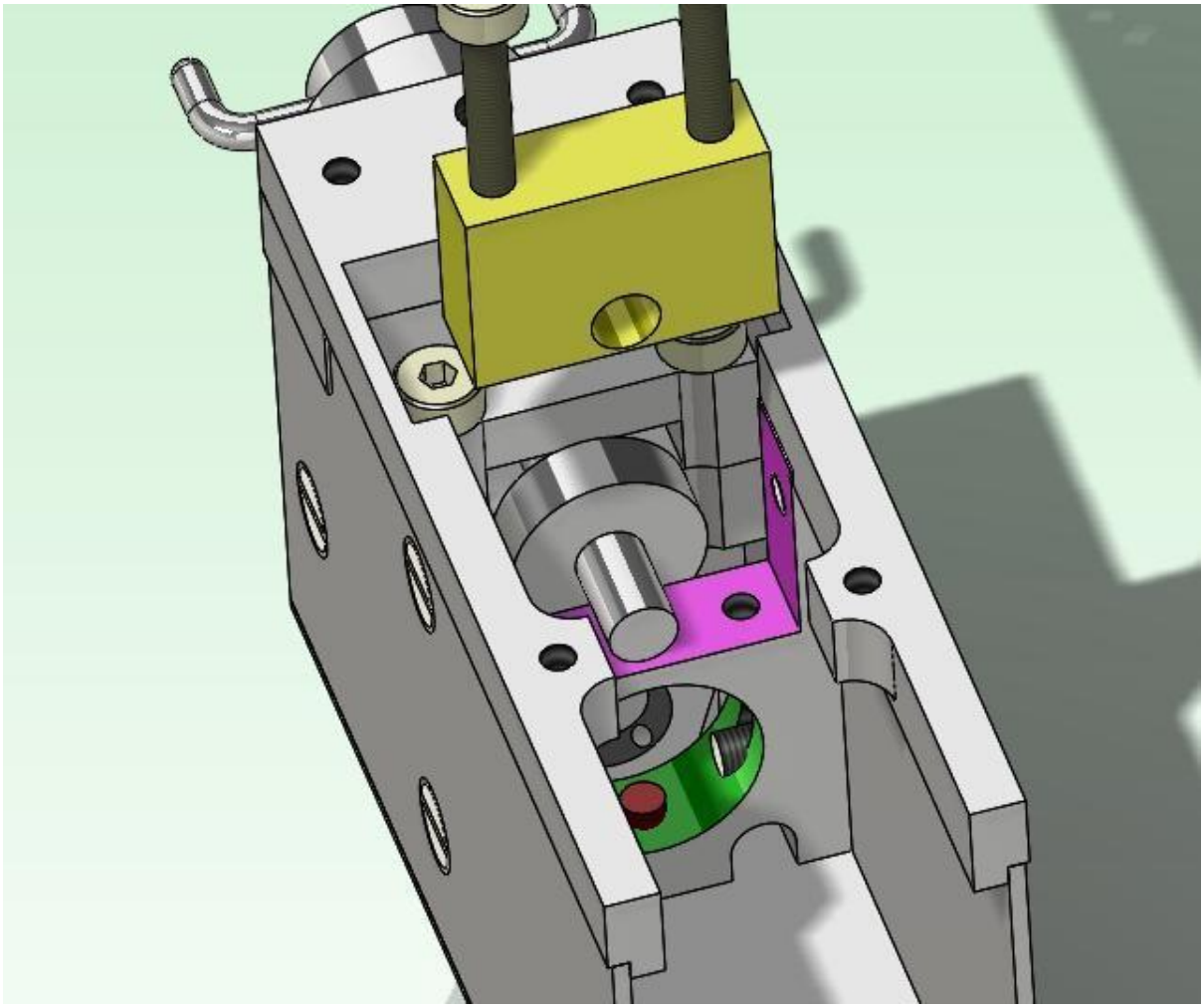
O rings and ball aren't shown on the CAD drawing as I've not got round to it:



Time to make some of the internals, now; it was only when I was checking the CAD drawing that it dawned on me... ***Steaming great nit!!*** I'd brazed the outrigger support for the crankshaft into the lubricator at the same time as the rest of the bits of the tank. I'd forgotten that the support – on the right hand end of the crank, above, needed to be removable in order to be able to assemble the crank! Doh!!!! (Yes, I know I could have had a simple overhung crank and dispensed with the outrigger bearing, but it just seemed a better solution, offering more stability.)

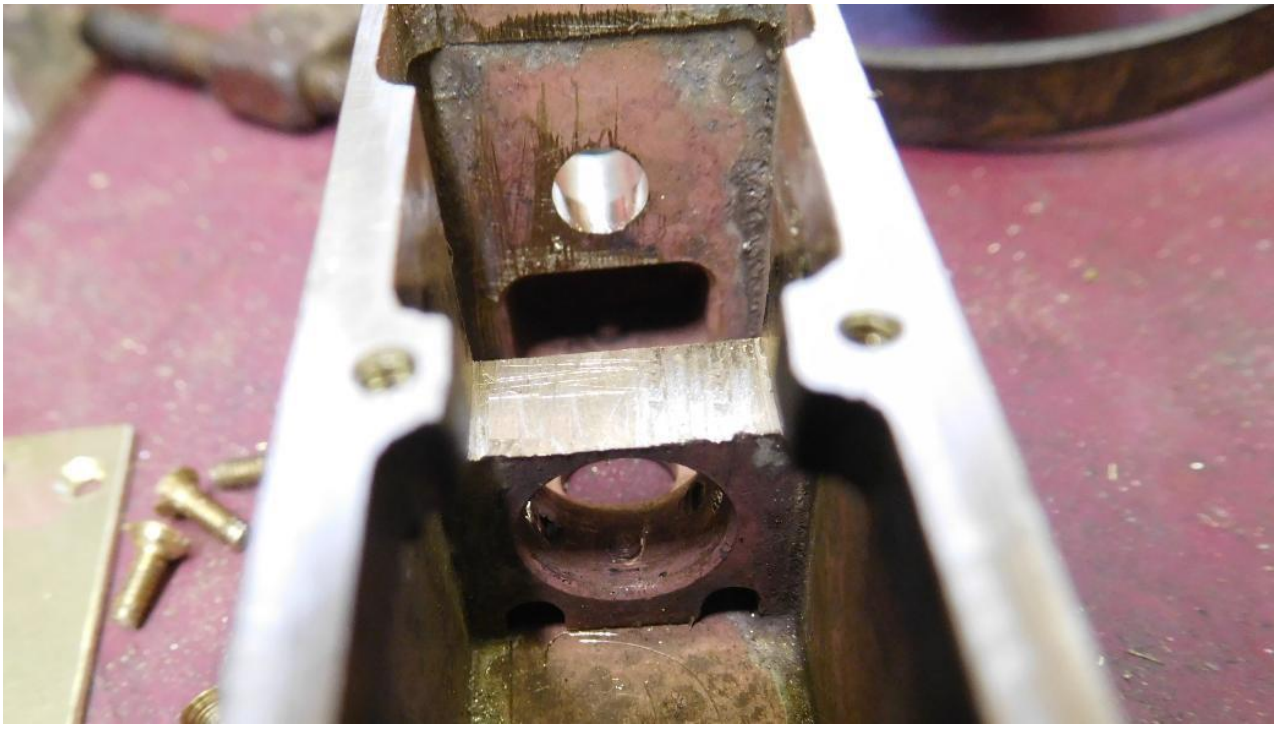
The only way out was to somehow remove the outrigger support – but how, now it was screwed and brazed in?

The solution adopted was to machine out a chunk of the brazed-in outrigger (purple faces in the exploded CAD illustration below) and let in a new piece (yellow) , screwed in place with a couple of M2 screws.



Starting to machine the outrigger away:

Done!



Having finished the cutout, I made the new insert piece and I now needed to secure it to the remains of the old outrigger with two M2 cap-head screws. Now there was an existing hole in the outrigger (Green on the CAD illustration above, and fairly obvious in the photo above). This is to allow oil to flow from the filler into the pump area, and those two M2 tapped holes I needed were just going to collide with it at a nasty angle. Cue broken drills and/or M2 taps and more “Grrrrr!” noises.

I could turn up a plug from a simple piece of plain brass bar to fit into the hole, drill and tap the two M2 holes and then remove the plug afterwards. However, I was concerned about it doing odd things when the drill hit it; it might spin round or just shoot out of the hole! If I Loctited it in place I’d have had a devil of a job getting it out later – and that big hole is necessary! Then I noticed the protruding screw in the bottom

of the hole (browny-red colour in the CAD illustration). So I turned the plug with a head on so I could lever it out afterwards, and chewed out a little slot to clear the protruding screw. Now the plug wasn't going to go anywhere during drilling and tapping.

Here it is in position:

Here's the plug after use; you can see how awkward the M2 holes would have been to drill and tap, without supporting it with the plug:

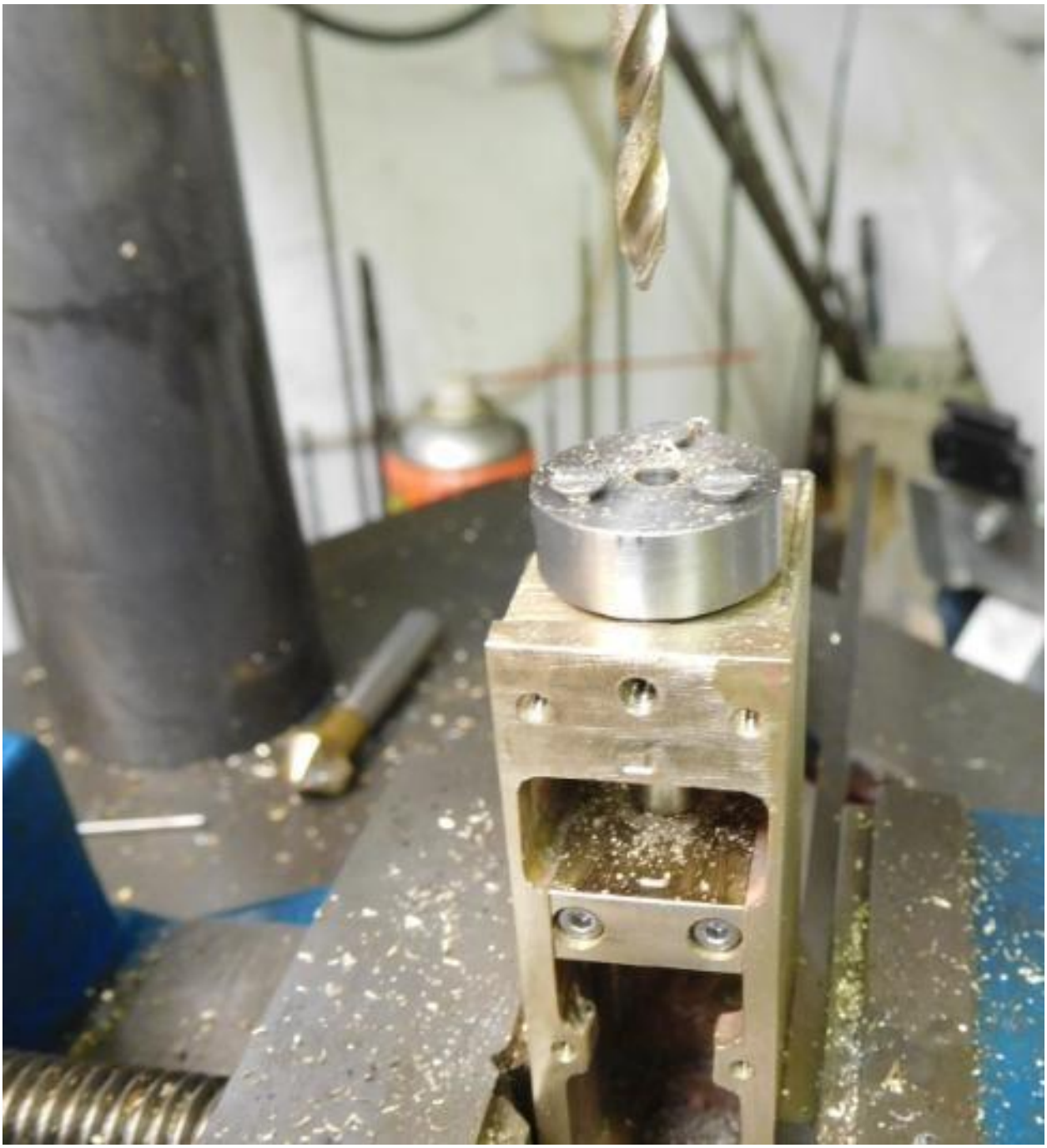
Next, I needed to produce the 1/8" bore in the new insert for the crank bearing. It needed to line up very accurately with the existing 9/32" outer hole.

It is theoretically possible to mount the lubricator in the milling machine, clock up the 9/32" hole and then go for it with a spot drill, drill and reamer. However it would be very difficult to do that, not least because

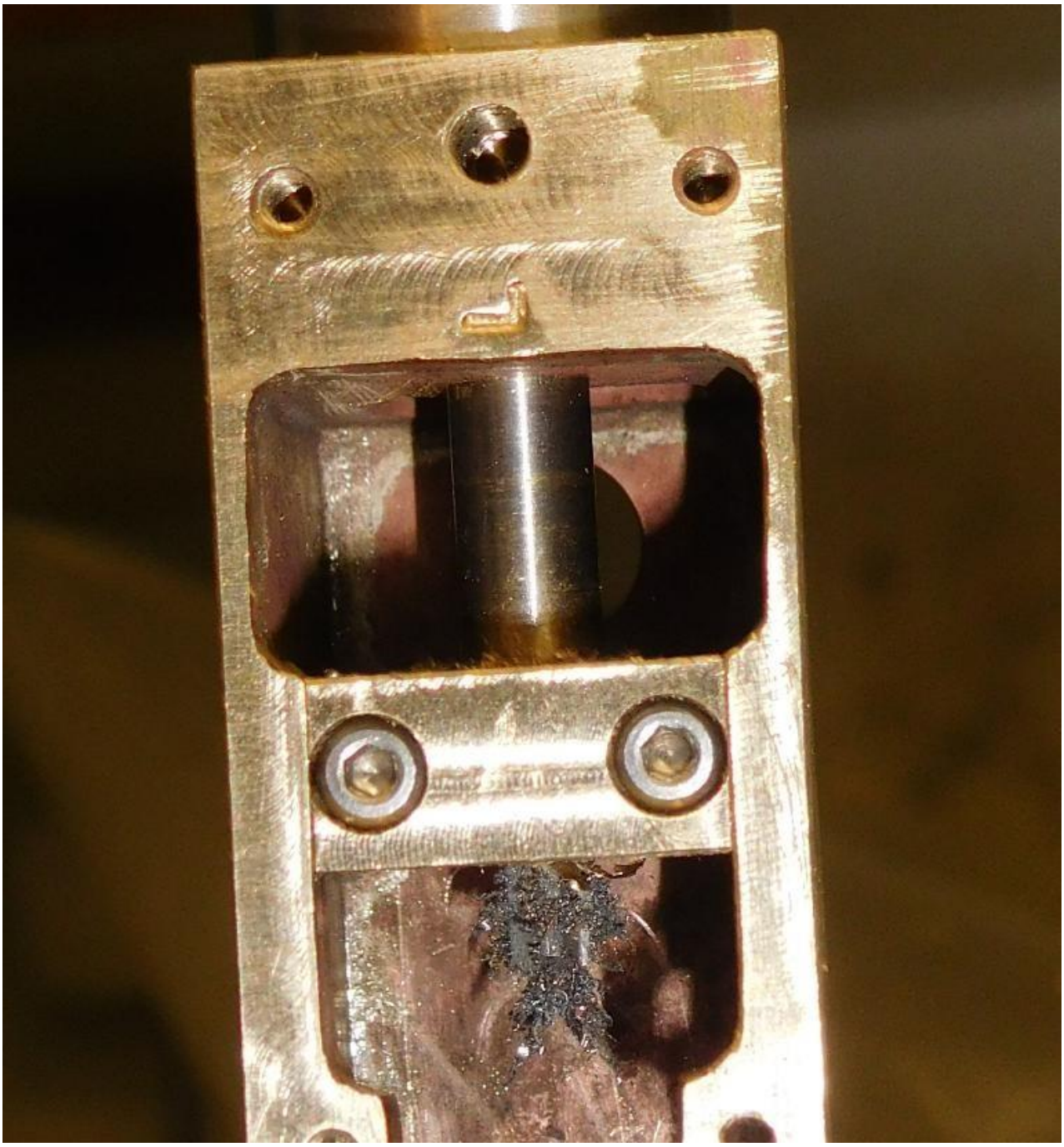
since producing the 9/32” hole, I had cleaned up the end faces on the lubricator, effectively deleting the datum I’d used to create the 9/32” hole. A tiny error in clocking up would mean a large positional error of the new hole. So that’s a “No”, then.

A drill jig was called for; a simple turning operation from a piece of round bar. It was machined to locate snugly into the 9/32” bore. I’d made the other part of the outer hole in the lubricator 5mm to be well clear of the crank, (See CAD drg. P.3). It was the roller clutch that would be providing the bearing, and I didn’t want any clash. Hence I could make the drill jig 9/32” to fit the bore, but with a nice long 5mm nose so it would almost touch the new insert piece and avoid chances of drill wander. The jig was drilled and then reamed 3,1mm as I happened to have a reamer that size.

I fitted the drill jig to the lubricator and drilled the new insert 3,1mm:



...then following up with an 1/8” reamer. The steel swarf on the end of the reamer is from the drill jig, which was sacrificial in that you don’t normally machine the jig!!



The insert was stamped to ensure it subsequently gets refitted the right way round; I was pleased I'd made the insert accurately enough so that it fits either way, but once the 1/8" hole was in place, there's probably only one right way now!

Job done! And all with a broken wrist...

*...or was it*? I had a virtual appointment with the hospital doctor this morning, and he wasn't completely convinced the X-rays showed a break – but he's reserving judgement until next Wednesday when I go for a real visit. I imagine it involves him seeing how much I scream when he pulls on it...

04-Dec-2020