Flywheel with spokes, made from stock materials

By Thor Hansen

Cast flywheels for model engines are available in many sizes but not always cheap, so I often make my own flywheels.

If you have a 3D CAD/CAM program and a CNC milling machine you can, of course, easily make your own flywheels. For us who don't have a CNC milling machine, a piece or two of suitable steel pipe and some steel rods can be used to fabricate a spoked flywheel.

If I can find a piece of thick-walled pipe of suitable diameter, I have used an off-cut to fabricate a spoked flywheel. If I can find two pipes with different diameters so that one pipe nearly fits inside the other you can glue the largest pipe onto the smaller one after silver soldering (brazing) the spokes, this way the spoke ends don't show. Finding suitable pieces of pipe isn't always easy, however, one day I looked into the skip on the industrial estate near where I live and found some discarded and rusted ball and roller bearings of suitable diameter.

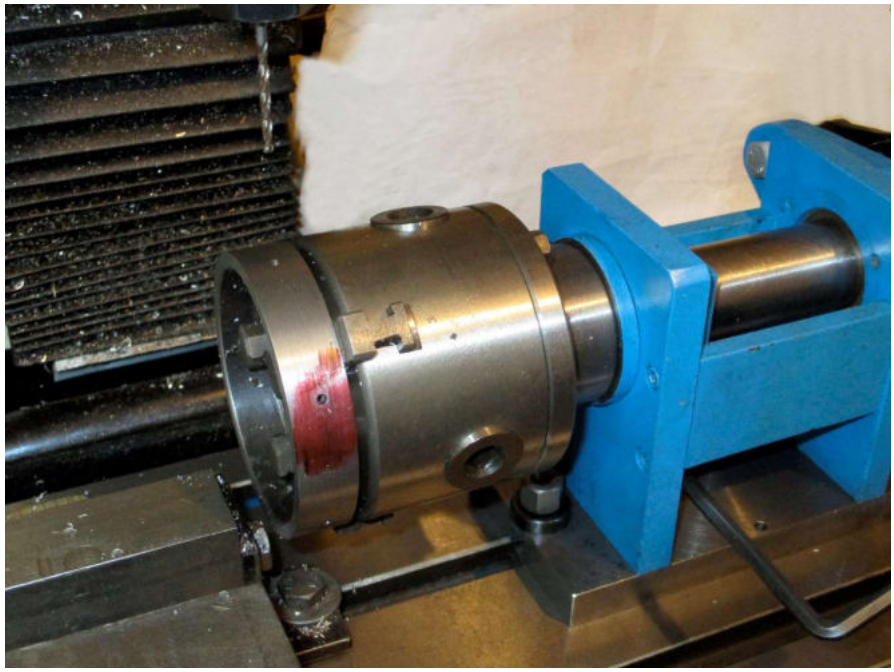
Flywheel made from ball bearing races

The inner race of the taper roller bearing had an ID of 70mm, and the outer race of the ball bearing had an OD of 90mm. The inner race was too large to fit inside the outer race of the ball bearing. The material used for ordinary ball bearings contains about 1% Carbon, and some Chromium and other alloying elements, and they are hardened. So the first job was to heat the races in my makeshift hearth to red and then let them slowly cool.

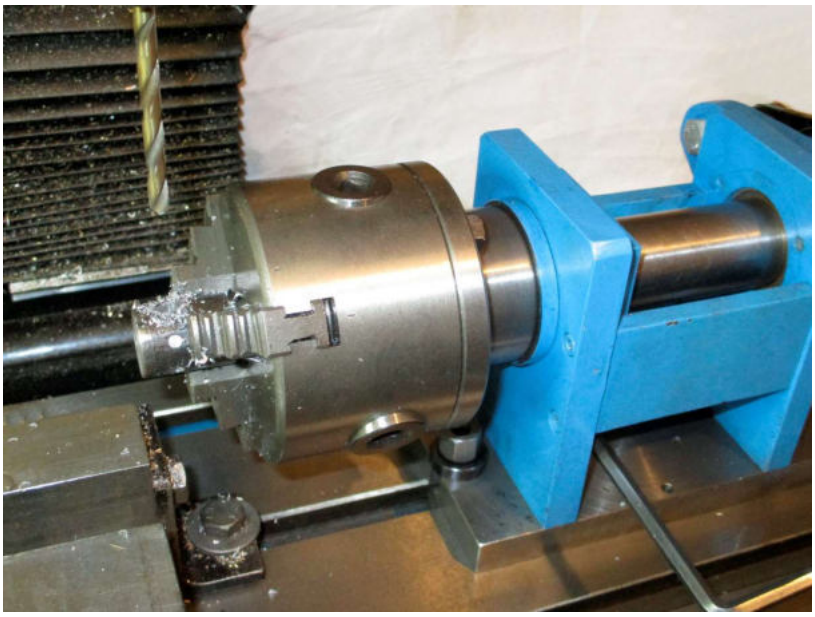
The inner race of the taper roller bearing was mounted in the 4-jaw independent and clocked in on the inner surface. I could then turn down the outside of the race to a diameter about 2 to 3 mm larger than the ID of the outer ball race. This also removed the taper.

The inner race of the taper roller bearing was now ready for drilling, I drilled six 6mm holes spaced 60 Deg. apart using my indexer – right photo.

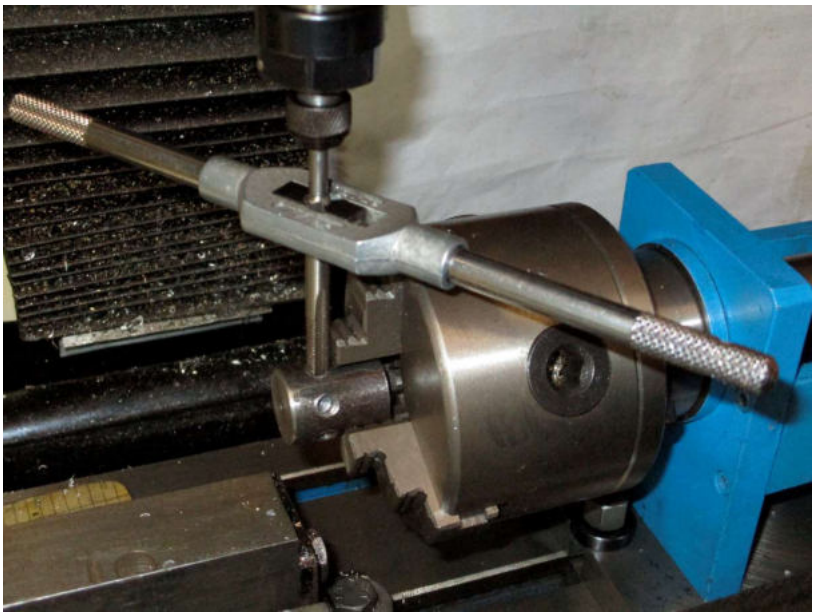
First I used a spotting drill and then drilled pilot holes, the material is fairly hard.



The next job was to drill six 5mm holes 60 Deg. apart in a 20mm dia. mild steel rod to make the hub. The holes were drilled to a depth of just over 5mm. This was done in the indexer almost the same way described before – right photo.

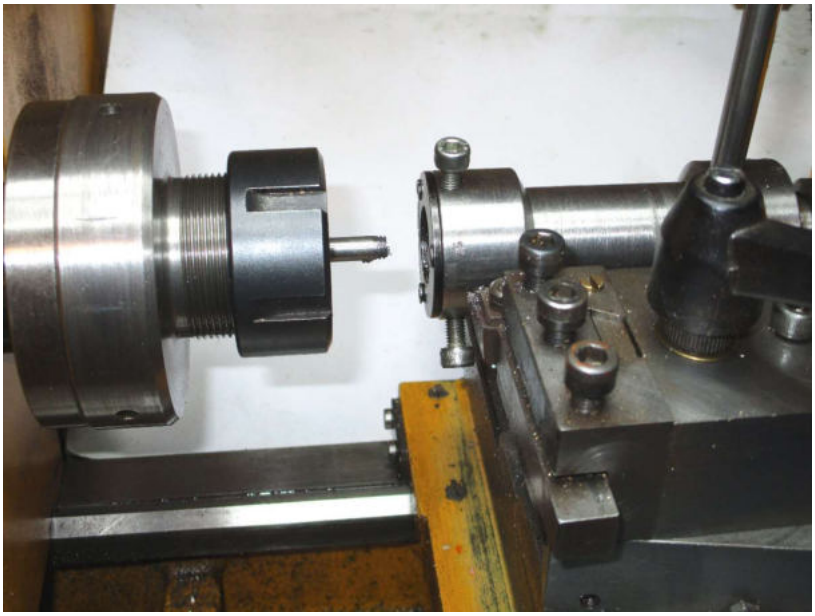


The 5mm holes were then tapped M6 – right photo.



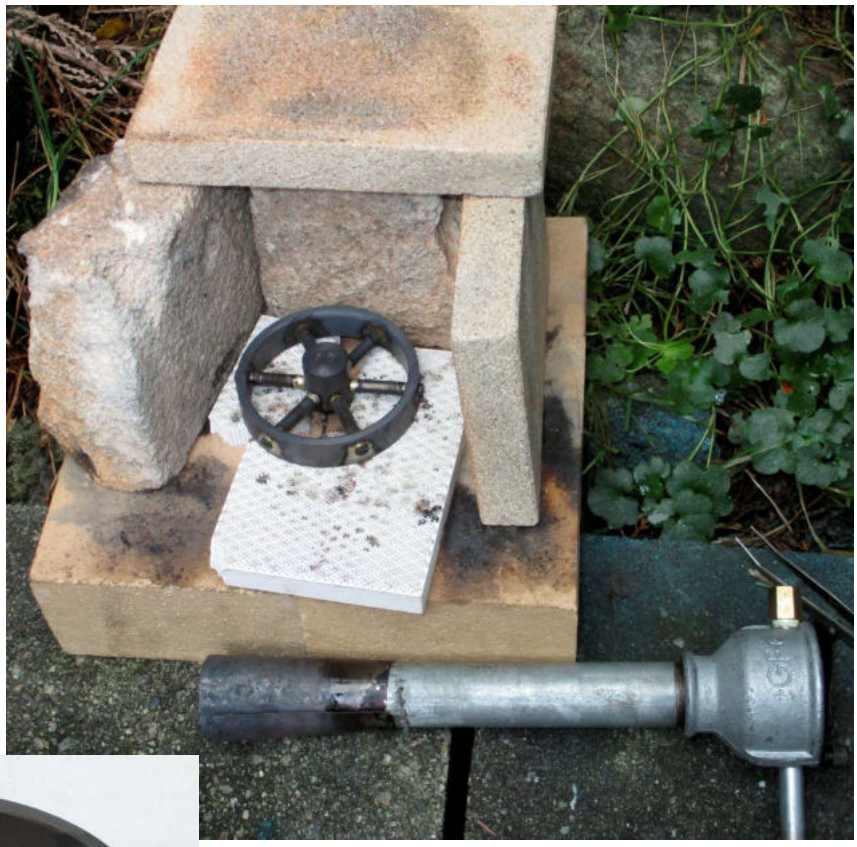
One end of the spokes were threaded M6 using a tailstock die holder, so one end of the spokes can be screwed into the hub, so even if my silver soldering (brazing) isn't entirely successful, the spokes will not come out – right photo.

And any water in the flux boiling off can not push the spokes out.



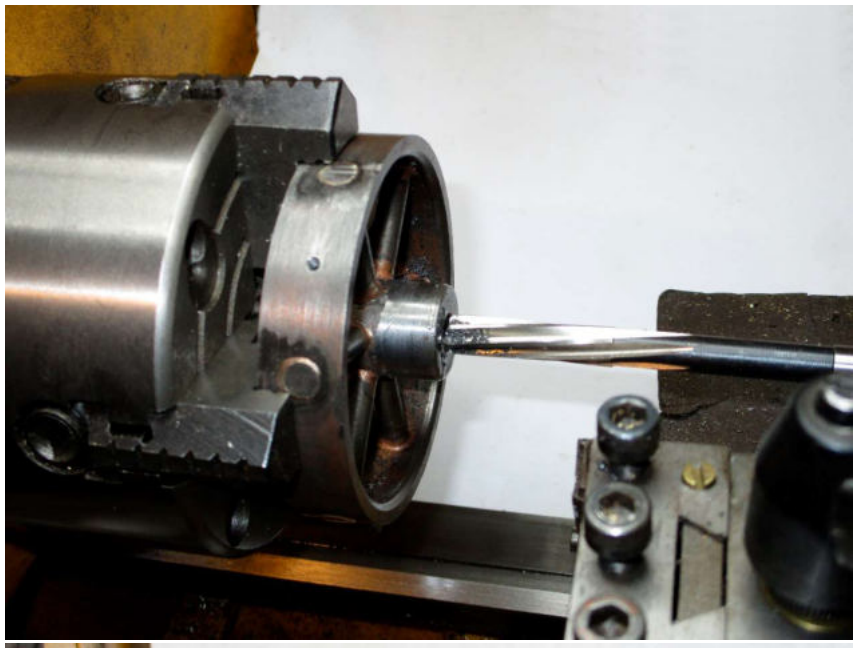
The right photo shows the hub, spokes (with one end threaded) and the rim, ready for fluxing and silver soldering (brazing).

Here are the parts silver soldered (brazed) together in my makeshift hearth.
I fluxed both around the hub and the rim and applied the silver soldering rod to the spokes both around the hub and the rim.
The silver solder penetrated from the inside of the rim to the outside so the spokes won't move.
The Reil type burner is in the foreground cooling down.

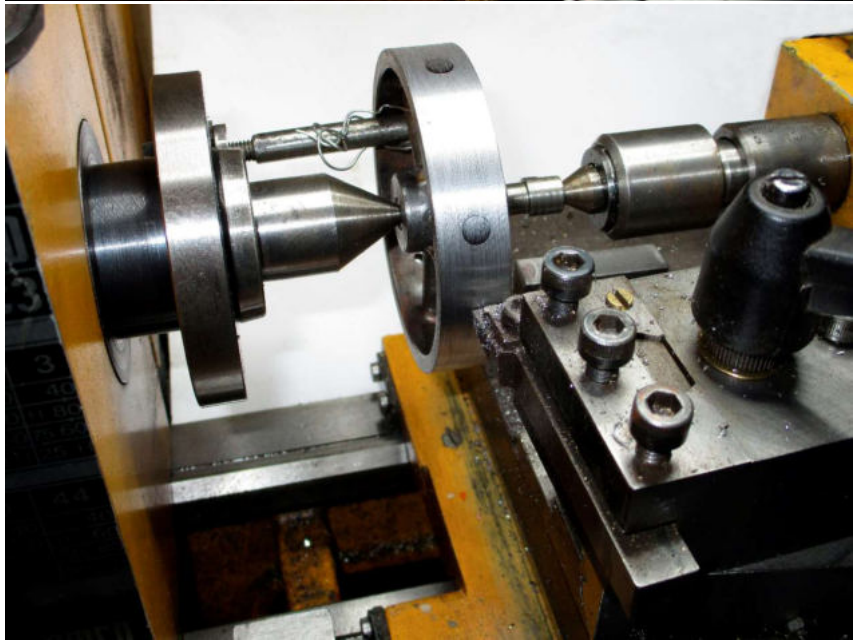


The left photo shows the flywheel so far, after pickling in citric acid solution. The saw cuts at the end makes it easier for my old fingers to screw the spokes into the hub before soldering (using a small screwdriver).
I also drilled three 2.5mm holes in the rim – between the spokes and threaded them M3.

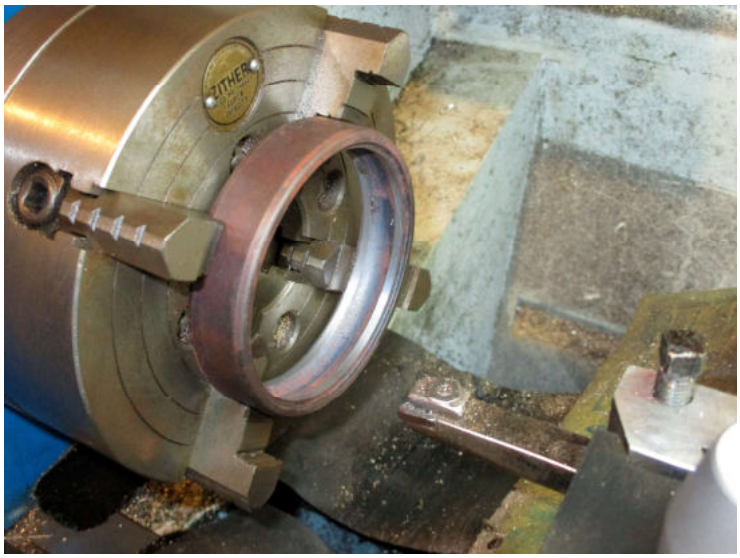
The protruding end of the spokes were sawed off and the work was then transferred to the lathe and mounted in the 4-jaw independent and clocked on the inner surface (diameter).
A spotting drill was used to make a start for the hole through the hub. After drilling a pilot hole a 7.8mm drill was used to drill through the hub before reaming to 8mm – right photo.



The work could now be mounted between centres using a mandrel so I could turn the sides and outer diameter – right photo.
The outside cleaned up at a diameter of 79mm.
The material in the rim was a bit hard to turn and prone to chatter.

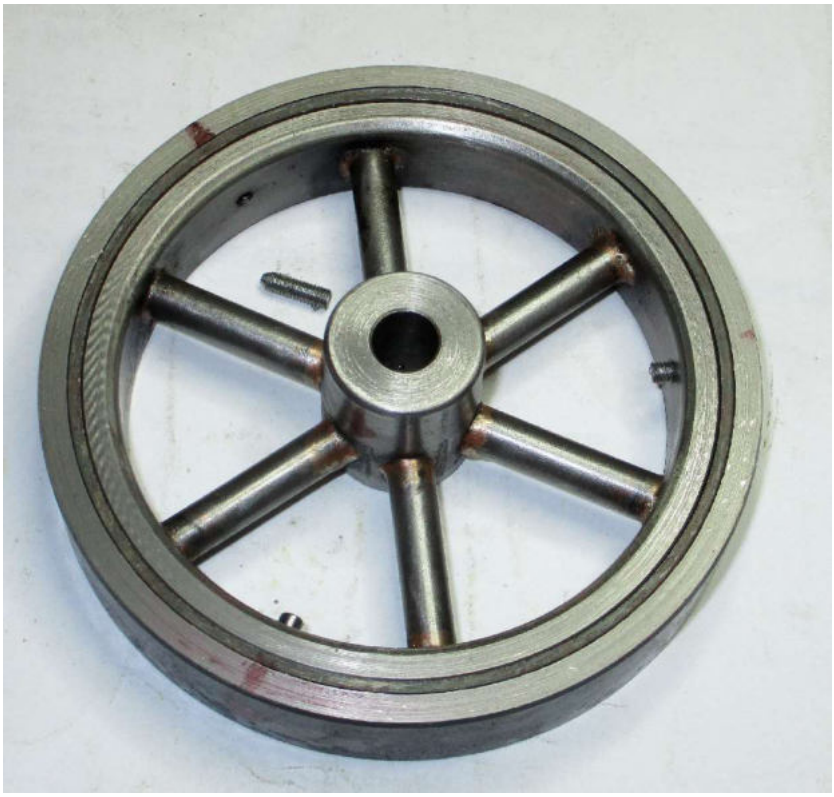


The outer race of the ball bearing will be used to make the outer part of the flywheel rim, you might call it the tyre. It was mounted in the 4-jaw independent and clocked in on the outer diameter – right photo.
The inner diameter was bored to 78mm through. Then the saddle stop adjusted so the boring bar could not bore through, nearly 1mm of the 78mm part remained. The rest was then bored to just over 79mm so the inner rim would just fit. This way the inner rim



will rest on the little shoulder in the outer rim (tyre) while the glue cures. To the right is a photo of the flywheel before applying any glue.

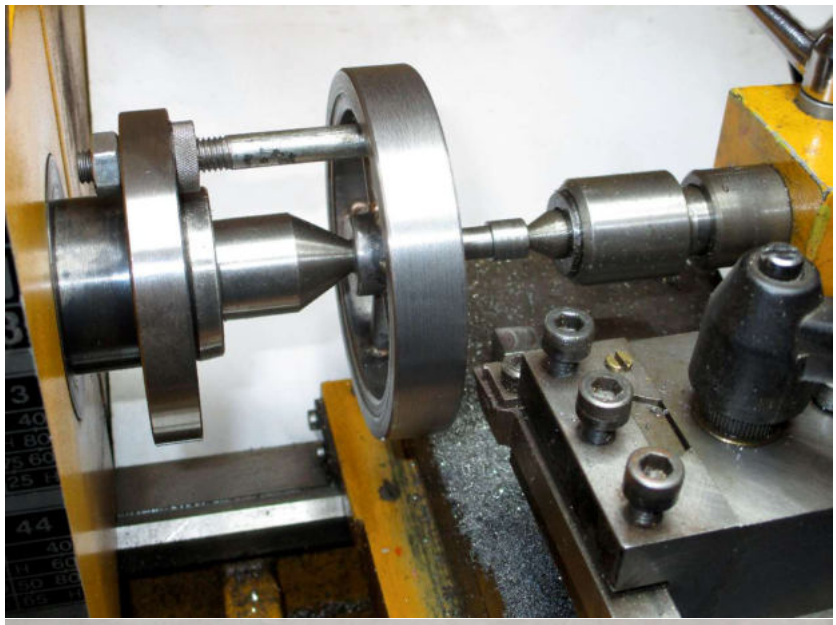
Since the flywheel will be mounted on a mandrel between centres and finish turned in the lathe I wanted to make sure the two parts of the rim didn't move. The three holes in the inner rim that I tapped M3 was used to mark the inside of the outer rim (tyre). I could then use a handheld drill with a 4mm spotting drill to drill three shallow points.



I then made three pointed grub screws (set screws), when they are screwed into the tapped holes in the inner rim and into their shallow points they will secure the two parts – right photo. Felt pen marks were used to show how to orient the two parts.

The mating surfaces were cleaned and epoxy glue applied to the outside of the inner rim and inside of the outer. I used a drop of anaerobic glue on the grub screws just before tightening them. After the glue cured the protruding part of the screws were sawn off and then a small file to clean up.

After the glue had cured the flywheel was again mounted on a mandrel between the lathe centres and the sides and outer rim cleaned up – right photo.



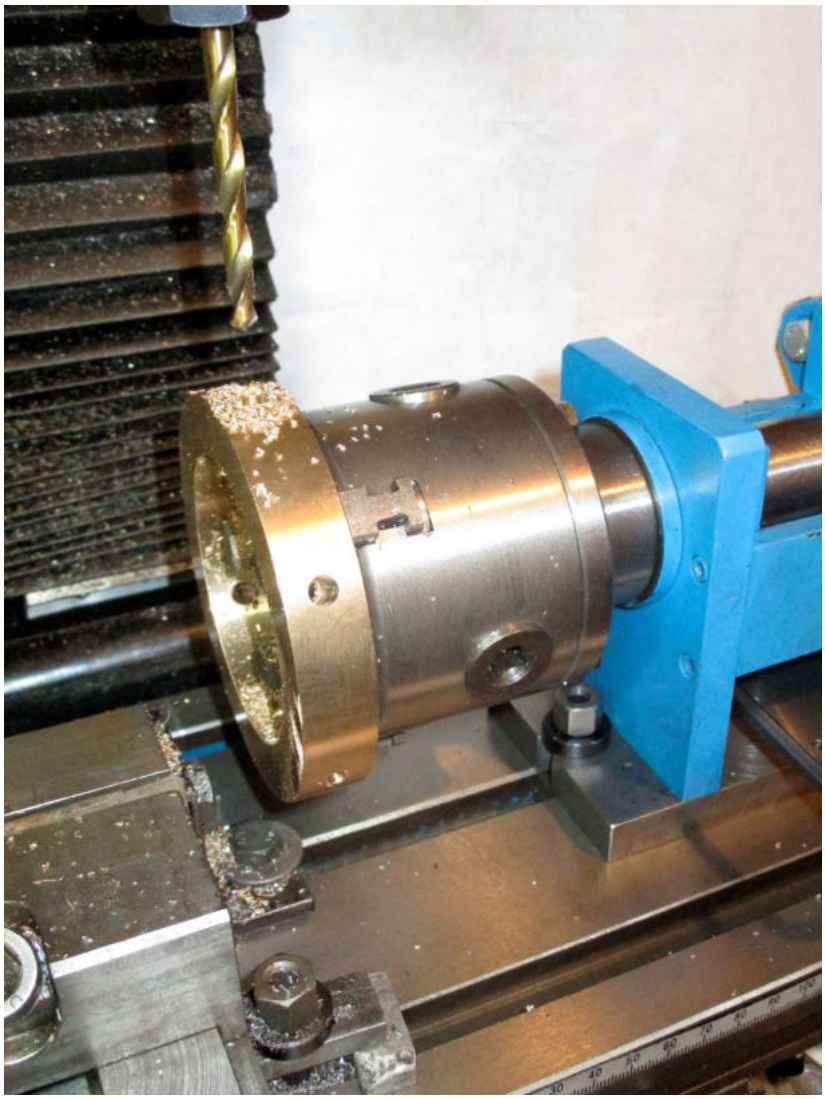
This is the flywheel after turning. I still got some chatter so mounting the flywheel on the faceplate might reduce the problem.

After a bit of elbow grease and emery paper the flywheel was ready for some paint.

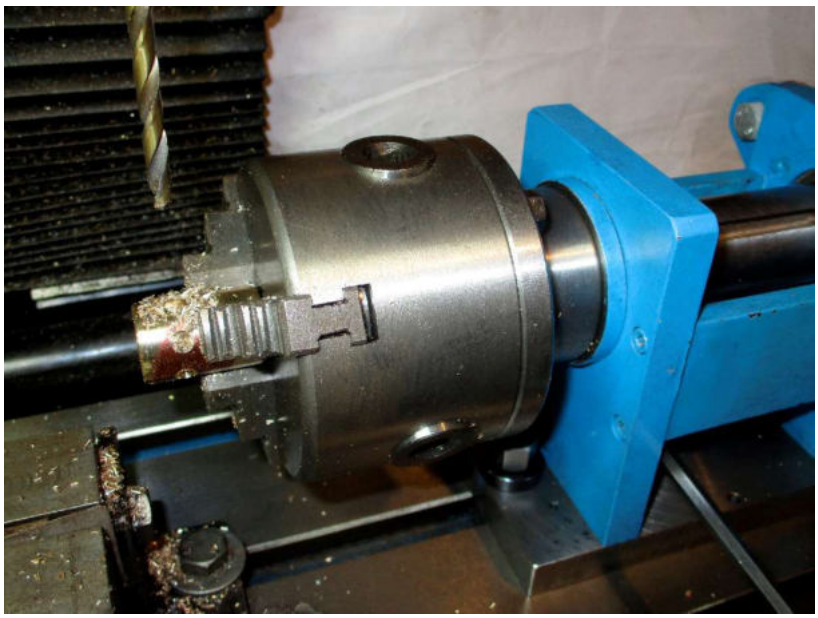
A friend managed to source an off-cut of thick-walled brass or gunmetal tube, unfortunately I couldn't find any other pipe off-cut that the brass tube just wouldn't fit in. So for this flywheel it is possible to see the spokes on the outside of the rim.

The brass or gunmetal tube was first mounted in the 4-jaw gripping on the outside and centred on the inside. The inside was then turned until it cleaned up.

The work was then transferred to the indexer in the milling machine and a spotting drill used to make six marks spaced 60 deg. apart. Pilot holes were then drilled before using a 6mm twist drill with the cutting edge lightly stoned – right photo.

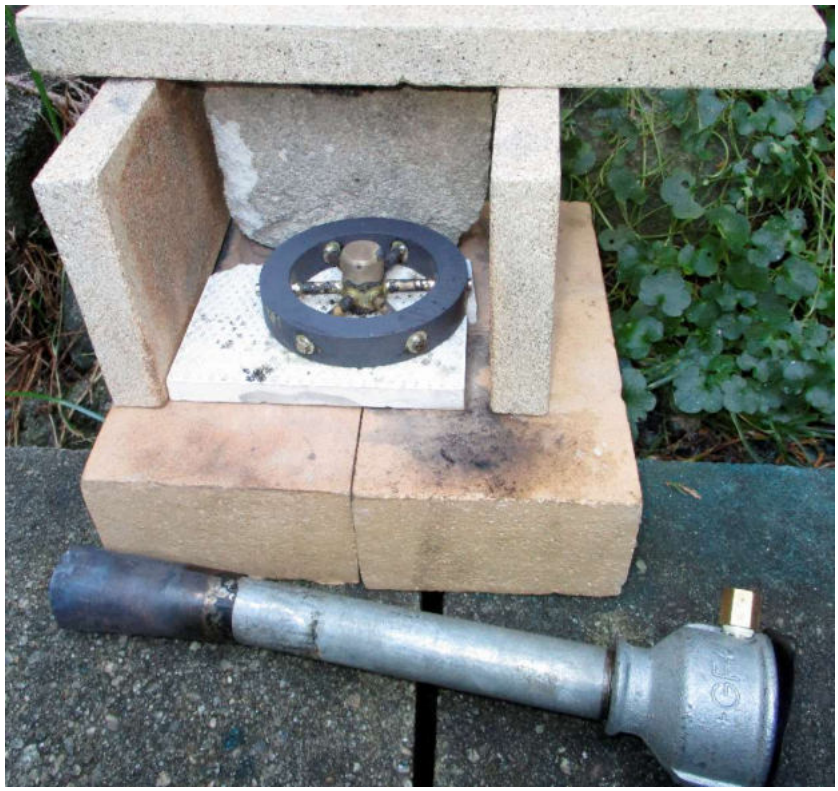


A piece of 20mm dia. brass rod was used for the hub. The indexer was used to drill six 5mm holes (spaced 60 deg. apart) to a depth of just over 5mm. The holes were then tapped M6 – right photo.

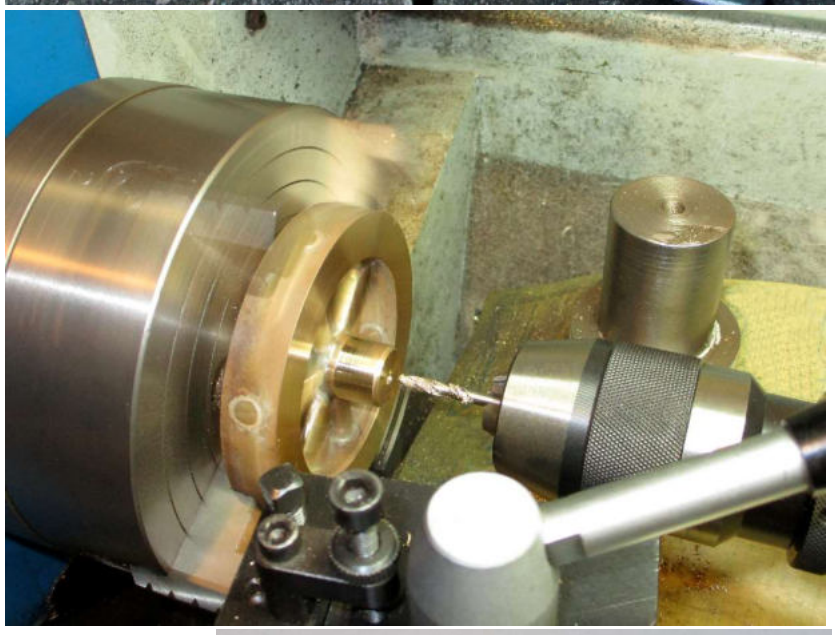


The spokes were made from 6mm brass rod, one end threaded M6 using a die held in the tailstock dieholder.

The parts were cleaned and fluxed and silver soldered (brazed) together in my makeshift hearth – right photo.



After pickling in citric acid the part of the spokes protruding from the rim were sawn off and a file used to clean up.
The work was then mounted in the 4-jaw (gripping on the outside) so the hub could be cleaned up and a spotting drill used to mark the centre of the hole for the crankshaft. A 7.8mm drill was used before reaming to 8mm – right photo.



A 3.3mm hole was drilled in the hub and tapped M4 for a grub-screw.
The flywheel was mounted on a mandrel between lathe centres as I did for the steel flywheel and the wheel cleaned up to run true.

The finished flywheel: