

Replacing the Barrel Teeth

on a 1 piece barrel wheel

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One of the more ugly jobs that surfaces fairly frequently at my shop is that of a badly damaged wheel on a one piece barrel.

I have seen others recommend making an entirely new 2 piece (barrel and wheel) replacement part. Another approach is machining away the old toothed portion of the one piece assembly and soldering on a replacement cap, like a normal 2 part barrel. That is the process we will discuss here.

Sometimes that is easier said than done, so here is a process that works well for me.

I have several secrets for this process, or maybe a couple of them, worth sharing. The first is the use of a very narrow (thin) .0135" thick cut off tool. Making such a tool out of drill rod and not overheating the steel is not easy, but obviously it can be done. I have used thicker cut off tools but at least part of the success of my method is minimizing the cutting force required to machine away the old face.

Another step, before you make any chips is to accurately measure the height of the barrel, the thickness of the wheel itself, etc. After the face is off it becomes problematic to set end shake, make the new assembly the proper height, and fit everything properly unless you know the original measurements. Don't ask me how I know this little bit of information.



Photo 1 3/16" Drill rod cut off tool, .0135" thick



Photo 2 Top view showing the thin sharp blade of the cut off tool

Too much force and the tool will jam or stick and the barrel will either twist or collapse and then we get to make a new barrel too.....just what we are trying to avoid.



Photo 3 Removing the damaged wheel / barrel face

Results of the operation using the thin sharp cut off tool. Notice the barrel itself is grasped in a 6 jaw chuck with a lot of clamping surface. Also, the barrel end cap is left in the barrel to allow a much more firm grip. What is not shown is the use of a live center in the wheel end of the barrel assembly while this process is underway.



Photo 4 Why we are replacing the entire wheel face

You will note there are at least 4 bent teeth in this one area. What can't be seen in this photo is the wear in the face of all the teeth, as well as the tips of the teeth are all slightly topped from spinning. This is not the first time this barrel has had a problem. One of my other secrets is following a barrel failure you need to inspect very carefully all the teeth, under 20 power or greater magnification, looking for other damage such as bent teeth, topped off teeth, cracks, and wear.

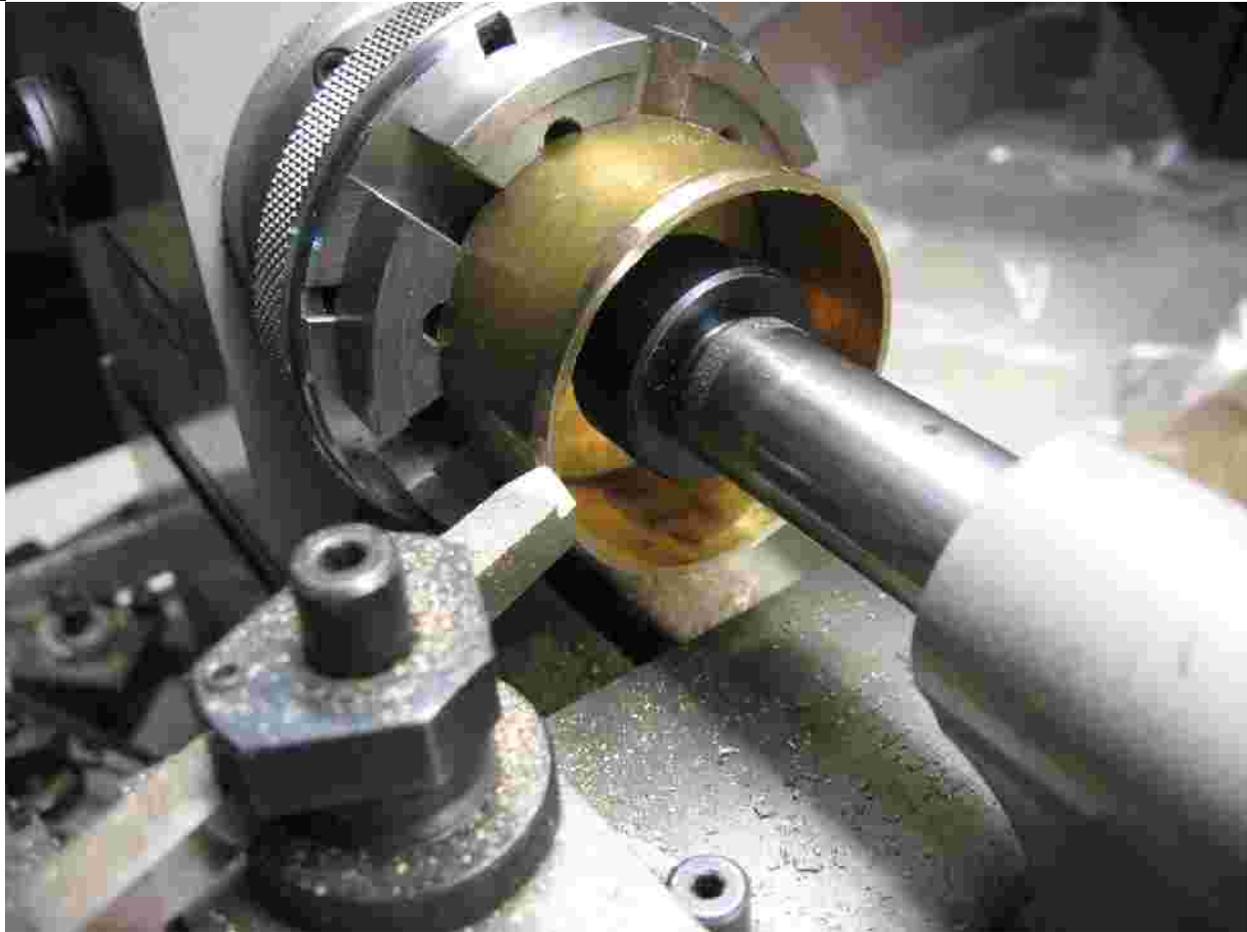


Photo 5 Cleaning up the face of the barrel

Note the use of a live center against the barrel cover

After the old wheel face is removed it is necessary to clean up the outside of the mating surface for the new wheel. I recommend the use of the live center for this also, see photo. The goal is to keep the barrel in the jaws with no movement while machining. The live center in the center hole of the barrel cover assists in this, another small secret in making this work.

As mentioned previously, the contact / clamping area of the 6 jaw chuck is one of the several secrets of the success of this operation. The same results can be accomplished by machining a tight recess (bored) in a block of wood, or aluminum. It just takes longer and adds steps.

Also of note, seldom do barrels run true and round after a century or two of use and abuse, and a few broken springs. It may be necessary to reshape the barrel slightly using a small hammer and a mild steel mandrel turned to the correct inside diameter, with a relief cut for the hook. Don't overdo it!

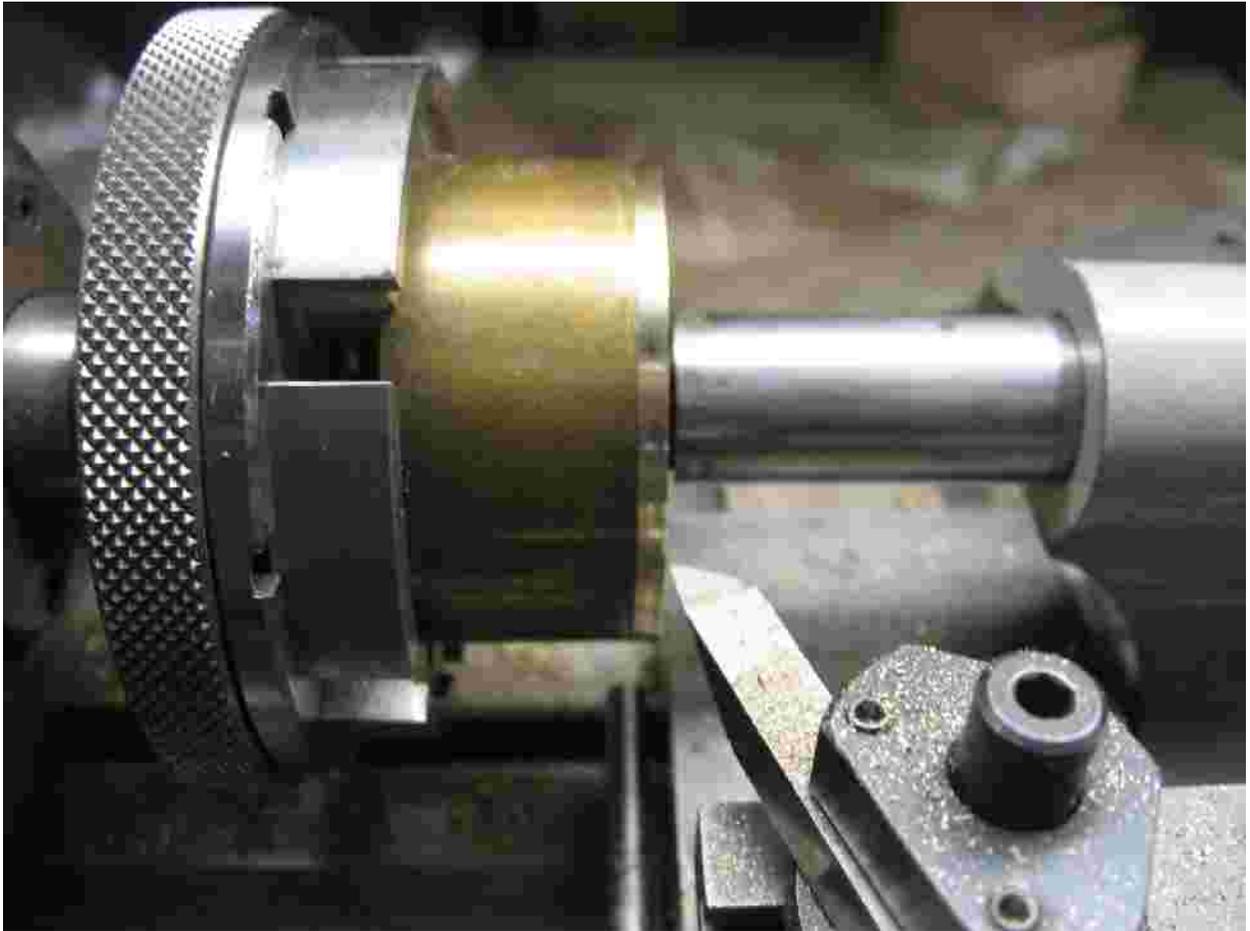


Photo 6 Machining the step in the barrel for the new wheel / barrel facing



Photo 7 Machining the new wheel blank and machining the recess



Photo 8 Cutting the new barrel wheel.

Please note the blank has not yet been cut, the teeth you are seeing are just an old gear I was using as a clamping washer. Yes, I use coolant on brass, a subject I have mentioned often.

Teeth are cut in a single pass. In this case the wheel was about 1.750" in diameter, 80 teeth; thickness of the wheel was .236". The cutting of the teeth takes about 10 minutes on this machine. Cutter speed was 2200 RPM using a Thornton cutter. Depth of cut was .046"

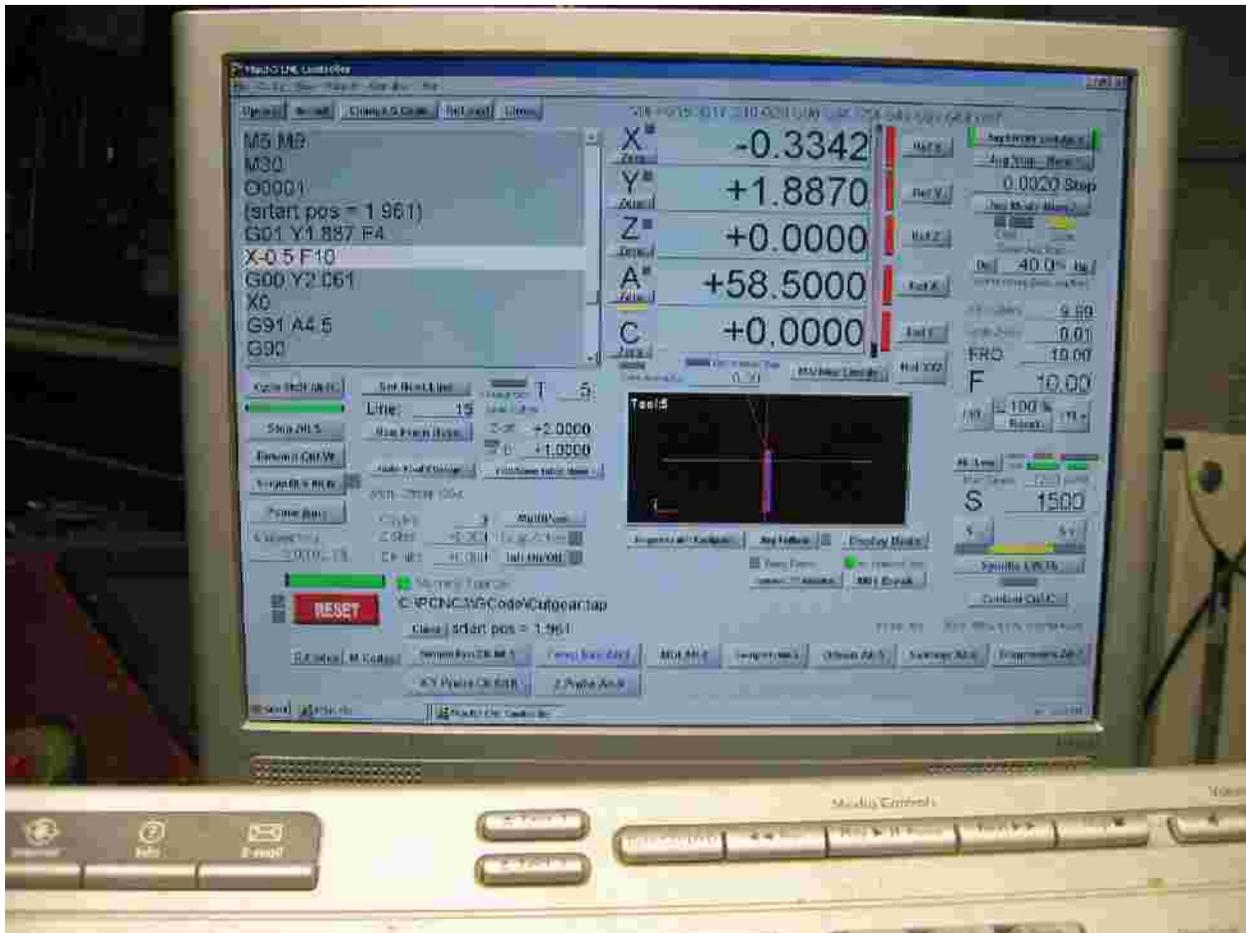


Photo 9 CNC screen shot

I cheat and use a computer controlled wheel cutter on a 4 axis CNC mill. The control software is MACH 3 and the machine is a Tormach 1000 mill.



Photo 10 Wheel is ready to have a final step machined to match the OD of the step machined on the barrel itself. The step is then soft soldered to the barrel.

I have completed these operations on occasion in less than 2 hours, but usually the total time is more in the 3 hour range when all goes well. If it doesn't go well....we all know how that goes....back to minimum wage....or less. But I digress.

So, to summarize.

The real secrets are covered in prior text but include the following:

- Measure everything and record the measurements. Duplicate the measurements on the new assembly
- Inspect the old wheel under magnification, say 20X or more looking for clues that led to failure

- Hold the barrel firmly in a 6 jaw chuck or in a block of wood or aluminum machined to hold the barrel.
- Use a live (or dead) center during machining operations to keep the barrel in the chuck from working loose.
- Use a very thin cut off tool, no more than about .025" thick max, I like thinner yet. Make it if you don't have such a tool.
- Machine with caution and care. Vibration and intermittent cuts will loosen up things you don't want loose.....
- I generally do not "just replace a tooth". 90% of the time I will replace the entire "cap". Why? That is perhaps another paper.....

This process works well for me. I have done perhaps 100 or more barrels in this fashion. Your results and mileage may differ. But, I do recommend it as my preferred method over making a new barrel.