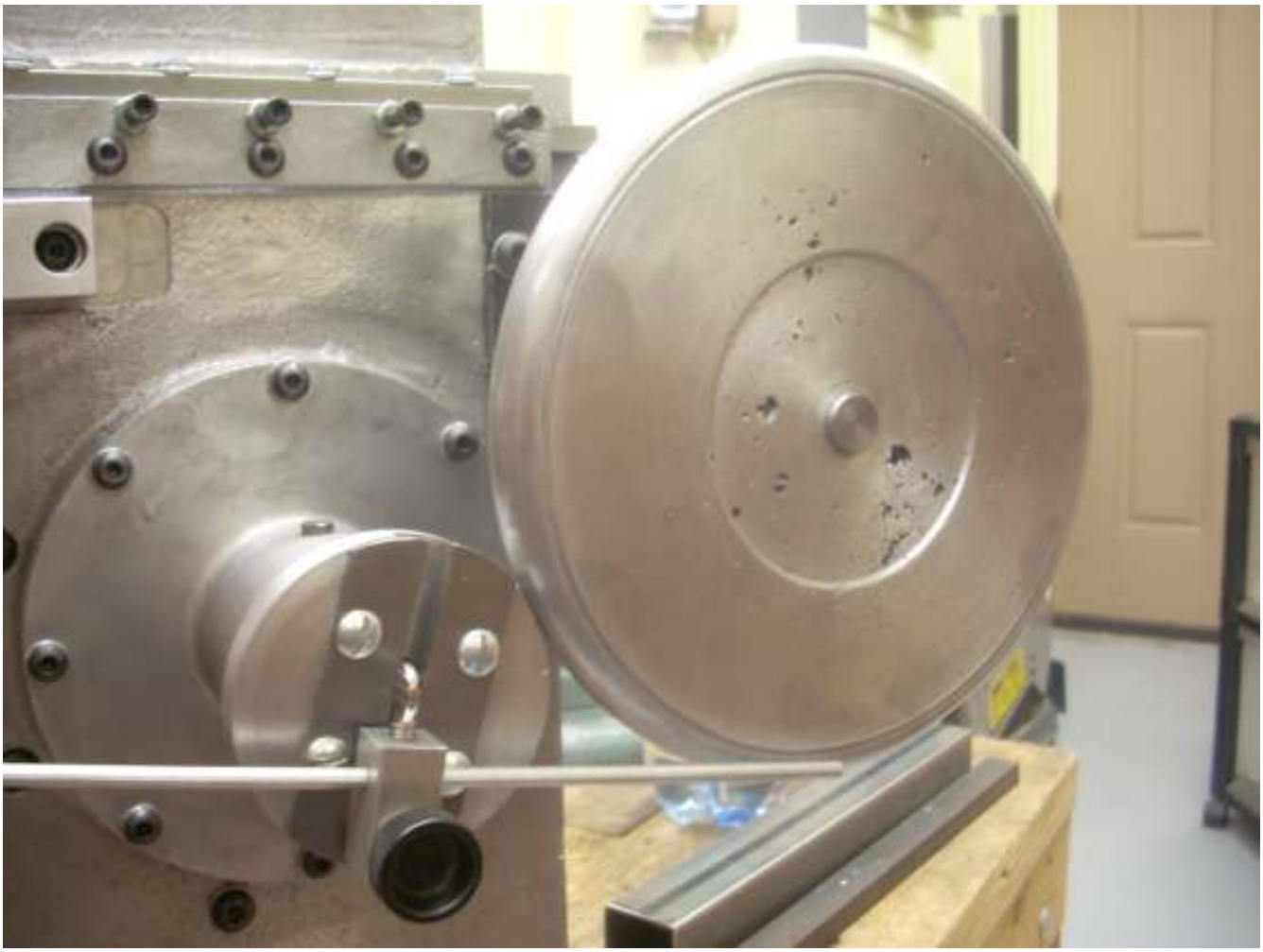
Machining The Handwheel

By R. G. Sparber

10/21/2008

Copyleft protects this article.

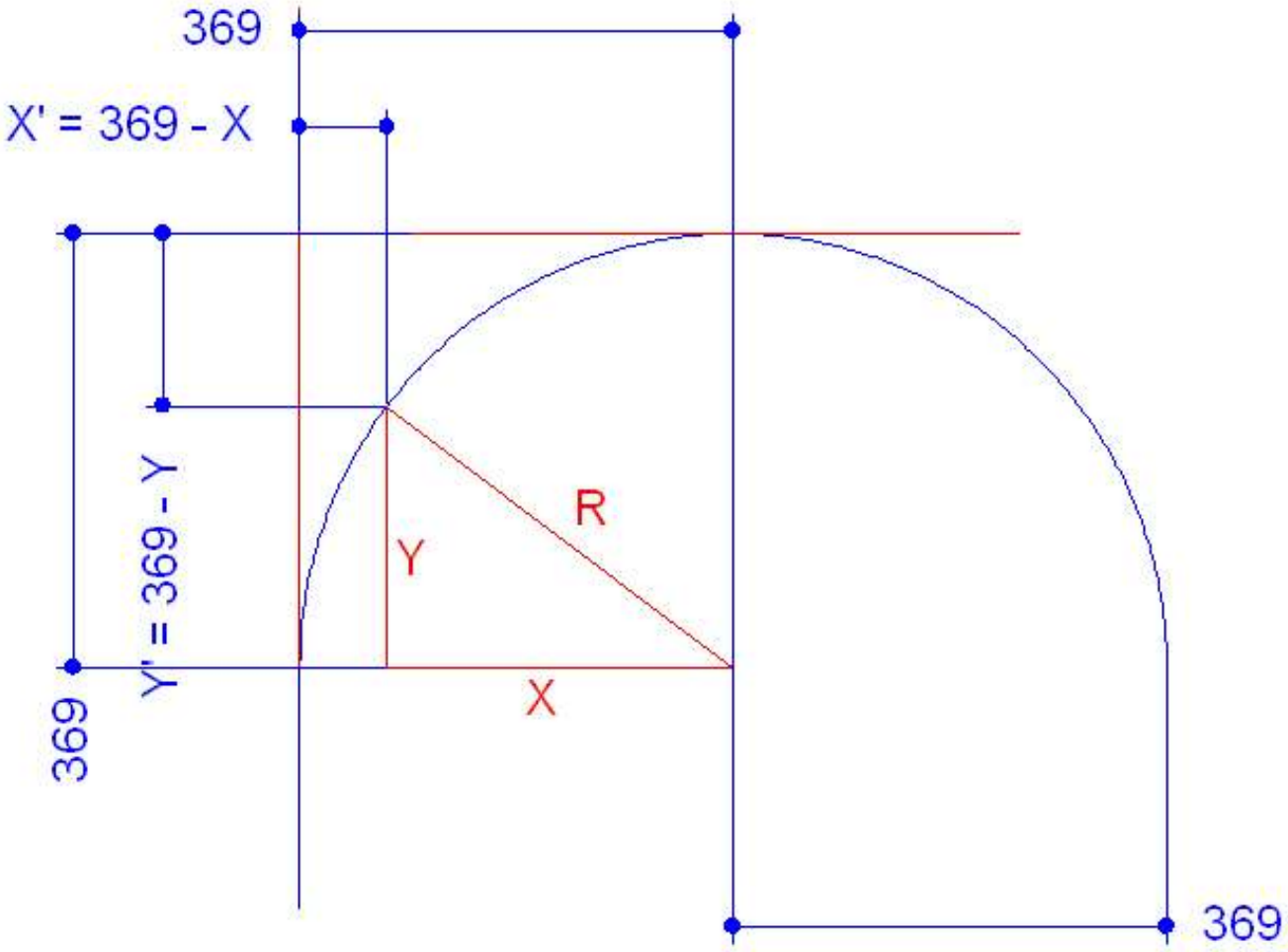
Gingery does not call for a handwheel but does mention the need to manually advance the shaper before running under power. A key feature of any handwheel that will spin under power is that it must not have openings that can catch fingers or hands.



I have temporarily mounted the finished handwheel on the right side of the machine but this is not a good place for it. A finger can easily get caught between this spinning handwheel and the

automatic feed mechanism.

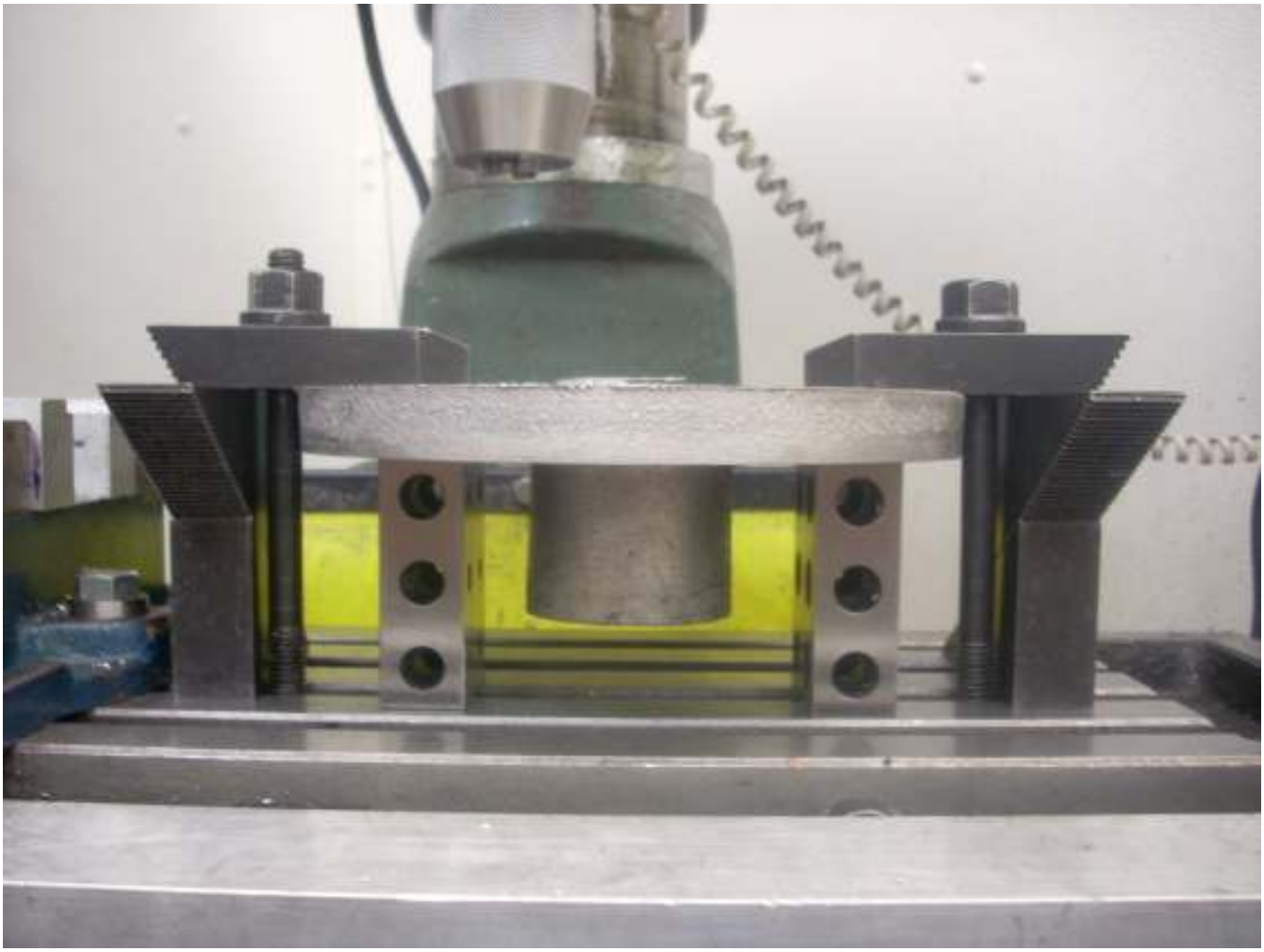
Note that the perimeter is rounded and polished. The goal here is to have no spinning sharp edges. I could have done this rounding with just a file but it would have taken a long time plus didn't sound like much fun. Instead I employed a technique called Manual Numeric Control to cut this perimeter. This involves taking a series of 0.1” steps to rough out the shape and then going back and taken 0.01” steps. A file is then used to remove the remaining metal.



The first step is to find an equation that describes the shape I want to cut. You are looking at a cross section of the form to be cut as viewed from above. I measured my rough casting and see a width of 0.738”. My half circle will therefore have a radius of 0.738”/2 = 0.369”. Any point on this half circle can be defined by an X,Y set of numbers (shown in red). The trick is to convert those numbers to reference a more convenient point. I have chosen the upper left corner. As viewed in front of my lathe, this would be the front right corner of the rough casting

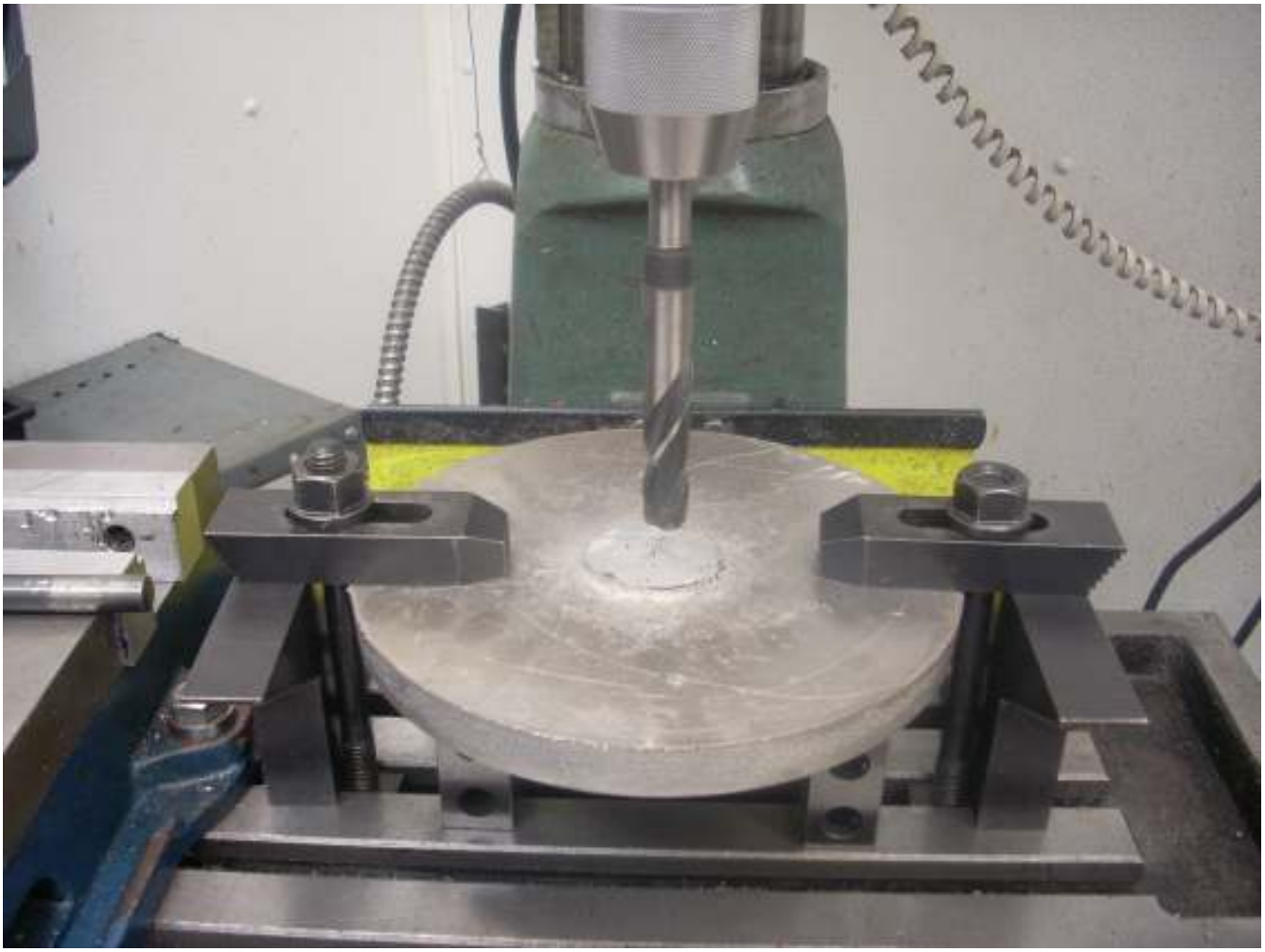
defined by the right face and the perimeter. It is easy to place my cutter at this corner and zero both my X and Y dials. My X dimension is along the lathe bed and is noted above as X'. My Y dimension is along the cross slide and is noted above as Y'. By moving X' in steps of known value, I will get a series of corresponding Y' values that tell me how much to feed in my cutter. All of this was done on a spreadsheet. If the math interests you, please contact me directly at rgsparber@AOL.com.

Although this is tedious work, it does go fast. I only had to make 4 cuts on each side at 0.1” per step. The 0.01” steps are more numerous but less metal is removed so they go quickly too. With the above drawing plus my spreadsheet in hand, it is time to make chips.

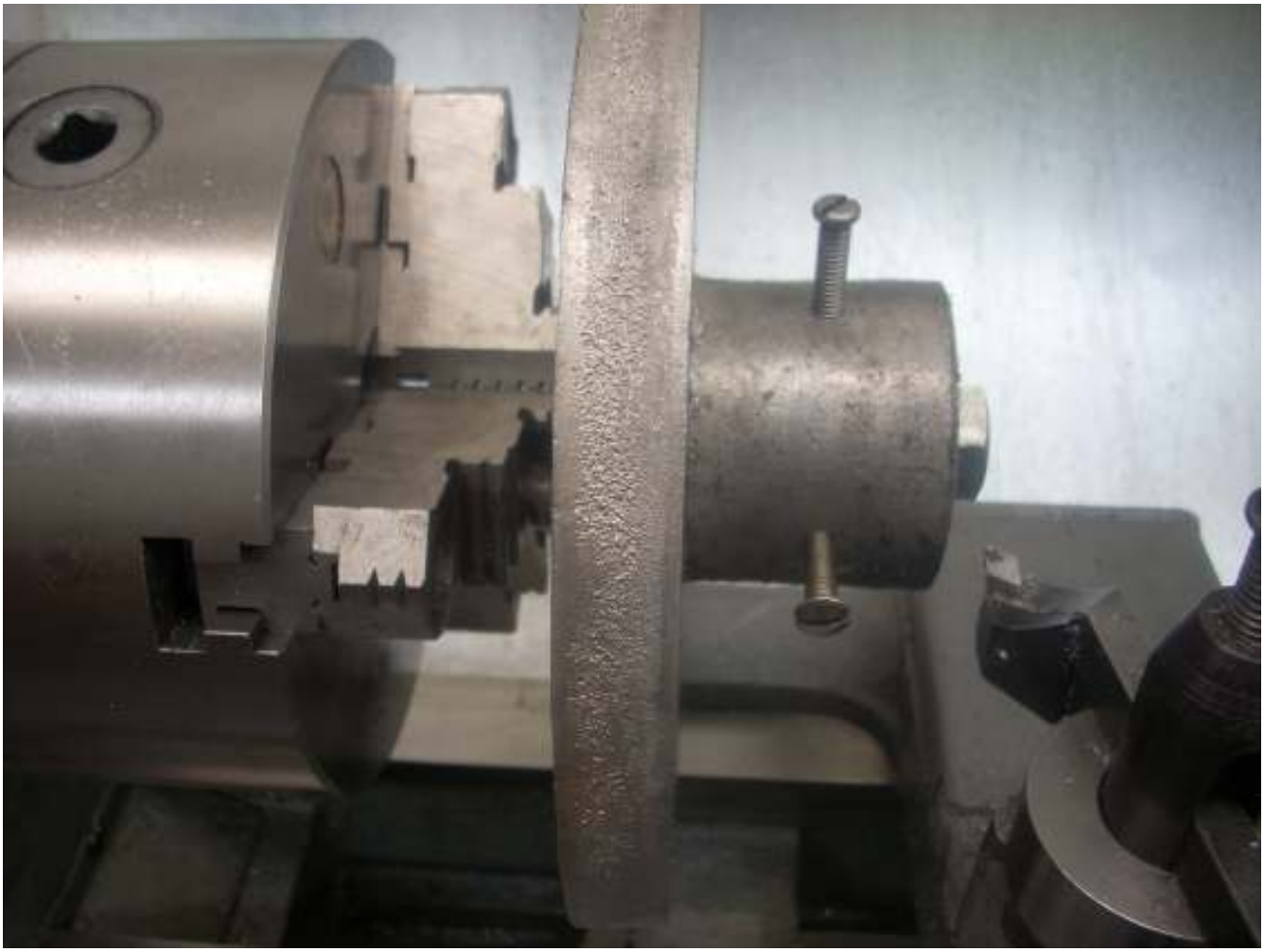


This rough casting is a second copy of the pulley pattern. A nice side benefit is that the mistakes I made on that pulley can be rectified this time.

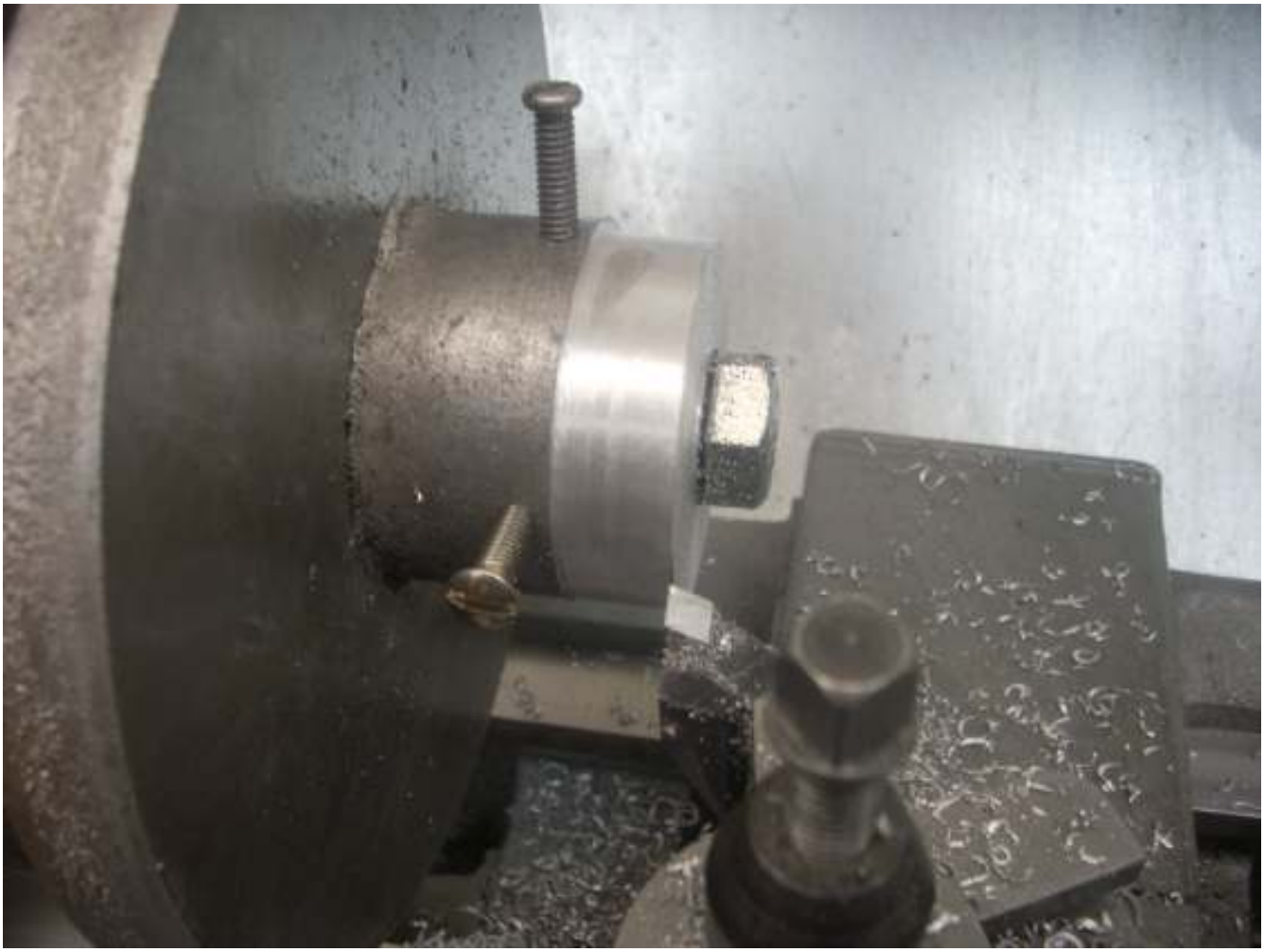
I started out the same way by marking out the center of the disk and then drilling a hole for the mandrel.



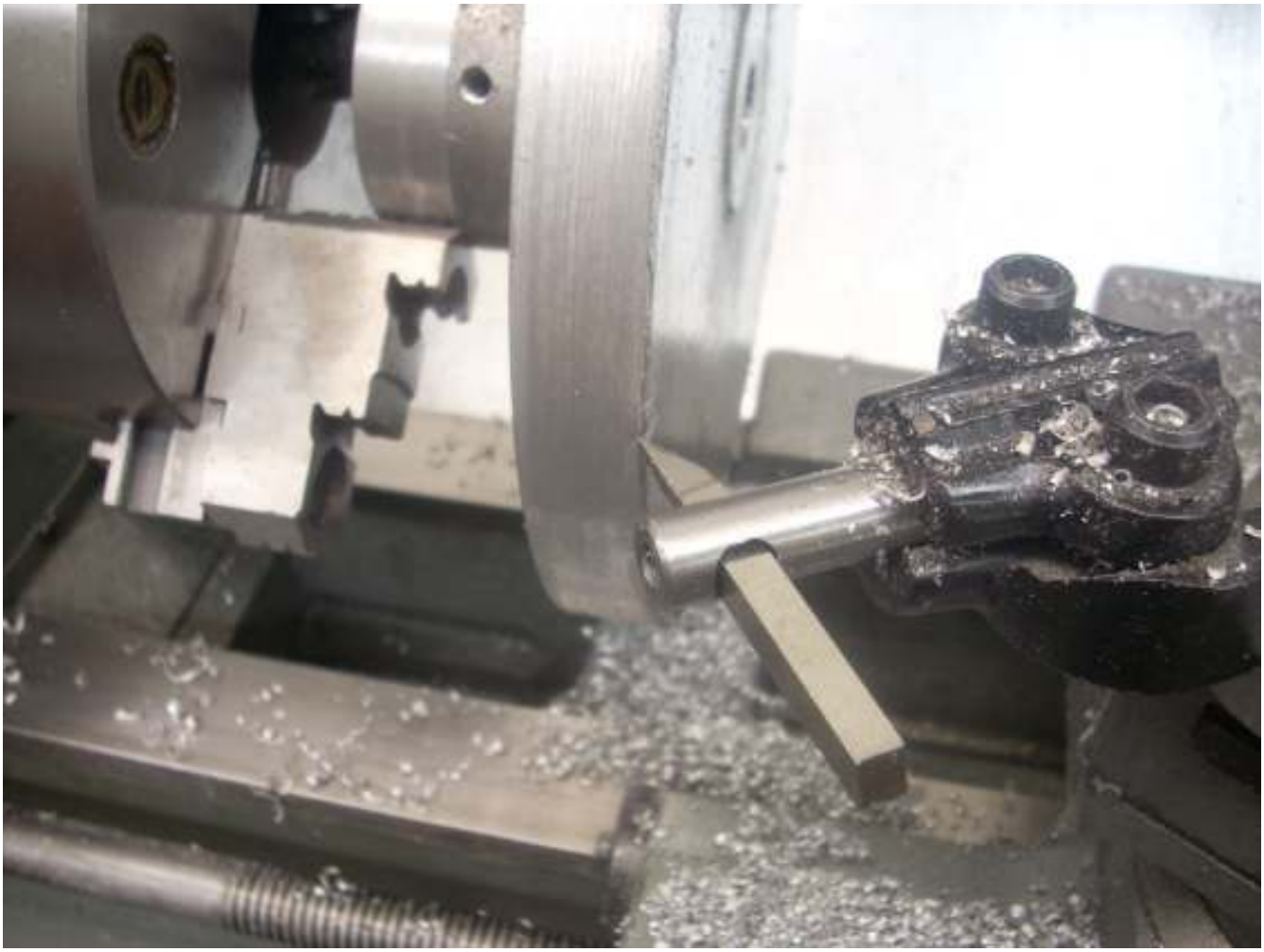
Last time I went for a bored hole that was a nice sliding fit on the mandrel. Not such a good idea since the mandrel distorted slightly and jammed in the hole. This time I'm simply step drilling with a ¼”, ½”, and finally a 5/8” drill. Quick and a bit more room in the hole.



This time I'm using a mandrel secured by screws but will only face the end of the hub and turn the perimeter of part of the hub true. I would have cut more of the hub but my ¼-20 grub screws have not arrived from Enco yet. Those bolts sticking out are not “cutter friendly”. In fact, they aren't knuckle friendly either.



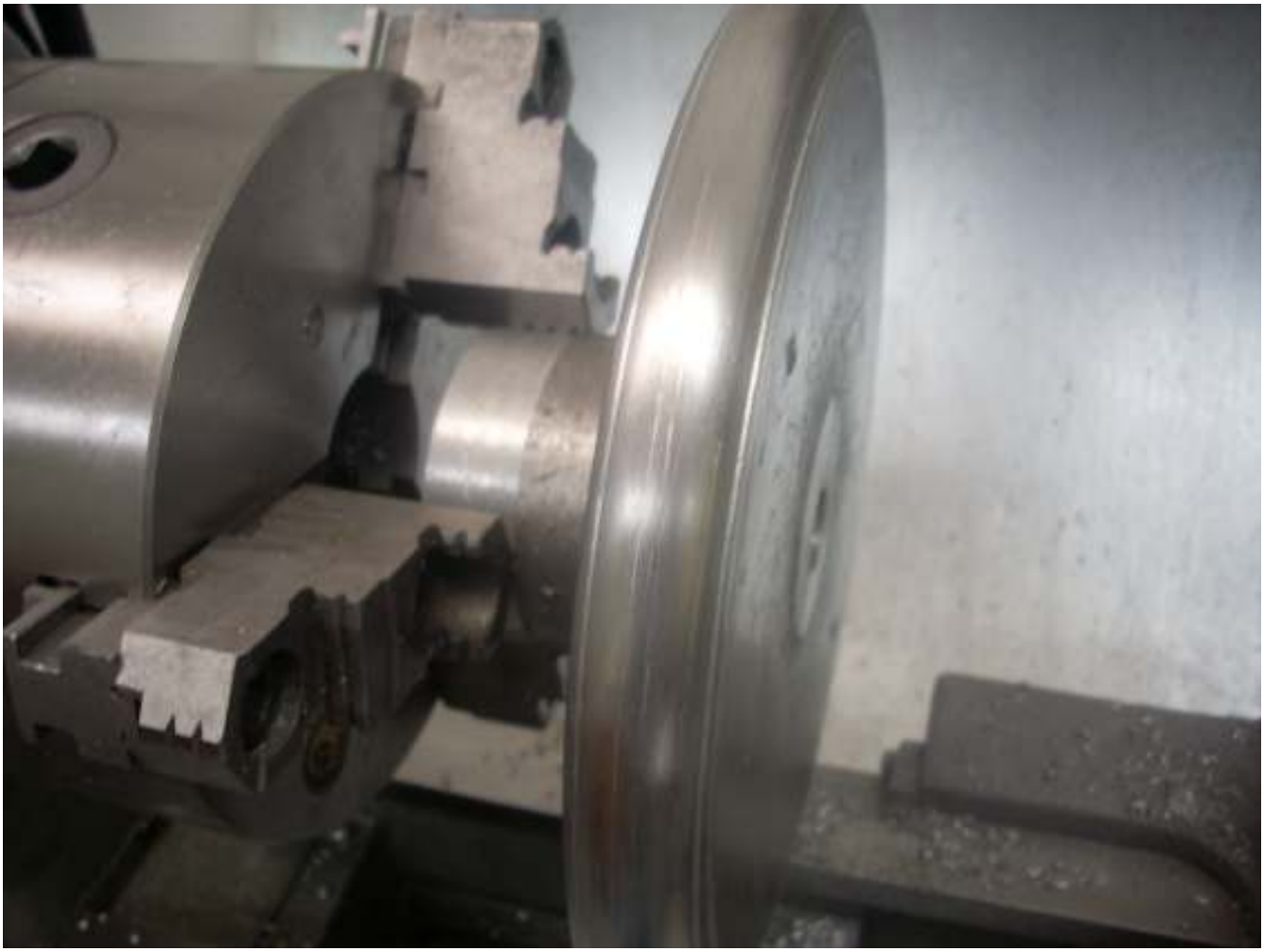
I now have a surface on the hub that is true with the bore.



I can now securely hold the hub in my 3 jaw chuck.

I have chosen a right hand cutter held in a boring bar. It was the only way to reach the entire perimeter of the casting. Here I have the cutter touching the right front corner and my X and Y dials are zeroed.

Not the best picture but maybe you can see the right half of the perimeter has been rough cut with 0.01” steps.



After rough cutting the right side, I moved the cutter over and cut the left side. Here you see the perimeter cleaned up with a file. That groove on the left is where I got confused and turned the dial the wrong way. Such is life.

I followed the file work with 220 grit, a 3M pad, and 0000 steel wool.

I trued up the outer face. The recess came from machining out an area with a fair amount of shrinkage. I didn't want to remove more metal to have it completely flat. Who knows, maybe I'll glue in a curved arrow in this recess to remind me which direction to turn the handwheel.

All in all, it came out fairly nice.

For reasons I can't explain, the uncut face looks fine so I won't mess it up by machining it.

This handwheel is rather heavy so should also act as a small flywheel. I'll be sure to mill flats in the axle so the two set screws securely hold the wheel.

Rick Sparber

rgsparber@AOL.com