

# Making Custom Washers and Spacers, Version 1.2

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What do you mean you don't have the right washer!



How often do you open your random collection of washers and realize that none will fit? If you have a lathe, you can chuck up some round stock, drill out the center, part it off, and have a custom washer. But would you really bother?



Have you ever sawn off the washer and then tried to hold it down on a belt sander with your finger to smooth the face? I did it... once. First I got a second degree burn on the tip of my finger. Then, when I let go, the washer went flying into next week. Yes, next week. I didn't find it until it was no longer needed. Sound familiar?

Or would you drill out an existing washer which either takes time to properly fixture or risk injury trying to hold it in your fingers? Maybe stack a few thin washers up to get the needed thickness. Or maybe you just settle for an oversized washer?

In any event, I find it rather unsatisfying when I must choose between having the right part, being safe, and “get ‘er done!”

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Well, the barrier to doing it right has just been lowered by making this fixture.

I can make steel washers and spacers up to 1-inch in diameter. They can be from about 0.05-inches thick up to 0.4 inches.

The fixture consists of a steel ring 2-inches in diameter that acts as my guide. A 1-inch diameter rod forms my platform and is free to slide through the bore. A set screw locks the rod. Three 1/8 inch thick by 1/4 inch diameter neodymium magnets are set into the platform such that they are slightly below the surface. These magnets will fracture if compressed so I used an “F” drill (0.257 inches in diameter). I drilled these 3 holes deep enough that the face of each magnet is below the surface. Didn't use any glue, the magnets just stay in their holes. If you need to remove them, use a more powerful magnet to pull them out.

That hole down the center of the rod is left over from an experiment.



Here is a sample of #6 washers of various thicknesses. All are 3/8 inches in diameter.



Making a nicely finished #6 spacer 0.4 inches long is finally a quick, and safe, operation.

Along with this fixture, you will need occasional access to a lathe. Forming of the washers and spacers is done on a belt sander. Although I use a bandsaw, the stock can be cut with a hacksaw.



I start by selecting steel round stock with the desired Outside Diameter. Then, using my lathe and the proper drill bit, I drill down an inch or two. Take it slow and pull the drill out often to remove swarf. Use plenty of cutting fluid. This will keep the drill going straight.

The drilled rod is my feedstock and will be stored until needed. It is best to keep all common sizes ready to go.

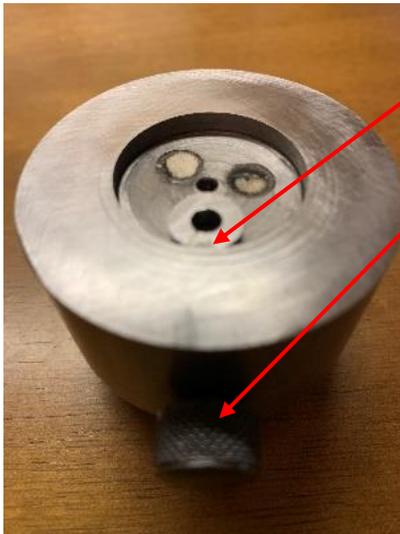


When I want to make a washer or spacer of a given thickness, I first deburr the end on my belt sander. Then I saw off a piece about 0.05-inches longer. This is my rough washer.



With the set screw loose, I raise the platform until it is proud of the guide. Using my finger, I wipe the surface clean. Those magnets certainly attract swarf. I then place the deburred face of the rough washer against the platform.

The magnets hold the rough washer against the face.



Next, I lower the platform and slide the rough washer against the bore adjacent to the set screw. This may require the platform to be rotated. When about 0.005 inches of the rough washer's face is above the guide, I tighten the set screw. With a little practice, you will be able to run your finger from the guide to the washer and feel this amount of stick out.



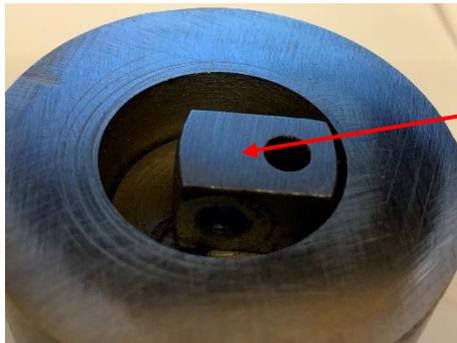
Position the fixture in your hand so the set screw is pointing in the direction of the belt's motion (red arrow). This prevents the washer from jumping to the other side of the bore.

Holding the fixture tight, slowly lower the guide down onto the moving belt. In just a few seconds the face of the rough washer will be smooth and the guide will start to be sanded. Lift up the fixture.

With a little practice, you will be able to clean up the washer's face with minimal loss of metal from the fixture. Consider that the washer's surface area is much smaller than the fixture's. However, if you are concerned about uneven wear on the fixture's face, John Herrmann has a great suggestion:

*“...make several saw cuts lengthwise on the outer diameter of the steel ring - one aligned with the setscrew, others at other positions (say, every 90° or so). Use any one of the saw cuts as a visual guide for setting and sanding the washer, just as you did with the setscrew. By randomly varying where you set the part, you'll even out any sanding of the bottom of the ring.”*

Loosen the set screw and raise the platform. The rough washer may be hot so take care as you slide it into a cup of water. With the platform proud of the guide, again wipe the surface clean. Then place the finished side down on the platform and repeat the process. Your washer or spacer is now finished.



Although I designed the fixture to make washers and spacers, it will hold any steel shape less than 0.4 inches thick that will fit in the bore.

I thought of a few possible improvements as I built this prototype. The guide can be made of water or oil hardened rod. However, I see very little loss of metal using mild steel so didn't bother. I did try using a single countersunk, 1/8 inch thick by 7/8 inch diameter magnet. It was held in place with a flat head screw set into that central hole in the platform. This caused an unexpected hazard. The magnet was strong enough to snatch the fixture from my hand as it was attracted to the steel under the moving belt. This caused the fixture to shoot straight out and bounce around the shop. Lesson learned.

## **Acknowledgment**

Thanks to John Herrmann for suggesting a means of minimizing uneven wear on the face of the fixture.

I welcome your comments and questions.

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