

I like to bore the hole for my barrel opening around .990 inches in diameter. This allows me to use the diameter of the bore as a gauge to determine where I should stop broaching.

You should now have one groove $\frac{3}{8}$ inches wide the full length of the receiver. I now insert the $\frac{7}{16}$ inch broach with the back that I ground to $\frac{3}{8}$ of an inch into the slot in the receiver.

The slot in the receiver will now act as the sleeve to guide the broach through the receiver cutting a parallel groove directly opposite the first groove. Once you have made the first pass with the $\frac{7}{16}$ inch broach you will need to add shims, .020 thousands of an inch thick, one at a time just like you did with the $\frac{3}{8}$ inch broach.

Now at this point you should have a receiver blank with one $\frac{3}{8}$ inch, and one $\frac{7}{16}$ inch groove cut parallel to each other. The next step is to widen the $\frac{3}{8}$ th of an inch groove to $\frac{7}{16}$ of an inch, using the other $\frac{7}{16}$ inch broach that has the back ground to $\frac{7}{16}$ of an inch. I follow the exact steps as before using the $\frac{7}{16}$ inch groove as a guide, adding shims with each pass until the maximum depth of cut is made.

I now add one more unconventional wrinkle to the mix. As I stated earlier I had originally ground a broach to cut the arc of the diameter of the bolt lugs. I believe this is a waste of a good broach, because I found that I still had to do some file work for the bolt lugs to properly fit.

What I do next is to save time filing. I want to remove material from the center of the raceway groove that was only cut with a $\frac{7}{16}$ inch broach. I insert the sleeve into the receiver along with the $\frac{3}{8}$ inch broach. To this I add the maximum amount of shims needed for the $\frac{3}{8}$ inch broach to cut to its maximum depth.

I then press the broach down and through the receiver. When I am done I will have a receiver blank with two parallel grooves $\frac{7}{16}$ th of an inch wide full length of the receiver.



At this point your receiver blank should look like the picture above. Now I know what you are thinking I leave the receiver raceways square. The answer is NO I do not, when I am finished the raceways will have an arch very close to an actual Mauser receiver.

The first time I tried broaching a receiver, I thought I was going to break the broach. That's when I realized I needed to make the passes through the receiver without the sleeve, plus grind the leading edges of the broach for clearance.

I am confident that if you make the sleeve properly, and grind the broaches properly that you will be able to broach your own bolt action receiver.

Some might be wondering how many receivers the broaches will cut. I believe that my set of broaches will probably cut 35-50 receivers. I was very careful when I ground my broaches, making sure that I did not get them to hot and change their hardness. I believe that if you do the same your broaches will last for many, many receivers.

Let the Milling Begin!

To start milling the magazine opening I place the receiver blank on the milling table. I then place a level on the rear tang and bring the receiver blank tang to a level position and then secure the receiver to the milling table using standard holding fixtures.



For this to work the cut for the receiver tang must be straight.

Notice the scribe marks on the receiver; those are used as reference lines for milling.

They were made after the receiver was painted in lay out dye on the lathe using the point of a cutting tool.

The power to the lathe was turned off and the lathe rolled by hand

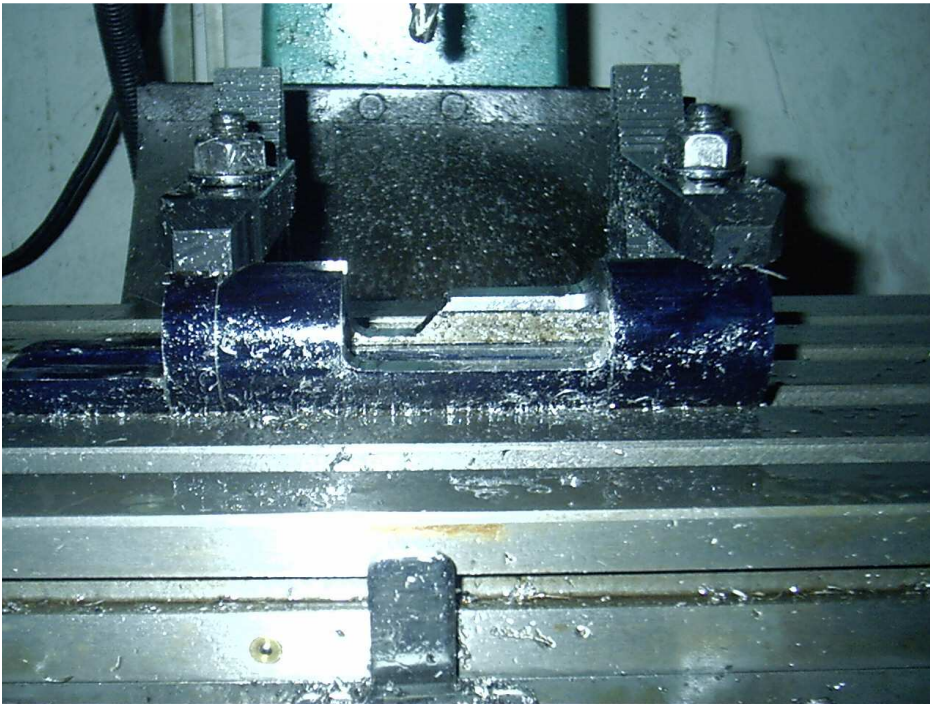
I like to paint the receiver blank with blue layout dye and using the measurements from drawing #1 mark the front ring, rear ring, magazine opening and the rear area of the receiver just before the tang.

I may have jumped ahead just a bit. You will notice that one side of the receiver has been removed, thus forming the tang. I like to cut this piece off using a band saw. It can be done on the mill or with a hacksaw.

I begin milling out the magazine opening using a cobalt or carbide $3/8^{\text{th}}$ or $1/2$ inch end mill. Do not over cut; start in the center of the receiver. The left raceway has both the thumb cut and a raised area that comes up to the edge of the bolt.

The way that I determine this cut is by looking down bore of the receiver. The raised area is equal with the top of the raceway. The right opening stops approximately .030 of an inch above the bottom of the raceway.

Once I open the magazine opening with preferred $3/8$ inch center cutting end mill, I switch to a $1/2$ inch cobalt Ball type end mill to cut the profile at the edges of the magazine opening. (Look at the picture)



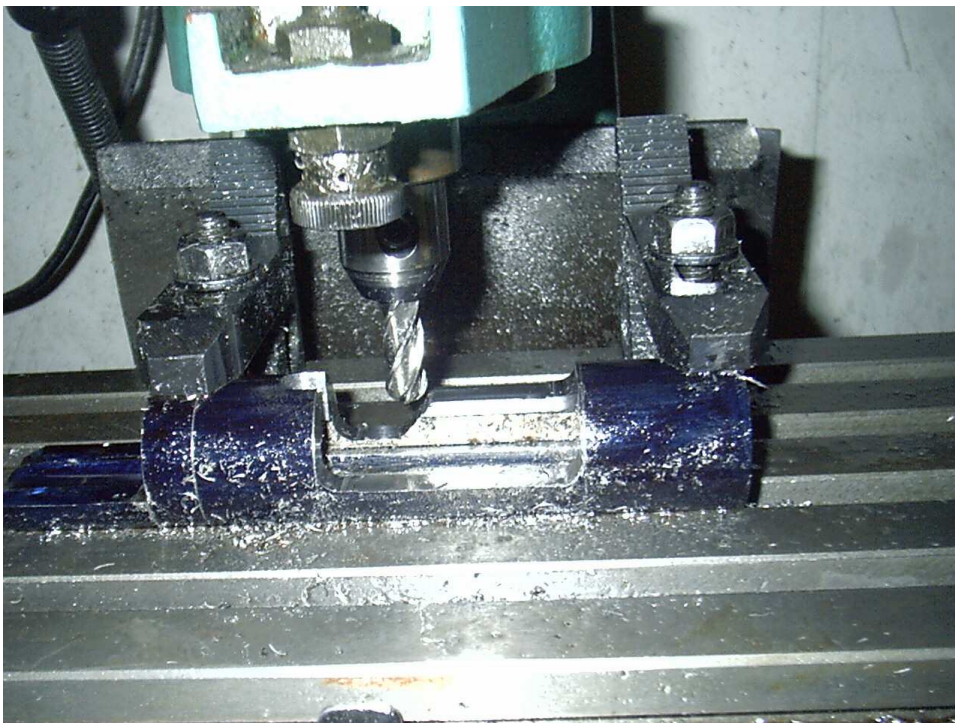
The old saying is that a picture is worth a thousand words. I have found that when it comes to making some of the cuts on the Mauser receiver, this old saying holds true. Study the picture, before you make your cuts

While the receiver is still mounted on the table I make the thumb slot cut with the same ½ inch Ball end mill that I used to cut the profile of the magazine opening.

I start cutting the bottom of the thumb notch at the bridge end of the magazine opening and cut forward, toward the barrel end for a total length of .700 of an inch. I then raise the Ball end mill about .100th of an inch and continue cutting upward until I lengthen the thumb slot to an overall length of 1.125 inches measured at the very top of the thumb cut.

The bottom of the magazine thumb slot starts about .030-.050 inches above the top of the lower left raceway. After cutting the thumb slot I side mill a notch .325 inch long at top dead center for the charging clip. Use plenty of cutting oil and go slow.

If you don't get the profile of the thumb slot just right you can finish with a file. My first receiver thumb slot looked ugly, but several receivers later I could cut the slot free hand with the mill. So don't get discouraged if everything doesn't come out perfect the first time. Find out what works for you at your skill level and go for it.

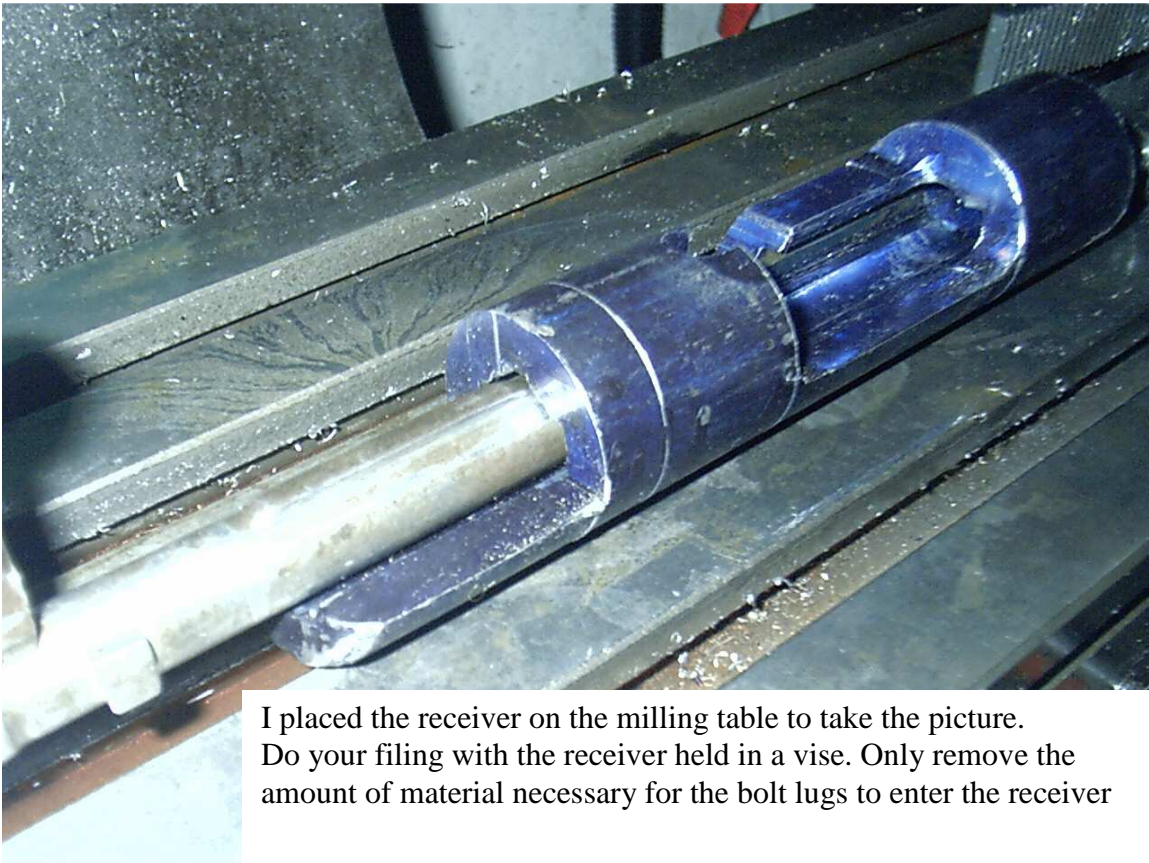


The next step is done by hand. I take the receiver off of the mill and place it in a vise. I take the half round file that I had cut down earlier to a width of .433 inches and file the square ends of the raceways to a slight arc that will allow the bolt without an extractor to enter into the receiver.

Now don't over file, the amount that needs to be removed is very little. The round side of the 12 inch half round file closely matches the arc of the bolt locking lugs.

I have been asked why I mill the thumb slot in my receivers. I do it for two reasons first I like the thumb slot and second it removes a lot a material from the left raceway and makes filing the raceway arc easier.

I next insert the bolt into the receiver. The bolt will enter the receiver up to the bolts guide rib. I mark the guide rib with a scribe. I then use these marks as a guide to broach the slot for the raised bolt guide rib.



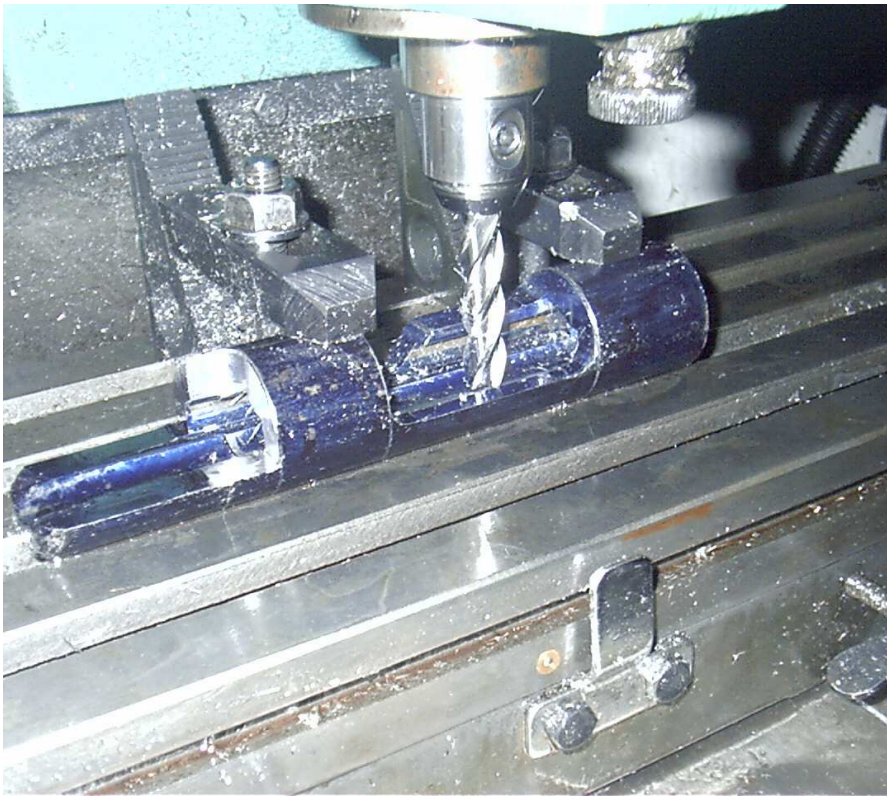
I placed the receiver on the milling table to take the picture. Do your filing with the receiver held in a vise. Only remove the amount of material necessary for the bolt lugs to enter the receiver

You may find that the bolt has trouble entering into the receiver; you may need to remove some extra material from the right side of the receiver raceway.

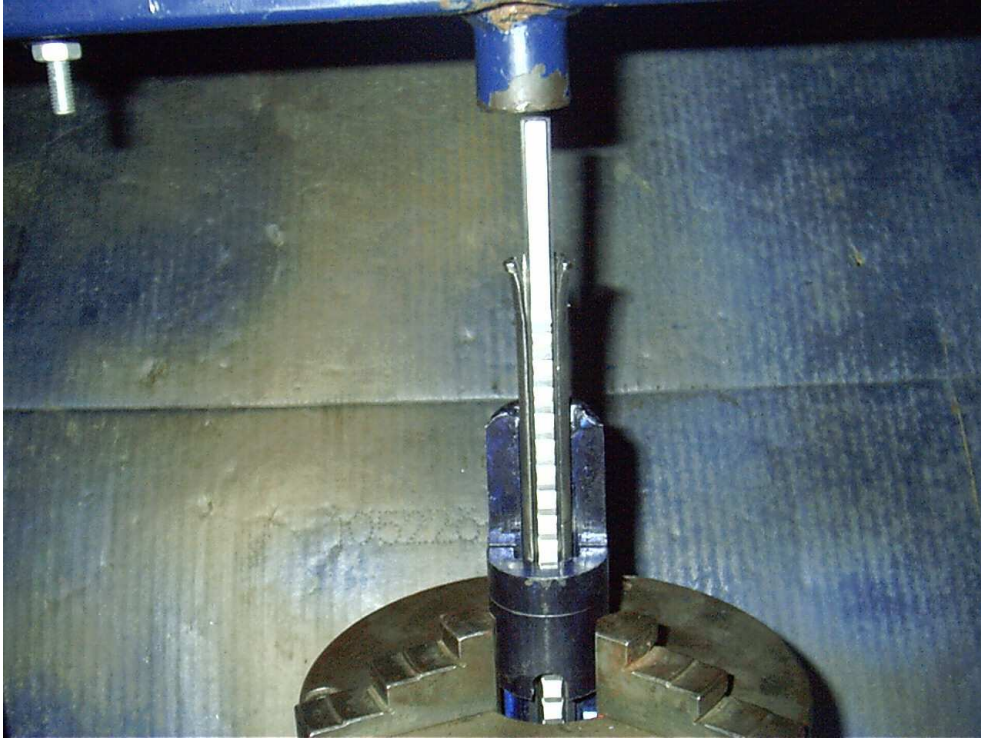
When I was making my receiver I found it hard to file the short lip on the right side of the receiver. The right side raceway is wider on a Mauser style receiver because of the width needed for extractor clearance.

You can put the receiver back on the milling table and remove a slight amount of metal with an end mill from the magazine opening. On my receiver I removed .045 inches from the opening. This cut down dramatically on filing.

What ever you do keep the end mill off of the flat area of the raceway.



I now take the receiver and place it back into the 3 jaw chuck on the 20 ton press. I insert the sleeve and the 1/4 inch "C" type broach in the bridge end of the receiver, aligning it with my marks

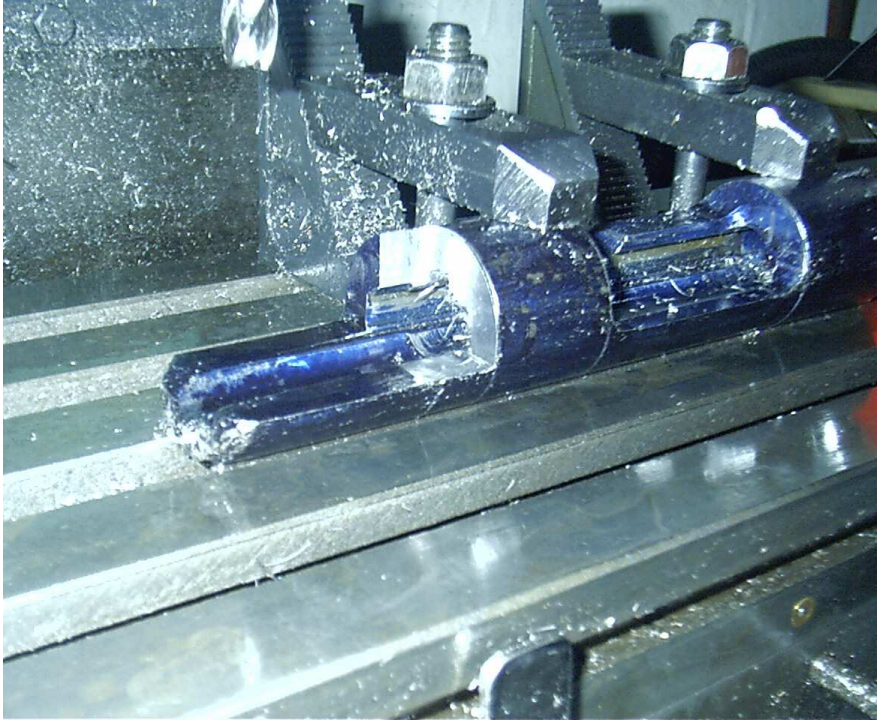


The bolt guide slot is broached very similar to cutting the 3/8 inch slot, the only difference is that you can not push the broach all the way through. You must stop the broach before it gets into the front ring, if it gets in the front ring it can damage the locking lug area, so be careful.

Once you reach the maximum length that you can broach, you will have to press the broach backwards out of the receiver. Do not try to drive the broach out with a hammer and punch, it may damage the broach. The bolt guide rib is not that tall so depending on the exact thickness of your shims it may only take one or two shims to reach the full depth needed to cut the groove.

After I finish broaching the guide rib groove I place the receiver back in the vise and again file the raceways until the bolt enters into the receiver until the bolt handle touches the breach end of the receiver. I then very carefully mark the left side of the bolt handle. This mark will be the guide to mill the notch for the bolt handle to set in the receiver.

I now place the receiver back on the milling table in the same position that I used to cut the magazine profile. Using a 3/8 inch center cutting end mill I cut the opening for the bolt handle.



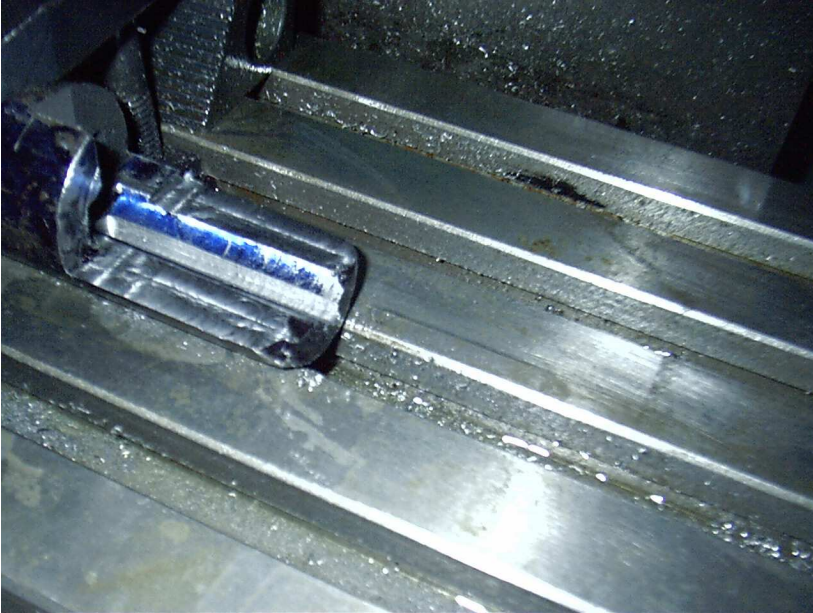
I now have one of two choices to make. I can either cut the groove for the cocking piece or go to the lathe and turn the eccentric notch for the safety lug. Since I know the length of the cocking piece groove to be 2.375 inches, I will go ahead and mill it now.

To mill the groove I use a long $\frac{1}{4}$ inch center cutting end mill. The first cocking piece groove I ever tried to mill I broke the end mill. You can put a lot of stress on that little end mill so go easy and use plenty of cutting oil.

The sear opening is also made in the cocking piece groove, but I will leave that for a later operation. I will mill the cocking piece groove to a depth of .160 inches. Please remember that the dimensions that I give are for my receiver and my parts.

Not all Mauser parts measure the same. A fool proof way to get the proper depth for the groove is to wait till after you properly cut the tang to height and then install the bolt sleeve assembly into the bolt and insert it into the

receiver and then scribe the bottom of the cocking piece.



When ever you decide to cut the cocking piece groove this is how it will look. This picture also shows the rear tang reduced in height by approximately .060 inches, leaving the area directly under the bolt handle at the original height.

Now comes the part that everyone dreads, cutting the opening for the third lug or safety lug. I use a 1/2 inch boring bar and a 3/16 inch square cobalt tool bit blank that I grind to proper shape, mounted in the lathe.

To make an eccentric cut will require a 4 jaw chuck with independent jaws. The chuck must also have a hole large enough for the receiver blank to set in to and still move up or down.

It will also require a small level and a dial indicator with an appropriate magnetic base holder.