While I have the receiver chucked in the lathe I also cut the nose of the front ring of the receiver to a diameter of 1.420 inches. A standard Mauser Large Ring receiver has a diameter of 1.400 inches but I want some extra metal for spit and polish.
I cut the nose of the receiver up to the front edge of the recoil lug. On my receiver the cut was .420 inches in length.

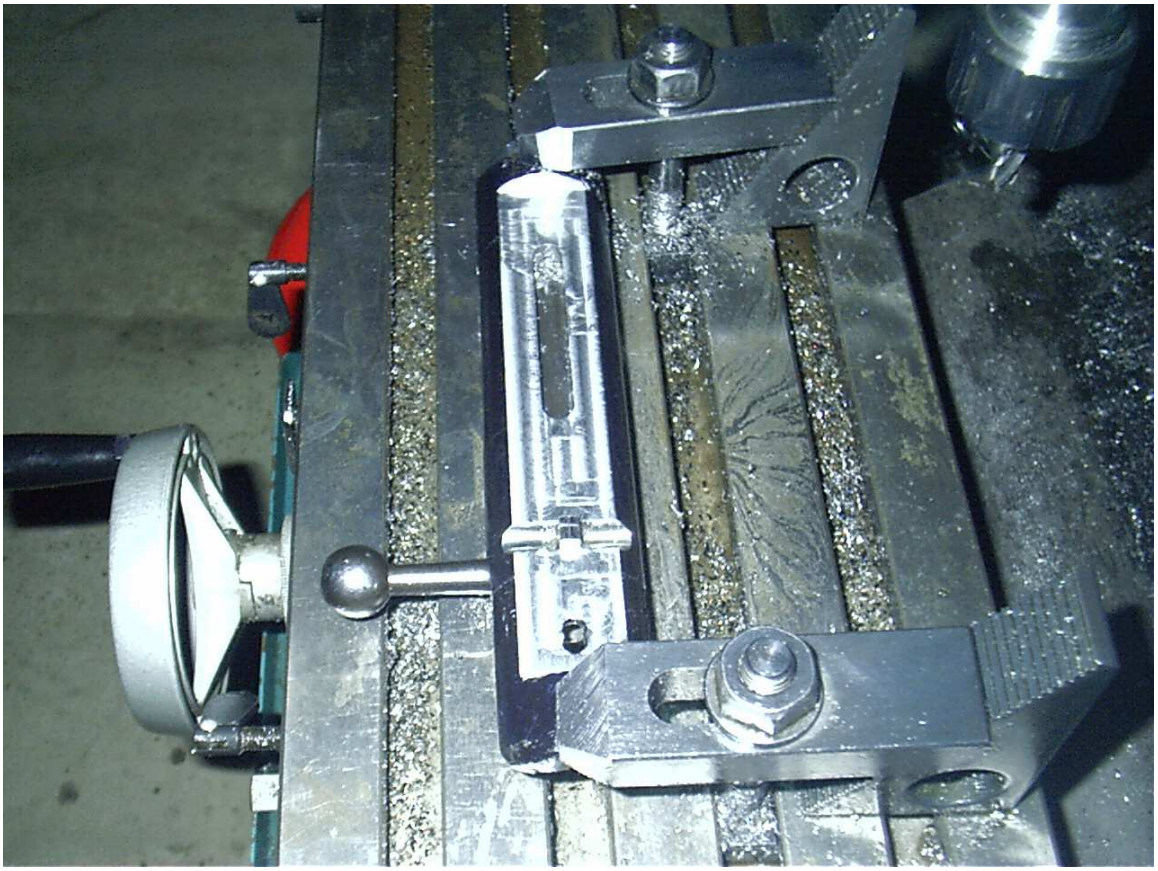
I wait to cut the receiver's nose at this stage for a reason, first I needed the extra full length diameter to assist in holding the receiver in earlier milling and lathe operations.

I make the cut now because it will be used as an index guide for profiling the receiver body in later machining steps, in a similar manner that I used the rear tang.

Chapter Eight

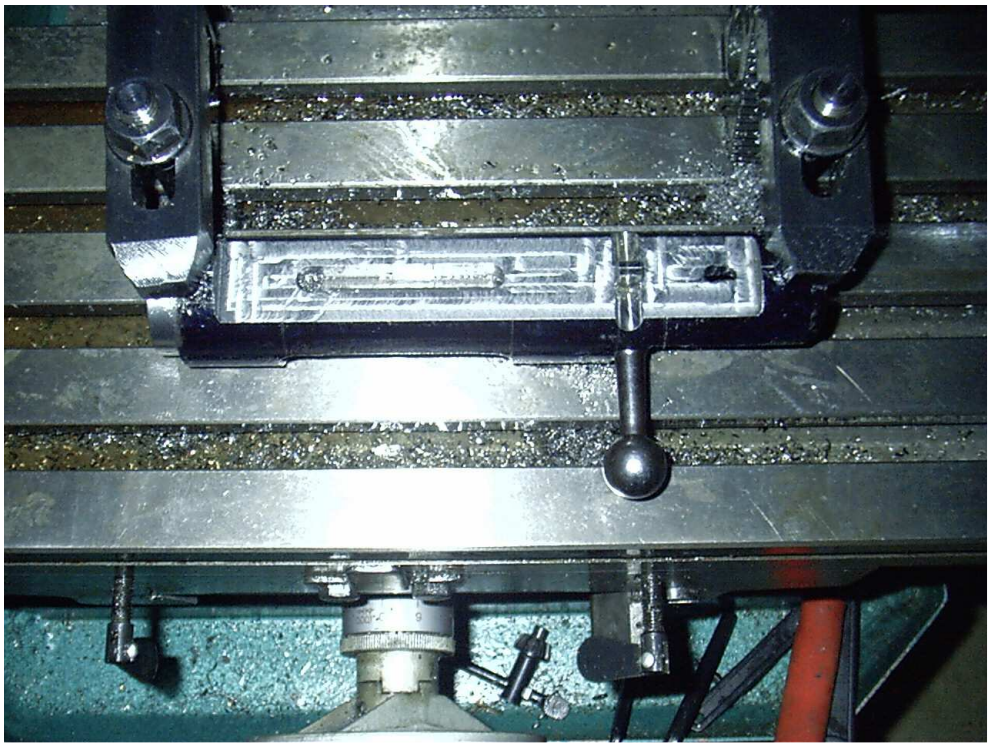
Milling the Magazine Well Opening and Ejector/Bolt Stop Flange

Milling the magazine well opening is not as difficult as it may seem. I start by scribing a mark on each end for the magazine well opening and the sear opening. I then place the receiver on the milling table, with the round bottom up. I place a level against the underside of the bottom tang and bring the receiver to level. Using standard holding fixtures I firmly attached the receiver to the table. Do not over tighten the rear holder; you can bend the receiver tang.



I install a 3/8 inch center cutting carbide end mill in the mill. I mill a slot all the way through the bottom of the receiver at top dead center, inside the scribed lines for the magazine well opening. Do not over cut this slot the hole only needs to be large enough to allow a caliper to pass through to measure the thickness of the receiver bottom off of an installed bolt.

Once I have cut the slot I remove the receiver, and insert a bolt. I determine the amount of metal to remove by measuring off of an installed bolt.

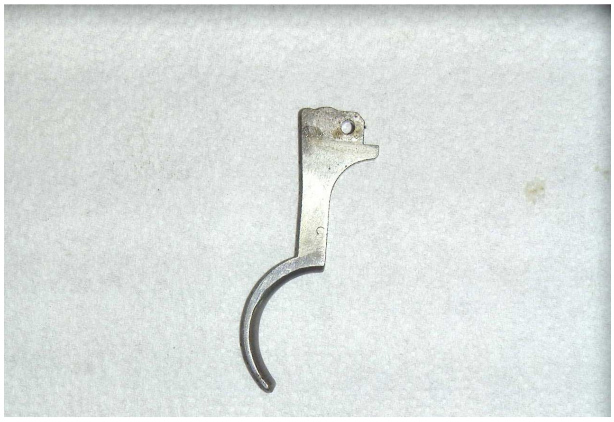


The above picture shows the receiver bolted to the table with the bolt installed. Do not cut this preliminary slot with the bolt installed or you will ruin the bolt. I remove material from the bottom of the receiver, leaving the sear pivot; recoil lug, and rear hold areas alone.

I want to remove metal from the bottom of the receiver until a thickness of .305-.310 inches remain, as measured at the center of the bolt through the preliminary hole on the bottom of the receiver.

I now also mill the sear opening in the receiver at this time, however if this is your first receiver you might want to hold off at this time.

If you do mill the sear opening measure very carefully and remember that the opening will align with the cocking piece groove. An easy way to help locate the proper sear opening is to lay the sear into position, and scribe both ends of the slot. Do not over cut the length of the sear opening the trigger pivots very close to the opening, and an over cut will effect trigger movement.



The picture on the left is a Mauser sear. Notice the raised hump with the hole; this is the sear mounting pivot hole. The raised area on the opposite end is the sears contact lug; the slight inset is the sears contact area. When I measured earlier to get the proper location for the sear pivot lug on the receiver I measured from the sears contact area to the center of the sears mounting pivot hole.
The picture on the right is a Mauser trigger, notice the slight hump just left and above the triggers mounting hole. That area contacts the bottom of the receiver. When the trigger is pulled the rocking motion pulls the sear down thus releasing the cocking piece to move forward in a firing motion. If you over mill the length of the sear opening in the receiver it will interfere with the rocking motion of the trigger. Even if you plan on installing an after market trigger on your homebuilt receiver, you must not over mill the sear opening.

Your receiver is now beginning to take the shape of the Mauser receiver profile. With the bottom milled flat the sear opening cut your receiver should appear as shown in the next picture.

I like to stop for a moment and give my receiver another coat of Blue layout dye, on the bottom, and on the rear near the area of the bolt stop flange.

If you have followed the steps, your receiver should look like the one shown at the side.

Before I begin milling the Bolt Stop Flange or lug, I first must determine if I have enough material on the left side of the receiver to form a lug. One short fall in using a 1.750 inch diameter piece of round stock is that you need almost every thousandth to make this receiver.

To determine that I have enough material I measure the thickness of the left side at it maximum thickness. You must have a minimum .285 inches for the Bolt Stop Lug and .100 inches for the receiver side portion, for a total of .385 inches. Now you can fudge a few thousandths, but no more than .005 inches.

When finished the lug is tapered; with a minimum height of .285 inches on the tang side and .265 inches next to the bolt stop hole. This is needed for the bolt stop to set against the receiver body.

I found that during filing of the left raceway it was easy to remove to much metal not allowing for a usable Bolt Stop Lug to be milled. When you are filing the left raceway as soon as the bolt can comfortably side into the

raceway stop, this should allow you a more than a sufficient amount of metal to mill the Bolt Stop Lug. If you find that you over filed or started with a piece of metal, less than 1.730 inches, you can add metal by welding.

The way that I corrected my receiver was by first wrapping the front of the receiver with wet paper shop towels, and securing it in a vise. I then heated the area until the metal lost its ability to draw a magnet. I held heat on this area for about 5 minutes. Now do not over heat, you can do this with a propane torch or an oxygen/acetylene torch.

If you have never used an oxygen/acetylene torch you may over heat the metal. All you need is to get the metal hot enough for it to loose its ability to draw a magnet, which to me is a dull cherry red.

Once you have reached that point, let it cool naturally in the air, DO NOT dowse in water. This is called annealing, 4140 pre-hard can be annealed, the metal will not be as strong as before, but will still be stronger than normal cold rolled steel.

Now you must wrap the front of the receiver in wet paper shop towels or their equivalent. The front of the receiver must not get hot at all. If you have done this properly you should be able to actually touch the front of the receiver and feel NO heat.

Once the area has cooled to the touch, I weld several passes side by side till I raise the area. I weld this using an arc welder and 1/8 inch, 7018 AC rods. After welding I anneal again to remove stress from the metal, and to remove any hardness that may have occurred from welding. Remember keep the shop towels wet, and let the receiver to cool naturally.

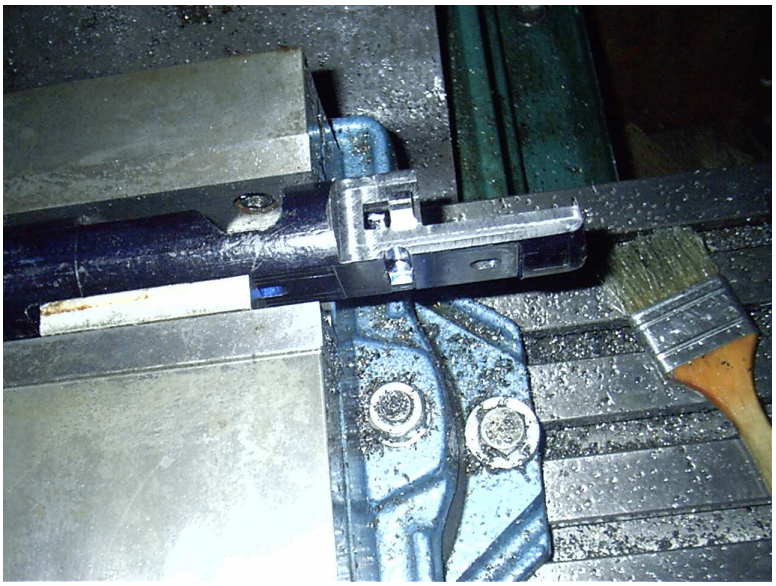
I hesitate to mention that you can weld on a receiver, or any gun part; a lot of good people some times do very stupid things, like not keeping the front of the receiver cool. One other option is to add a small amount of solder to the raised portion of the Bolt Stop Flange (lug) to make the bolt stop set tighter against the receiver body.

Welding can be used to correct many mistakes as long as the mistakes are made in the back half of the receiver, and proper care is taken to keep the receivers locking lugs cool.

I now reinstall the receiver, right side down in the milling vise, for milling the Bolt Stop Flange area. I like to use a small piece of aluminum as a spacer between the receiver's bottom, and the jaw of the vise. You can place a machinist square on the tang, and check for level, but since my vise is of milling quality I just rely on the square of the jaws for holding the receiver in place.

Using the measurements from drawing #3, I very carefully scribe the outline of the Bolt Stop Flange or Mounting lug, including the flat area next to the hole for the bolt stop.

I mount a 3/8 inch center cutting end mill in the mill and begin cutting around the raised lug, being very careful to not over cut. I prefer to leave the receiver thickness around .105 inches, but if needed you can mill down to a thickness of .095 inches. Do not routinely mill the receiver down this thin.



Notice the piece of aluminum being used as a spacer against the bottom of the receiver

When I mill for the Bolt stop Flange I also mill along the rear tang. The square hole was filed square after a round 3/8 inch hole was drilled. When drilling, DO NOT drill into the raceway or you may damage the raceway.

The size of the square hole matches the width of the raceway. I originally was going to buy a special broach to make that little square hole, but after pricing the broach I decided I could take the 15 minutes needed, and just file it by hand.

What I soon realized was that you want to file it by hand if the hole is off slightly you can correct it by filing. I examined some of my Mauser made receivers the holes were rough, in my opinion some of the early receivers my have been filed by hand, so save your money, and buy a small file.

Now comes the fun part milling the actual magazine well opening, and cartridge feed lips. I included in the chapter on design the drawing of the actual template I used to layout the magazine opening.

I again place the receiver in the vise; I very carefully mark the opening for the magazine well. I center template #1 onto the bottom of the receiver in the magazine well opening and trace around the template with a scribe.

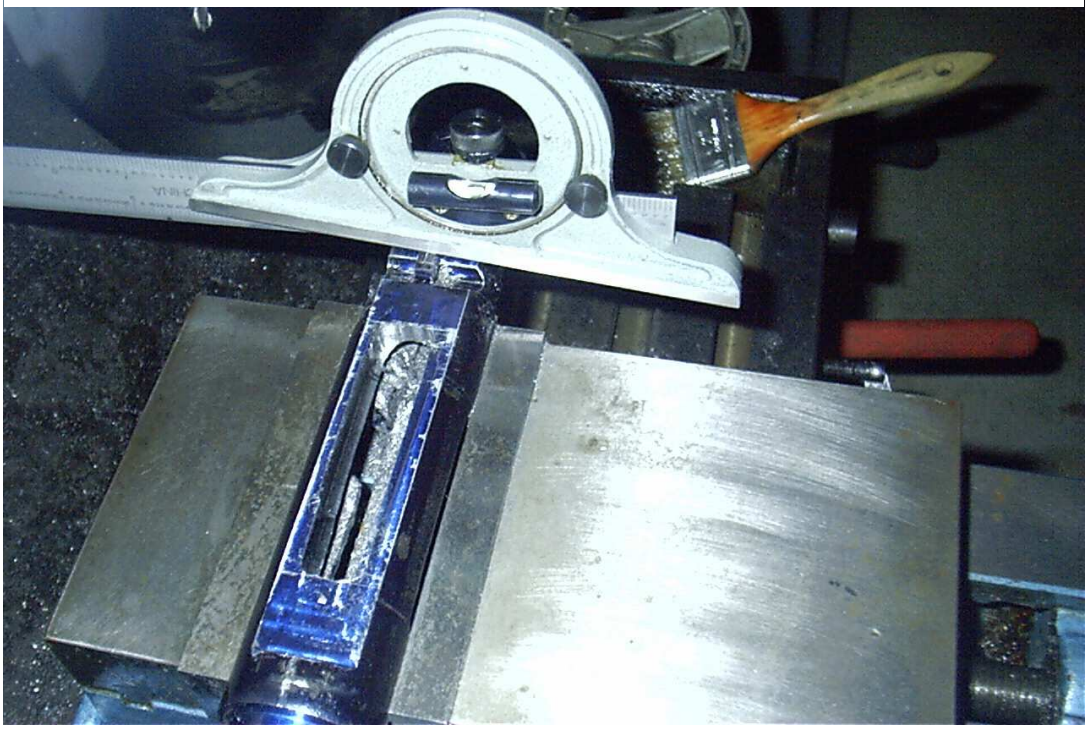
I then center the #2 template over the outlines of template #1 and trace around it with a scribe. These lines will make up the reference lines that I will use as a guide to mill the opening.

First I mill the inside area of template #1 as shown in the picture below. Please notice the layout lines for the magazine well opening as well as the lines of template #2. I use a ¼ inch center cutting end mill for this operation, and cut just to the lines.

DO NOT over cut the inside lines represent the inside measurement of the cartridge feed lips, if any thing mill slightly to the inside of the lines.

My templates are the actual size, and shape that I used to form my magazine well opening, and cartridge feed lips. I made them very close to finished size to save hand work, so take heed.

Next I loosen the vise but leave the receiver in the vise, using a machinist combination square, I tilt the receiver to an angle of 6 ½ degrees.



When you tilt the receiver, you will have a high side, and a low side. Do your milling on the high side. The magazine well is tapered, this duplicates that taper.

The magazine well opening is a taper, and I want to cut a straight line, fortunately for me my milling vise has a swivel base.

I rotate the base of the vise using the scribe lines as a guide so that I can mill the taper of the magazine well opening straight. I have found that the taper of the magazine is slightly over 1 degree.

I like to start milling using a ¼ inch Ball type cobalt or carbide end mill. Because the receiver sets at a 6 ½ degree angle you will remove more metal from the top first, because of this it will be a little difficult at first to judge total depth. If you screw up here you may be finished so start shallow.

I found that you want to keep the magazine as smooth as possible, and that conventional milling works best. When you are milling just follow the lines.

If at any time during milling you find that you need to reset the angle of the vise, then do so.

Template #2 has a step out about .750 inches from the front of the magazine. I simply side mill to the line and continue milling.

Once I complete the first side, I like to take the receiver out of the vise and then reinsert the receiver into the vise 180 degrees.

I then set the angle of the receiver at 6 ½ degrees, reset the angle of the vise to correspond to the taper of the scribe lines, and begin milling.