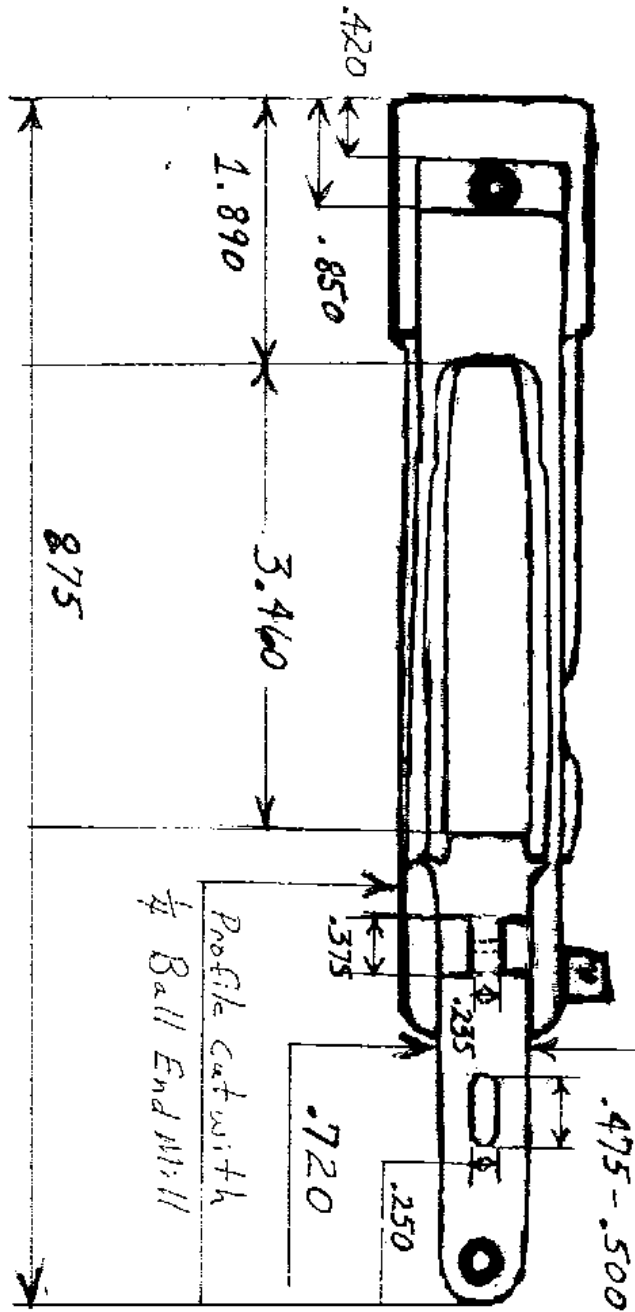


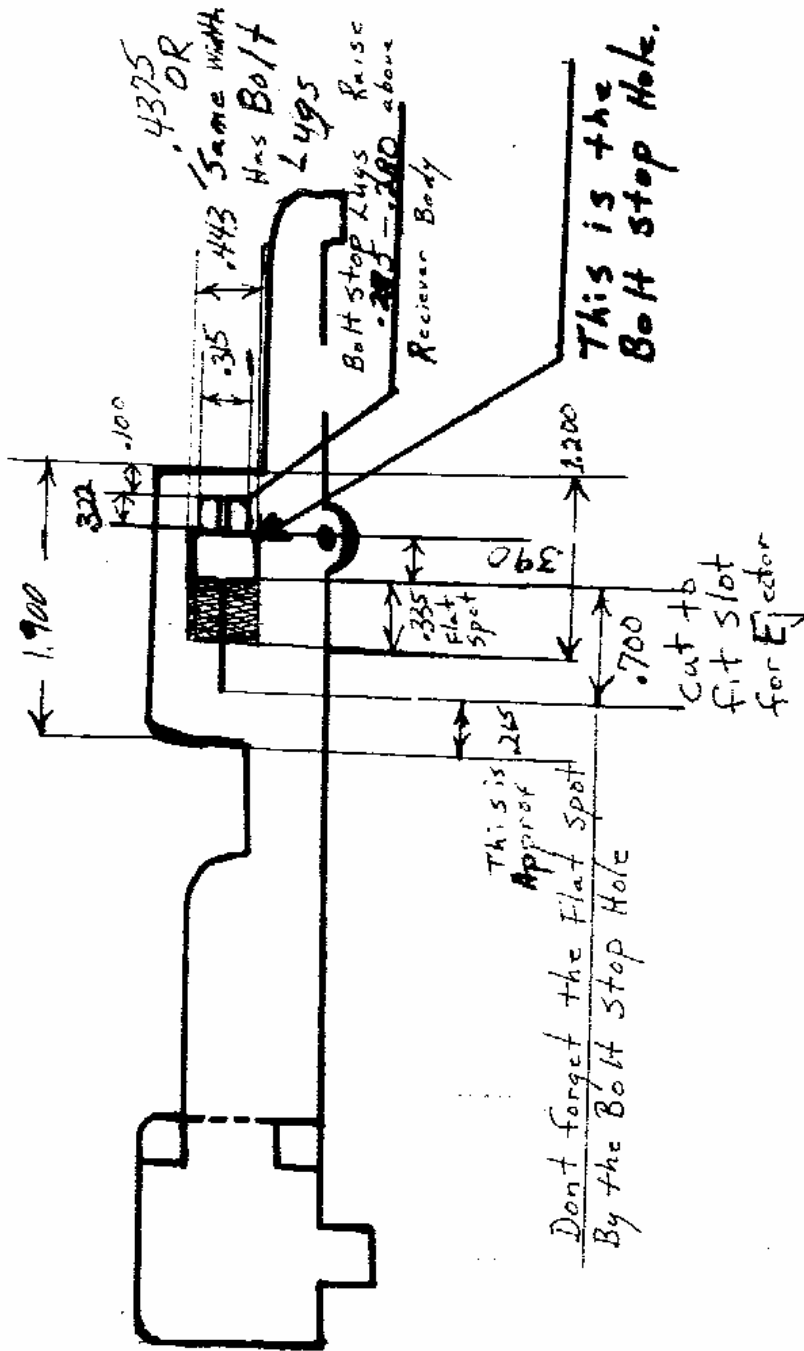
Full size Mauser Receiver (Large Ring)

Drawing #1



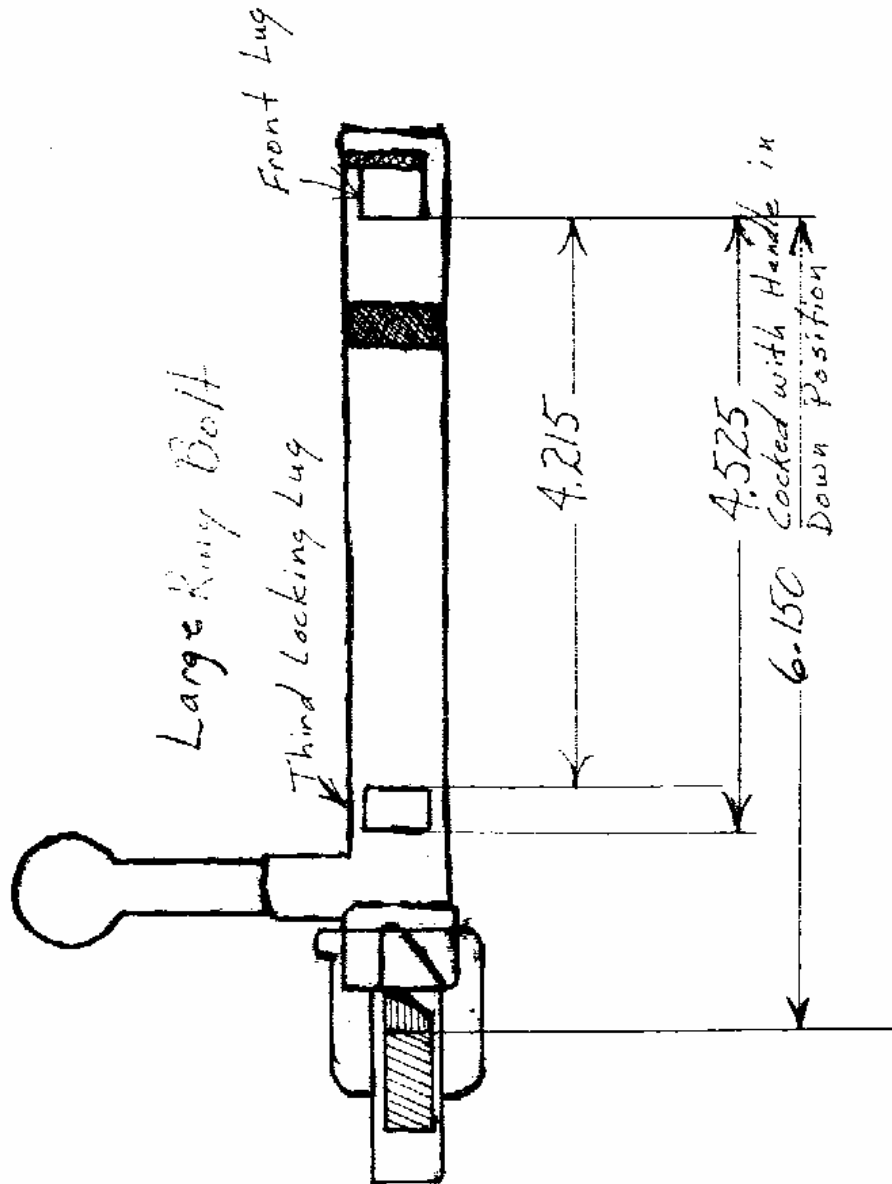
Mauser Magazine Feed Lip View. Notice the shape of the magazine opening and how they are shaped. These were made using the templates on page 17

Drawing #2



Mauser Bolt Stop Hole

Drawing #3



Full size Mauser bolt showing the distance between the front locking lug contact area and the third safety lug. Also note the distance from the locking lug to the cocking piece, measurement taken when the bolt is in a cocked position with the bolt handle down as if it were in a firing position, this measurement is needed for proper sear placement.

Hint: safety lug does not contact receiver

Drawing #4



This is the inside magazine template #1

This is the first template I use. I lay it centered on the flat side of the receiver, starting where the magazine and cartridge feed ramp meet and then scribe around it. Remember the inside edge of the trigger guard/magazine sets flush with the End of the cartridge feed ramp. This profile was taken from an actual receiver.



This is the outside magazine profile template #2

This is the second template I use. I lay it centered over the scribed lines of template #1. I then scribe around it. This allows me to cut the magazine opening profile, plus creates the magazine feed lips profile. I have tried to get templates #1 and #2 to be the actual size of the templates that I used for the milling of the magazine feed lips. You should check them for size against an actual Receiver before proceeding to cut your magazine opening.

Hint: Print out and paste to a thin piece of metal, then cut on the line to size



This is the magazine inside magazine feed lip contour gauge that I use to check the profile of the feed lips. Notice the slight half hour glass shape near the barrel end of the gauge, without this hour glass shape the cartridge will not feed properly.

Hint: There must not be any sharp edges to snag the cartridge, if the cartridge will not pass through the hour glass shape, try polishing before you begin to enlarge the opening

Grinding the Broaches



The broach on the left is a full size 7/16 inch D style broach shown for reference purposes only.

The broach in the middle is a 7/16 inch D style broach ground down to complete final sizing for the receiver raceways.

The broach on the right is a 7/16 inch Broach that has been ground down and is the second broach used in the step broaching technique used to create the receiver made in this book

Some people may be wondering why we are grinding down standard keyway broaches and not buying broaches already made for cutting raceways for a bolt action receiver, the reason is simple, cost.

Broaches used by commercial firearm manufacturers used to broach bolt action receivers also require a very large hydraulic broaching machine rated at several tons and I might add weighs several tons. Such equipment is beyond the reach of the homebuilder, even finding a place to put such a machine would overwhelm most home shops.

To broach my Mauser receiver I used one 3/8ths C type push broach, two 7/16ths D style push broaches and either one 1/4 inch or 6mm C style push type broach for the bolt guide slot. I personally used the 1/4 inch broach it works just fine, although I do have a 6mm broach on hand.

We will also need to make a round bushing .700 inches in diameter, 8 inches long, with a 3/8ths slot milled full length to accommodate the 3/8ths and 1/4 inch C style broaches. The sleeve once milled will be very thin at the bottom, about .120 inches in thickness.

The bottom of this slot will be flat leaving the corners at the bottom only about .060ths of an inch thick. I used a piece of 3/4 inch drill rod to make my sleeve, I suggest you either use drill rod, stress proof or 4140 pre-hard to make your sleeve, there is a lot of stress on this thin little sleeve and it's got to be strong.

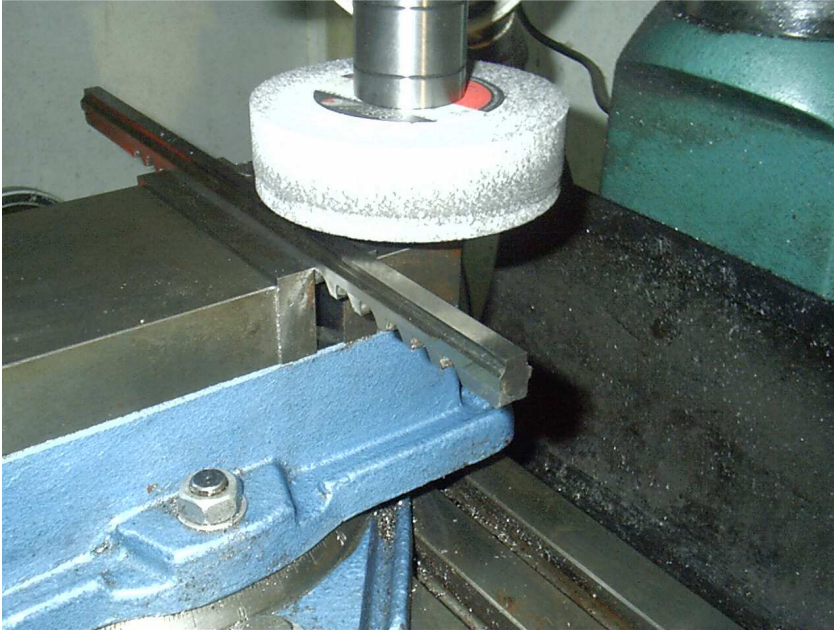
I had used my sleeve several times, before I took the first picture, so it's a little beat up, but I expect to finish several more receivers before I make another. If you screw up don't worry, just make another. A piece of 3/4 inch drill rod is not that expensive.

Every broach used will have to be ground down or altered in some way. I thought about having my broaches ground by someone with a surface grinder, but I was unsure about the final dimensions, plus I didn't want to have to answer the stupid questions from the guys at the machine shop, so I came up with a way to grind the broaches on a Mill/Drill or its equivalent. I suggest that if you own or have access to a surface grinder, that you grind your broaches with it. It will be faster and you will have a greater chance of success.

I feel the need to pause and make a comment. Not everyone you deal with will know or understand the laws about homebuilding. I encourage you to use common sense. What is legal today may be illegal tomorrow, therefore I suggest that you **DO NOT** advertise your homebuilding hobby, unless you really know to whom you are talking and dealing with, don't become jail bait.



To grind my broaches, I used a 1 ¼ inch arbor with an R8 shank. To the arbor I attached a 5"x1 ½"x1 ¼" straight cup type grinding wheel, white in color, fine grit. I mounted the arbor, with wheel onto the mill/drill.



On the milling table I mounted a 5 inch milling quality smooth jawed vise. I then placed one of the 7/16 inch “D” style broaches in the vise; with the cutting side down, making certain that the ridge next to the teeth touches the top of the vise jaws. You can protect the teeth if you wish with duct tape or thin strips of copper.

The height of a new 7/16 inch “D” style broach measures .850inches in the front and .910inches at the back. I took the measurements at the very ends. The cutting area is 7/16 inches wide and the width of the back or base is 9/16 inches. Both the USA and import “D” style broaches that I own have these same measurements.

I hold the broach in a vise so that I can set the back of the broach level. The difference in the height of a broach is made when the teeth are ground and not by grinding the back. If you set a broach cutting teeth down flat on a milling or grinding table and then ground the back of the broach level, you would end up with a broach that would not cut.

Both of the 7/16 inch broaches must have a total of .140 of an inch removed from the back. When you are finished grinding the back, the broaches will measure .710 inches on the front and .770 inches on the back. When I began grinding I made very shallow passes, no more than .002 per pass.

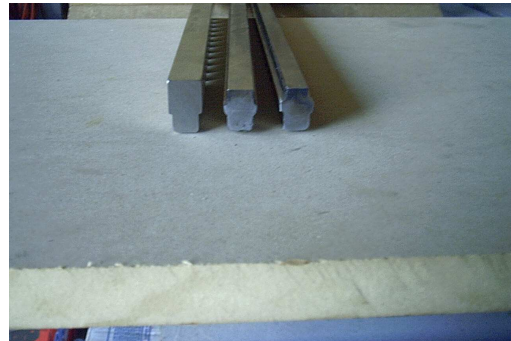
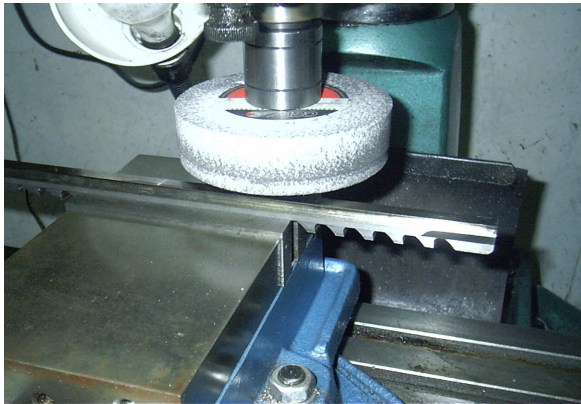
Now I know the broach is not supported on the ends. I quickly learned that I could make two or three passes and stop, let the broach cool naturally and not have a problem with warping.

Originally I tried holding the broach on the ends and using wet paper towels and heat control paste and found that I could still warp the broach. I know this is unorthodox, letting it hang out there, but it works, you just have to go slow.

I found that I could make between two and four passes, go piddle around for 5 minutes come back and repeat the process and be fine. If you want to grind your own set of broaches using this method, be prepared to spend a whole weekend.

After I ground the height of the broach, I then lowered the cup grinding wheel to grind the sides. A new 7/16ths "D" style broach has an overall width of 9/16ths of an inch. The back of one of the 7/16ths broaches is ground to an overall width of 3/8ths of an inch and the other is ground to an overall width of 7/16ths of an inch.

On the broach that will become .375 inches after grinding, I ground .0940 thousands of an inch off each side, the other broach I ground .0640 thousands of an inch off each side.



The picture on the right shows the comparison between the broaches. When I originally ground the broaches, for added strength, I left about .050ths of an inch of the original 9/16 inch width protrude from the broaches, below the area I had ground. Later, I found that the broach which cuts 3/8^{ths} of an inch wide at the back can not have these protrusions; it must instead be ground to an overall width of 7/16^{ths} of an inch.

I found that these protrusions kept the broach from making the maximum depth of cut that I needed to complete the raceway.

The 3/8 inch "C" type broach needs to have .015th removed from its back to allow it to set in the sleeve and pass through the hole of the receiver. I did this on a 4x36 belt sander fitted with a blue silicon carbide belt, an aluminum oxide or red belt would not cut the tool steel of the broach.

Both the 3/8 inch and 1/4 inch "C" type broaches will need the square edge part of the nose, slightly rounded to traverse the round hole of the receiver. I rounded the edges of both broaches with a 4 1/2 inch hand held grinder, after placing them in a vise.

When I originally started grinding broaches I ground a broach that allowed me to cut the arc of the diameter of the bolt lugs. I soon realized that this was a waste of money, because I still had to fit the bolt to the raceways using a special ground file.

The file that I used was a 12 inch long half round file that I ground down freehand with my hand grinder. I would occasionally stop check my progress with a straight edge, correct any high spots and then continue.

I cut from both sides on the file until I had a file 7/16th of an inch wide and 12 inches long. Surprisingly this went very well; the file I used was a high quality USA made file and it never lost its hardness.

I only stopped a couple of times to let it cool. For some reason the grinding wheels I used didn't make the thing hot. I'm now considering using the hand grinder to rough out my next broach.