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Bending Mauser Bolt Handles

by: David Kaiser

Far and away, the most modified bolt action rifle is the venerable Model 98 Mauser. Not that the design had any deficiencies as a military rifle, but if you want to attach a scope, the straight bolt handle needs some alteration for easier operation and scope clearance.

For many years, we offered a set of bolt handle bending blocks from Three V, but approximately six years ago that maker decided to quit production and Brownells has been searching for a suitable replacement ever since. We were offered an updated design from a gunsmith and it closely matched a design we were working on but had not yet perfected. We combined the best ideas of both designs and came up with our new bolt bending blocks. We feel this design offers the best combination of ease of operation and durability. **Brownells Mauser Bolt Forging Block Set, #080-941-500** that includes the Bolt Forging Punch #080-941-000 gives every gunsmith an alternative to welding-on new handles on small and large ring Mauser rifle bolts. For the gunsmith without advanced welding skills, but who has access to oxyacetylene welding equipment, it's a relatively simple process.

Forging or bending bolt handles on sporterized military rifles involves two, important concepts; utility and aesthetics. The bolt handle must be bent at the proper point and be shaped correctly to clear the eyepiece of a rifle scope. At the same, time it should be shaped and polished to look good. This is one area where there are no hard and fast rules regarding handle shape and finishing. Your sense of proportion and taste are the most important elements on how this job will look when done.

Since the job involves several skills, I recommend that you obtain a few surplus Mauser bolts as practice pieces. Bolt bending is best done on straight handled bolts with full-round knobs. Our new bolt bending blocks work on both small ring and large ring Mausers. If your Military 98 has a turned down bolt with a flattened knob, it should have a completely new handle welded on. We've included some photographs to help you follow along and get an idea on how we like to re-forge a bolt handle and how the finished product will look.

Begin by completely stripping the bolt and the action. Thoroughly clean both the bolt and the action. Closely examine the bolt and the action for cracks or other problems, such as an oversize or damaged firing pin hole or bolt face. If you're installing a new barrel or changing caliber at this time, check the headspace. If there are any problems with the bolt or the headspace, replace the bolt and/or correct the headspace before you proceed any farther. It's much better to scrap out a bolt or an action at this point than to discover a potential safety problem after you've done extensive work. If you are going to convert a rifle to a magnum cartridge, now is the time to open up the bolt face.



Initial bolt forging with a ballpeen hammer

Also, make modifications to the action, necessary to facilitate feeding the new cartridge. To help gauge the finished shape of the bolt handle, go ahead and drill and tap the receiver for scope mounts and temporarily attach them and the scope to the action.



Moving the bolt handle 15° off of vertical

Since bending bolt handles involves heating the bolt handle to a bright red heat and use of a punch and hammer to change the shape of the handle, you will need a large, heavy, bench vise that's been properly mounted to a heavy work bench. You will need an oxyacetylene torch with a fairly large tip to quickly heat the bolt handle to a bright red "forging" heat. Treat this modification the same as you would any welding operation, and that is, SAFETY FIRST. Make sure all flammable materials are removed from your work area. Have the appropriate safety equipment readily available, including safety/welding goggles for gas welding, heat resistant gloves, and a good fire extinguisher. Bending bolt handles should be done very quickly once the handle is at a forging heat, so it may be helpful to have the assistance of another person to hold the lighted torch while you do the forging work.

Mausers bolt handles are essentially square where the handle root joins the bolt body. To achieve a good looking bolt handle, I recommend that you first round that square section and blend it into the round section of the shank. For Model 98 Mausers, measure outward from the bolt body on the bolt handle root about .180", and use a medium-cut, flat file or belt grinder to round the root from that point forward, toward the knob, blending in the radius with the bolt handle shank. Small Ring Mausers (Models 93, 95, 96, etc.) which cock on closing, have a smaller diameter bolt body where the bolt handle attaches; measure outward about .230" from the bolt body and round over the handle root from that point.

Install a Brownells Bolt Heat Sink #080-638-003, to protect the cocking piece threads in the bolt body while it's being heated. Apply Brownells Heat Stop Paste #083-012-100 liberally on the bolt's cocking cam notch to protect that area from overheating. Some gunsmiths will also pack extra Heat Stop Paste inside the bolt body and around the bolt forward of the blocks to further help prevent overheating.

Place the bolt body in the Forging Blocks with the square root of the bolt handle engaged in the notch in the blocks. Center the bolt handle in the round groove in the right hand block. Clamp the Bolt Forging Blocks tightly in a heavy duty bench vise. The lips of the Bolt Forging Blocks should rest firmly against the tops of the vise jaws. Have a bucket or large coffee can of water at the workbench to cool down the bolt after the handle is forged. Don't forget to wear your heavy duty, heat resistant gloves. Use a pair of large, slip jaw pliers when removing the bolt from the Blocks and for cooling the bolt down in the water.



Top: Bolt handle modified with forging punch
Bottom: Bolt handle modified with ballpeen hammer face

Before heating and forging the bolt, do a dry run, manipulating the bolt from the Blocks to the water bucket, with gloves and pliers, just as though you had forged the bolt, so you will not over-cool the newly forged handle and will be able to properly cool the cocking cam area of the bolt body.

Set up your oxyacetylene torch with a large tip and a hard, neutral flame; you must heat the bolt handle quickly and work rapidly to minimize heat transfer to the bolt's cocking cam surfaces and bolt body. Also, you must work while the steel is at a bright red heat. If it cools to a dark or black red, the steel is too cold to forge properly and you may crack or break the bolt handle when you hit it.



Moving steel into the groove with the Bolt Forging Punch

You've got to work fast enough that the bolt's cocking cam surfaces do not change color past a light straw. Overheating this area will anneal or soften the cocking cam to where the nose of the cocking piece may gall it. If this happens, you may want to send the bolt to a responsible heat treating firm with experience in gun work to be re-heat treated after your bolt handle bending is complete.

I like to do this job with a helper, another person to hold the torch while you are handling the Forging Punch and hammer. If you can't find another pair of hands, my recommendation is to rig up a secure holding bracket to accept your lighted welding torch. Begin heating the bolt handle shank from the top down, keeping the flame off the handle ball to prevent scaling it. The entire shank should be glowing a bright, orange-red clear to the bottom of the handle where it goes into the Bolt Forging Blocks. Be very careful! Don't melt or burn the bolt handle, by over heating the metal.

Set the torch aside (or hand it to your assistant) and use your large hammer to hit the off side of the handle ball and start the bend into the forging groove in the right hand block. Get the bend about 15 degrees from vertical, and then use the hammer and Forging Punch to move steel down into the forging groove. You may have to switch to your ballpeen hammer only to forge the handle root down into the groove.



Front view of finished M-98 bolt knob

You should have a square corner at the handle root when viewed from the top of the Forging Blocks. Continue heating as necessary and forging the shank into the groove. The lower end of the shank should angle upward from the top of the blocks enough that the bolt knob will clear the stock. For most stocks, this will mean that the underside of the handle will need to be about .150" to .200" above the round groove at the outer edge of the Forging Block. The bolt knob should

angle back, slightly toward the trigger for ease in grasping. How far back depends to some degree on your esthetic sense and on the caliber of the rifle being built. A light recoiling caliber, such as .257 Roberts, can have the knob swept back closer to the trigger than would be desirable in a heavy recoiling rifle, such as a .338 Win. Mag. A heavy recoiling rifle should have its bolt handle almost straight down, or swept back only about 1/8" to 1/4" maximum.



Applying heat to the standard bolt handle

After the bolt handle is forged to shape, the bolt must be cooled down to protect the heat treat of the locking lugs and the cocking cam. Turn off the torch and grab the bolt heat sink with your pliers as you open the vise jaws. If possible, have your assistant catch the Bolt Forging Blocks in a metal bucket partially filled with dry sand or kitty litter as you open the vise jaws. Remember, the forging blocks are hot! Don't let the blocks hit the floor because you may damage them.



M-98 bolt knobs showing progression from start to finish of the forging process

Slowly and carefully put the bolt into the water, locking lugs first, with the bolt body held at an angle, until you can immerse the triangular cocking cam cut in the bolt body while keeping the bolt handle itself in the open air. You DO NOT want to just drop the bolt into your bucket of water! What you are trying to do is quench the bolt but allow the bolt handle to cool slowly in the open air! Cooling it rapidly in the water will harden it, making the cleanup from forging very difficult.



Cutout at rear of Small Ring Mauser bolt after cleanup

Before you begin the next step, check the bolt in the action to see that it will clear the scope when it is in the up or open position. You may want to pad the exterior of the scope's eyepiece with masking or Bedding Tape to prevent any chance of scratching the scope. Do not try to close the bolt in the action at this time!

Use files, a Dremel or Foredom hand grinder with sanding drums or mounted stones, a 1" x 42" belt sander, and hand and machine polishing as necessary to clean up scale, roughness and inconsistencies from the forging process. The handle shank should be no wider than the square root where it joins the bolt body. The forging process will have spread the handle shank wider than the root, so it will need to be trimmed in width to a pleasing contour. The area at the inside of the handle radius should remain flat, and not be rounded over in finishing. All corners should be crisp with the edges broken slightly to prevent injury to the shooter in rapid fire manipulation of the bolt.

Small ring Mauser rifles, such as the Swedish '96 and Spanish '95 models, use a cutout in the handle root to stop the

rotation of the bolt around the bolt shroud when opening the bolt in the gun.

This cutout usually will deform when the bolt handle is forged. Use a Dremel Tool or Foredom hand grinder with a small, mounted stone or carbide cutter to re-shape the cutout so the bolt can rotate to the unlocked position against the bolt shroud. Do Not over cut! It's a good idea before you start the forging process on Small Ring Mauser bolts, to make a detailed sketch of the handle root cutout on your bolt so that you can restore its dimensions.