Example of a full tang blade with bolsters and pins

Fit & Finish - Full Tang Blades

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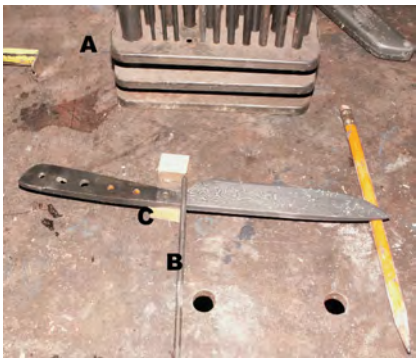
Ever since I started making knives, I've been haunted by the feeling that there are some neat "tricks" out there that would make my bladesmithing better. If you've had that feeling, maybe by "looking" over my shoulder, you might pick up an idea and/or get motivated enough to tell me how you do it!

We'll start by assuming that you have forged, heat treated, and ground a full tang blade - like the one shown here. The geometry on my blades is a taper from the center to both ends and a flat grind from the spine to the edge (blade and tang included). If a cross-section through your knife's tang is rectangular and without a taper, some of what I say below won't be applicable to your knife.



Fg.1: Marking the bolster rivet hole

The first step is adding the bolsters. I start by tracing out the shapes on brass or nickel silver plate (typically 3/8" thick), adding a bit extra for slop, and sawing them out on my cheapy horizontal/vertical bandsaw (hence the need for the slop room). The pieces are annealed by heating with a torch until they glow, then quenching in water. If you're not using non-ferrous materials, do whatever is appropriate. I position one of the pieces in its eventual location and using a center punch, mark the location for a central rivet (Fg.1).

Fg.2: Bolster clamp on drill press

The two pieces need to be exactly the same length, have the hole in the same location, and have the surfaces adjacent to the blade polished. This is greatly helped by the creation of a bolster clamp (Fg.2) - two pieces of 1/4" x 1" flat stock, drilled and threaded for 1/4x20 bolts and with a 3/8" hole located centrally. The two bolster pieces are stacked with one set of edges aligned together as closely as possible. They are placed in the clamp with the rivet hole visible in the 3/8" "porthole". The whole assembly can then be placed in a drill press and a 1/8" diameter hole can be drilled through both bolster pieces.

Remove the pieces from the clamp and insert a scrap piece of 1/8" rod a bit shorter than the combined depth of both bolster pieces to "lock" them together. If you have access to a mill or surface grinder, you can grind the surfaces facing the blade and the handle stabs flat. By ganging them together, you can thus assure exact matching lengths and flat surfaces (which makes fitting the slabs easier and allows polishing of the surfaces on the blade side). Before I had a surface grinder, I just clamped them together with a pair of vise-grips and used the knife grinder (carefully). You can now polish the surfaces facing the blade to whatever level you like (I run mine to 2000 grit, then use tripoli and rouge buffs to get a mirror finish). A hand clamp or those vise grips will come in handy here too. When done, mark the surfaces facing the stabs (I use magic marker arrows pointing out from the tang).

Fg.3: Grinding bolster surfaces

Anneal a piece of 1/8 rod of material matching the bolster material and cut if off approximately 1.5 diameters longer than the combined thickness of the bolsters and the tang. It's better to be a little over than under! Counter sink the rivet holes ON THE OUTSIDE (hence those marks mentioned above). Clean off all the matching surfaces (the surfaces of the bolsters against the tang and the corresponding areas on the tang). I typically lightly sand with really fine sandpaper and wipe down with acetone. Assemble the pieces with the polished surfaces forwards and the countersinks out, insert the rivet and set the rivet. Typically, it works best by alternating sides and using a small ball-pein hammer. Go carefully - you do not want to distort the surfaces of the bolster that will be next to the slabs of the handle. Once the rivet is set, you can clamp one of the bolster pieces in a vise (being careful not to mar the polished surface) and turn the blade until that bolster piece is where you want it. An adjustable wrench allows you to do the same to the other piece, so that when you get done, the polished surfaces are towards the tip of the blade and both bolster pieces are aligned with each other and the blade.

Fg.4: Soldering the bolsters

Next, solder the bolsters to the tang. I find that a set of wood vise jaw liners really helps here (Fg.4). I start with the blade tip down, use TIX solder (from Brownell's) and a MAPP gas torch. By gentle application of heat to the tang and bolsters,

eventually the solder will flow. I run a minimal amount of solder on the rear joint and some on the top and bottom of the tang-bolster interfaces. The blade is flipped tip up and I verify that solder has appeared at the interfaces of the blade and the bolster pieces. I have a piece of 1/8" brass rod sharpened like a chisel with a piece of scrap wood as a handle. That tools makes it easy to "chisel" off any excess solder in front of or behind the bolster pieces. The blade is cooled and we're ready to do the layout for the handle slabs.

I use stabilized hard woods (just how I stabilize them is another article). The surfaces that will be against the tang have been flattened and smoothed (a 6x36" wood sander is what I use). On the knife grinder (or whatever you've got), adjust the fit of the bolster to the front edge of the wood block (see Fg.5). Since the tangs on my knives taper, the angle is not 90 degrees, so some eyeball trial-and-grind is necessary. Don't sweat the angle the knife makes to the block. Once you're happy that the back surface of the bolster piece fits well to the wood edge, you can simply lay the tang on the wood, snug the bolster and front edge of the block together, and trace the outline of the handle. If you're really anal or really cheap, you can saw/grind the block to minimize wasting material or to align grain to the tang. If you do this, do it before fitting the block to the back surface of the bolster. Saw out the slab but leave some margin for error.

Fg.5:Laying out the slabs

Fg. 6: Glueing the first side

The next step is glueing one side to the tang. As with soldering, clean the effected surfaces. I use Devcon Epoxy from Sheffield's and Brownell's black epoxy colorant. Due to the multiple tapers, I also find an adjustable wood clamp and some "C" clamps useful. Inevitably, the slab will want to creep out of the optimal position, so the margin left on when sawing out the slab can save your bacon. The wood clamp squeezes the slab and bolster together, and the "C" clamps squeeze the stab to the tang. BEFORE doing this, make sure the stab lies flat to the tang. If it doesn't, adjust the wood to fit until you can't see light in the interface. Have some acetone and a rag or paper towel ready to clean up any epoxy on the blade or you.

Once the glue has set, you can drill the pin holes through the glued side. Again, due to the tapers in my blade, I find it helpful to rough grind the top and bottom of the slab square to the tang. The slab can then be clamped in the cross-vise on the drill press with the tang uppermost. I just eyeball that the center of the tapered tang is at right angles to the drill. If I did not do this and just used the slab surface for alignment, the holes would run at an angle to the tang.

Fg. 7: Glueing the other side

The other side is handled in a similar manner – check fit, clean, glue and drill. If you are using a wood that splinters easily, you may want to under drill the holes, then ream them as a final step. I also make sure that the holes in the tang are oversized relative to the final pin size, i.e., I use 1/8" pins but use a #30 drill on the tang.

It's time to insert the pins. I rough grind points on my pin stock and cut it a bit in excess of the thickness of the handle at each pin location. The pins are inserted point first and have a dab of epoxy on the pin shaft as well as in the hole on the other side. A soft plywood jaw liner and a machinist vise makes a decent way to drive the pins while supporting the slabs, thus minimizing splintering on the back side. The plywood allows you to drive the pins fully through the handle, so that when you grind the final shape, a full pin head is exposed. Note that if the drill hole/pin size is correct, there is no need to rivet the pins (unless you really want to).

Fg. 8: Pin insertion

The final step is to grind off everything that doesn't look like a handle. When I use a mosaic pin, I drill a normal pin hole in its location, then drill inwards (but not through the tang) on each side using the small hole as a guide. The mosaic pin is really two pins and are driven into each side. I've found out that driving it through the handle is a good way to splinter the backside. When all pins are in place, I use a slack belt and run the grind down to 2000 grit, and hot beeswax to finish.