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Clinker Breaker

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Editorial Musings & Projects

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Well...I warned you - if you don't contribute, you get whatever I'm working on and this month, it's fit and finish on daggers (yup. it's Medieval Faire time again).

Assume you have a dagger blade that needs a handle. The major pain with daggers is that they are symmetrical and the human eye is *really* good at detecting deviations from symmetry (hence one of the cardinal rules of smithing is never make anything with two of the same elements!).

We can divide the handle into three elements, the guard, the handle, and the pommel. There is a saying that if all you have is a hammer, everything looks like a nail. As applied to this project, I have a lathe and the equivalent of a full-size Bridgeport mill, so everything looks like a machining project.

Typically, the guard will be soldered to the blade, so the fit of the guard has to be at the level you would expect on any blade, i.e., within a capillary distance. While I know some folks are good enough with a file to acheive that clearance, I have a mill. If I elect not to cast the guard from silver or bronze, I have to select a material that can be crushed around the tang to acheive the necessary tight fit. The options are either brass (which looks cheap) or nickel silver (which is pricey but looks nice). Stainless steel looks fine but just doesn't like to crush down, so it's out for guard material.

So - saw out a block of material, mill a slot that is as close as possible to the widest and thickest dimensions of the tang where the guard is destined to live, anneal the material and (with a big hammer) mash it to fit the tang. The result is a wrinkled block of material that fits. Hammer the wrinkles out (thus making the slot slightly undersized.

Drive it back onto the tang to get the final fit. By now, the slot is probably not perfectly in the middle of the block, so scribe the guard shape onto the block using the blade as a centering guide. Saw out the guard. The wrinkles now need to be removed, so there needs to be some way to hold the guard when grinding and polishing. I've used machinist's clamps, hard wood wedges driven into the slot and an altered cheap drill press vise (below, left). I replaced the thin vise jaws from a 2.5" Harbor Freight vise with blocks of mild steel. The blocks were drilled and threaded to accept 8x32 cap screws. The guard can be laid down between the cap screws and the vise closed to hold the guard securely. It's then off to the surface grinder, belt grinder and/or buffing wheel to get the guard into the final polish.

The next stop is to curve the guard. It isn't easy to free-form the same exact curve on both limbs, so I welded up the jig shown above. It's a section of pipe of the right outer diameter with a bar of steel running at right angles to the pipe. The pipe is flattened at the location of the block and is sized to match the usual tang width (abut 1"). The bar is drilled and tapped for 1/4x20 cap screws. When a block of steel with matching holes is bolted down, the guard can be securely captured between that block and the pipe. I welded two other blocks of steel inside the pipe - one to fit between the jaws of a machinist vise and one that extends out under the blocks on the jaws of the vise. When the vise is closed, the jig is securely clamped. I then use a heavy brass rod (3/4" diameter) as a punch and hammer the wings of the guard down to the pipe surface. The result is a smoothly curved guard with a polished surface towards the blade. The marks from the hammering are easily removed and the guard is soldered in place using the

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usual procedures that I described in previous articles.

The next step is to fabricate the handle. The design I use is a spindle of stabilized wood captured between two spacers made of material that matches the guard and pommel. The block of wood is center drilled (1/4" hole) and the block can be rectangular. I find that a 4.5" block seems to work best. The ends have to be square to the hole and a decent table saw does that for me. If I was really anal, I could mill the ends and use the Bridgeport to drill the hole but that is overkill (there - you never thought you'ld hear me say that!). Once

the block is ready and the spacers cut from flat stock, the pieces are assembled on the mandrel pictures above - basically a piece of 1/4x20 all-thread and two threaded pieces of round stock. One end is set up to accept a live center and the other goes into the three-jaw chuck on my lathe. In place, it looks

like:

By calculation of the length and width of the block, an 8..10 degrees angle on the diagonal feed is selected -- OK, I just guessed at that number and it worked - sue me!. When the spin is over (after flipping the handle over to get the opposite taper), you have a rough (and I mean rough) spindle. If you don't have a lathe, you can saw the crude angles, but what fun is that? Okay- you have a spindle --Stick the narrow end (that's a 3/8" diameter end) into a drill and slip a chunk of wood over the other end - because you don't want to have your paw on the metal piece when we get to the next step.

The setup looks like the one shown above.

Set up a flex belt on your 2x72 grinder , fire up the grinder and the drill and start pushing the spindle against the belt. Now -- see why you want that piece of wood? You can now fine-tune the tapers (be careful not to eat away the wood while leaving the spacers sticking up). The result is:

We now have a nice piece of smooth wood with spacers but the hole in the center is still only 1/4". Unless you're a really poor knifemaker, the tang is a bit more robust than that. You need to enlarge the central hole to correspond to the tang. Typically, the tang thickness is less than 1/4" but the width may taper from 5/8" down to 1/4". The trick here is to drive a 1/4" hard wood dowel down the center and drill in flanking 3/16" holes corresponding to the wedge shape of the tang. Since the universe is perverse, the tang will still not fir even after you remember to drive out that sacrificial dowel. The next step is to reach into the tang drawer and find a chunk of mild steel that pretty well matches the tang, i.e.,

If you don't have one, make it -- you're a smith!. Slap the stand-in a vise, heat it up to yellow with a torch and slide the handle on. With a little luck, the tang will now fit. If the wood was an exotic jungle hardwood, you may find that your lungs stopped working. USE A MASK! or at least a big FAN!

Hokay, the tang fits, but the spacer between the guard and the handle still has a 1/4" hole and it need to fit over the top of the wedge of the tang. What do you do?.....Make a jig. The basic problem is how do you hold on to a circular, tapered washer without crushing it out of shape. The answer simple - squeeze it. As shown in the next picture, take a chuck of steel (about 2" long) , drill, tap, and install two bolts. Drill a cap slab to fit over the bolts and drill a largish (note the precision there) hole about 3/8 to 1/2" in the center, through the cap slab and into the underlying chunk. DO NOT drill all

the way through. Continue the hole with a 1/4" bit. Why? Because you can capture the spacer between the slab and the chunk using a 1/4" dowel (OK - an old piece of 1/4" stock) to center the spacer in the larger hole. Toss the assembly on the drill press and drill out the center of the spacer. It may need a bit of filing to fit over the tang wedge but the hard part is down.

You now have a symmetrical guard soldered on the tang and a spacer and a handle that will slip over the tang. But there is something missing -- the pommel has to screw down on something and all we have is the skinny end of the tang. We now enter the realm of 'What If'. IF the tang is 0.25" or more in thickness at the guard, then you could have welded a bolt on to the end of the tang before heat treating. This is a rare event (and a massive dagger). Typically, the tang is a bit over 1/8" at the guard and a bolt of that diameter is dubious (to say the least) with regard to attaching the pommel. My solution is to braze a bolt onto the end of the tang, i.e., the setup is :

It's basically a couple pieces of angle iron welded to a bit of rectangular tubing. The tang is clamped to one side and the bolt to the other. They join in mid air (the bolt is slotted to fit over the tang). A bit of borax and brass with the help of an oxy-propane torch fuses them together. While the heat is way less than welding, it still screws up the grain structure in the tang tip -- SO NORMALIZE!.

You can now slather epoxy over the tang and over the interfaces of the front spacer to the handle and over the rear spacer and the handle. It really helps to dry fit the pieces and mark them with a magic marker, i.e., a line on the underside of the guard running across the front spacer to the handle. Even given the use of a lathe, there will be a sweet spot to get the guard to align with the sides of the handle and to get the spacer to play nice between the handle and the guard. The time to find out that there are problems is NOT when there is epoxy everywhere including between your fingers! (By the way, Harbor Freight sells really cheap surgical/examination gloves that are worth it to keep the epoxy off your paws -- just a word of wisdom...).

OK - grease that puppy, align the marks and screw it together with a 1/4x20 nut on the bolt sticking out of the end of the handle. Be sure to pack the cavity with the excess epoxy. Wipe off the excess epoxy - acetone really helps here. You should also know about Brownell's black epoxy colorant - basically soot you mix into the epoxy and you get a gloss black epoxy that hides micro-discrepancies in alignments.

You now have only the pommel -- and what a pain that is. The simplest pommel is something radially symmetrically, like a cone or a ball. The worst is something that is bilaterally symmetrical (left to right) and symmetrical front to back -- all while not screwing up the balance of the overall dagger. I like my daggers to balance at the guard, so there is a delicate interplay of the length of the handle, the massiveness of the tang and the pommel. Since the guard is at the balance point, it falls out of the picture. Of course, I elected to use the most difficult version of the pommel. The blade shown to the right has a pommel that started out as a cubic inch of stainless steel. It was milled to remove the metal on the right and left of the pommel and then milled to remove metal from the back and front sides to create a taper from 3/4" to 3/8. The rest was formed using a slack belt on a variable speed grinder. If I had used brass or has a big block of nickel silver, this would have been a LOT easier.

You do not need all the gear I've mentioned here but it helps. Symmetry is a real hurdle and you can jump that with technology or just a lot of practice. Guess which route I took....