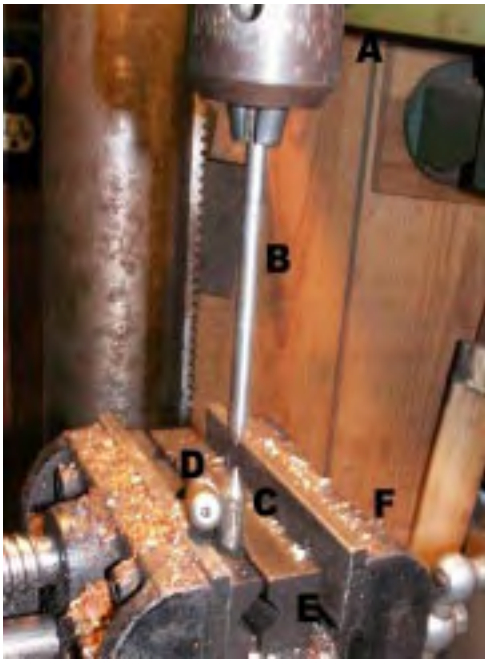
Knife Construction - Stick Tang Blades I - Handles & Pommels

Steve Bloom

(Continued from May issue)

Handle:

Handles have to comply with several constraints - they have to enclose the tang, they have to fit the hand, they have to have a decent interface with the guard and pommel, and they ought to look and feel good. A lot of these constraints are value judgements - what fits one hand may not fit another - but the general concept holds. The handle may be a single block or be a composite of multiple pieces. I'll primarily talk about the block approach but good examples of the composite approach can be seen in any Japanese hilt (tsuka). Not only are there two pieces of wood making up the handle, the cavity for the tang is typically confined to one piece and the other piece acts as a 'lid' - a non-symmetrical arrangement that combines superior resistance to shearing the glue bond with simplifying the construction.



Fig,13: Boring holes through handles

The block approach starts with making a hole that runs through the center of the block from the guard to the pommel planes (true whether we're talking wood or stag). You want a hole large enough for the tang but no larger so as to preserve the maximum strength of the material. Since the tangs on my blades are usually wide at the guard (3/4" is typical) and taper to 1/4" at the pommel, I also need to make a triangular cavity rather than just a simple cylindrical hole in the block. What works for me (Fig.13) is a combination of a drill press (A), a cross-vise (F), angle-blocks (E), a dead center from a lathe (C) - though any cylindrical piece of steel with a centered point will do), and an alignment tool (B or D). The scheme is to first mark the hole location on the ends of the block (Fig.14) and to drill a shallow hole at those locations. Then clamp the lower point (C) in the vise using the blocks, temporarily insert the bit to be used (normally a 1/4" twist drill), and adjust the vise to chuck separation such that the handle just fits between the lower point and the drill bit. Remove the drill bit and either insert a long rod with a centered tip (B) or a laser pointer (D) in the chuck. If you're using a laser, just make sure the chuck jaws depress the on switch. The rod is easier and cheaper than the laser but not as cool. Now, adjust the cross vise to bring the points together and lock the vise. Reinsert the drill bit, slip the handle onto the lower point (that's what the shallow hole in that end is for), and fire up the drill press. You can now hold the block in one hand and feed the drill into the shallow hole on the 'up' side (Fig.15). When you run out of travel on the drill press, flip the block and drill from the other side. The holes will meet in the center. Since I need a triangular cavity, I drive a sacrificial 1/4" hard wood dowel into the hole (taking care to leave a cavity at the end of the handle) (Fig.16). I can then drill shallow holes on the guard side to either side of the dowel and repeat the process described above to run two converging holes through the block (Fig.17). What is left of the dowel can be pushed out and the resulting cavity should be close to what is required.

Fg.15: Drilling the block

If the handle is crown stag, then drilling a hole all the way through may be problematical - especially if the handle curves. For those applications, a shorter tang and an extra long end

Fig.14: Handle layout

Fig.16:Wide tang layout

mill (Fig. 18) have proved helpful. Especially for crown stag, I find that drilling a large hole along the interface of two blocks of wood then using the blocks as vise jaw liners makes a convenient way to stabilize the handle when drilling or milling. I have also found that a side-cutting bit and a air die grinder makes a useful tool for enlarging and shaping cavities in antler and stag.

Fig.17: Drill flanking holes

Even with a triangular cavity, the tang may still not fit. A quick way to open the cavity is to make a stand-in for the tang, i.e., a piece of steel with approximately the same shape and thickness. Clamp the piece of wood in the vise (no oak jaws this time!) and heat it to a cherry to yellow temperature with a torch. Slide the block of wood onto the heated "tang" and the cavity ought to be large enough now to accommodate the real tang. If you do this, be very aware that lots of woods, especially the tropical ones that are so popular with knifemakers are really bad news when they burn. Be sure to have more than adequate ventilation and a good respirator. I use a positive pressure mask system that pumps outside air into a half mask. You'll also find that a welding glove is useful when you shove the block of wood home. Over time, you will accumulate a collection of pseudo-tangs, so the time involved in making one will be spread over multiple blades. The trick is to put them somewhere where you won't recycle them into something else after you forget why you made them in the first place.

Fig.18: Stag and end mills

We now have a blade with a guard and a handle that slips over the tang. It's now time to mate the two. I'm familiar with the concept that a disk sander combined with a foot switch makes mating the handle to the rear of the guard a breeze, but since I don't have that equipment (shocking, no?), I just use my Bader. The process consists of mating the two, holding the unit up to a light, and determining the high point, i.e., the location where the handle first touches the guard. I envision how the plane of the handle has to be modified to remove that high point and then try to hold the handle at the correct plane to the belt. The process repeats until I don't see any light between the guard and the handle. Over the years, I've gotten it down that I don't have to start over too often.

The Pommel:

The termination of the handle is another highly variable element in the design of a blade. The simplest (and in my opinion, the worst looking) solution is a circular pommel perpendicular to the tang in both the top-bottom and left-right directions - probably held on by a commercial acorn nut. Of course, some of my machinations that will be described here will probably strike some of you as way too much trouble for the result. C'est la vie.

I prefer a pommel that is oblong and I'll run through two ways I handle the problem. The first uses an external fastener (but not an acorn nut!). In both cases, a threaded section is needed to connect the pommel to the tang. In Fg.19, a short section of a 1/4-20 bolt (A) has been arc welded to the tang. Arc welding thoroughly trashes the grain structure of the steel of the pommel. I normally do the weld before heat treating and since my heat treat includs normalization, the problem goes away. If you weld the bolt section after heat treating, you should normalize and anneal the tang end with a torch.

A connector nut (B) will connect the threaded section of the tang to the bolt. The handle is traced onto the pommel material (C) and sawed out. The location of the bolt hole is done with a center punch running through the handle and a blind 1/8" hole is drilled into the handle side of the pommel below the bolt hole to act as a socket for a blind pin.

The bolt to be used is a stainless steel button-headed bolt (domed head, Allen wrench driven).

The idea is to file grooves in the bolt head radiating out from the corners of the hex hole. Filing is MUCH easier when a simple file jig (Fig.20) is made - basically a piece of brass round stock with one end drilled and tapped for a given bolt size and the other end pressed into a section of hexagonal stock (because the vise can grip it better - that's why!). The

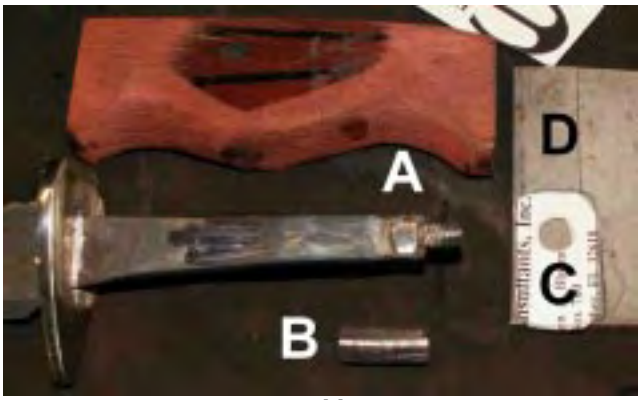


Fig.19: Pommel layout

result is shown in Fig.21.

The handle is assembled (see the paragraph on adjusting the bolt angle on this page) with the blind pin installed and the bolt tightened down, ground to the final shape, disassembled, wiped down with acetone to remove all oils and dust, packed with colored epoxy, reassembled, bolt and pin inserted and tightened and any excess epoxy wiped off. After the epoxy cures, the handle is buffed, heated gently, and melted beeswax is flowed over all surfaces (with the excess wiped off).

Fig.20: Flower Bolt

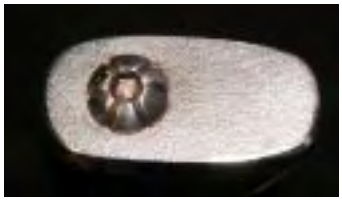


Fig.21: Flower bolt

The second way I handle a pommel is an internal fastener. They can come in two flavors. The easiest way is simply use a thick block of material. Use a transfer punch (or a thin pencil) and mark the material through the handle or make a template and use it to determine where the tang bolt hits the pommel. The material can then be drilled and tapped (probably using a normal and then a bottom tap). The trick is not to drill through the block and to have enough threading to actually hold the pommel on securely. While I've made plenty of blades this way, I find the balance of the knife is often compromised by the pommel weight (though that depends on the size of the blade too).

I've solved this problem by either soldering or welding a connector nut to the back side of the pommel. I typically use stainless steel for pommels and use the setup shown in Fig.22 The location of the nut is determined (see preceding paragraph). An adjustable wood clamp (A) holds everything in the correct location, the pommel plate is protected with masking tape (B) (because I use a flux-core MIG that spatters everywhere), and a pair of nuts (C) on a bolt (D) completes the setup. The nuts are welded together and welded to the plate. A similar rig can be used to solder or braze the components together - just be careful not to solder the bolt in place.

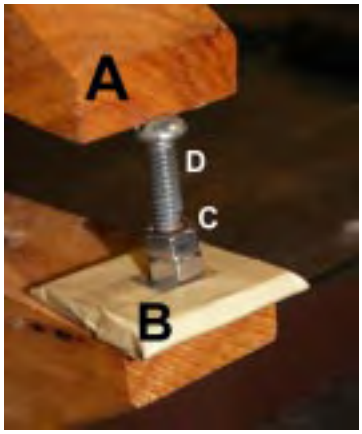


Fig.22: Welding jig

Now is when the cheap

Fig.23: Pommel bolt

nature of my being comes into play. One could measure the maximum length from the bolt hole to the edge of the handle and make a circular plate with that dimension as the radius of the plate. You would then screw it down, scribe the outline of the handle on the plate, remove the plate, saw on the scribed lined and reinstall. The more oblong the handle, the greater the waste of material.

There is, however, another problem. The pommel plate must sit square and flat onto the handle, it cannot meet at an angle and leave gaps. One way to achieve this is to simply bend the threaded section attached to the tang to the correct angle. I've found that protecting the majority of the threaded section with a connector nut and using a long piece of steel with a matching bolt (Fig, 23 - the yellow bar) is a good combination. The nut is installed, the bar is threaded into the handle and the bar is turned down. When the bar seats against the handle (for a full rotation), the tang bolt will have been bent correctly. You can also just put a nut on the tang bolt - whack it in the hopefully correct direction, assemble the handle, and guesstimate the next correction needed. Repeat until you're satisfied.

There is a further wrinkle in all of this - how to minimize material waste, i.e., cut out only the pommel you need and guarantee a flat fit that snugs down exactly at the right moment to simultaneously align the pommel and thoroughly tighten the handle components (Fg. 24). Connect the tang bolt with a "U" joint. This is a great trick for stag handles. You can control the rotation angle of the pommel by using a set nut with the connector nut (Fg. 23). You move the connector nut on the tang bolt, lock it down and trial assemble the handle. Repeat until it comes out the way you want.

Fig.24: "U" Joint