Building a Slip Joint Folder

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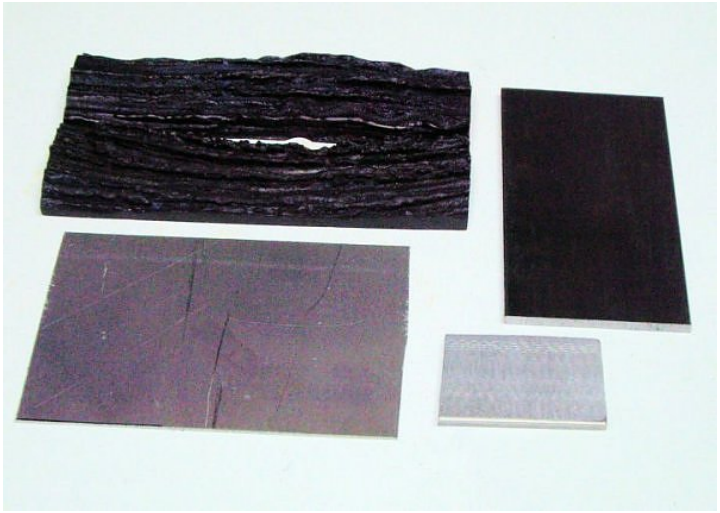
Part 1 of 2

This is part 1of 2 of Building a Slip Joint Folder by Steve Culver, Master Smith.

This is a step by step tutorial on building a slip joint folder with a single bolster.

Raw materials for the knife: ATS-34 steel for the blade and spring, 410 stainless sheet for the liners and bolsters, amber stag for the handle material.

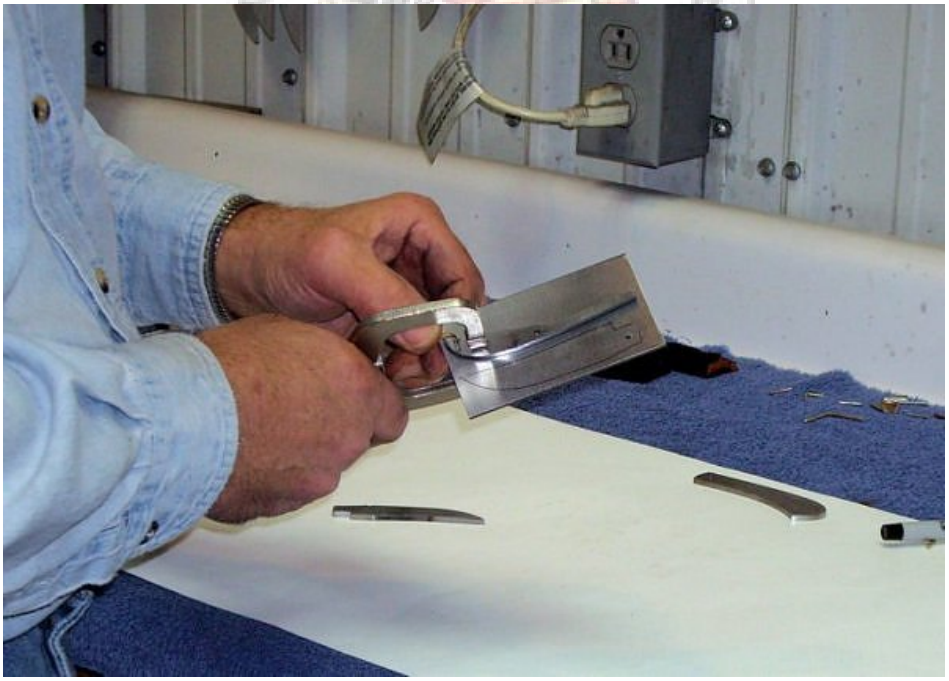


Surface grinding a few thousands off each side of the ATS-34 to remove the mill scale. I will also surface grind the liner and bolster material as I believe that removing the mill finish helps with making a sound connection when spot welding the bolsters to the liners.

Tracing around the pattern onto the ATS-34 for drilling the blade pivot and spring pin holes.

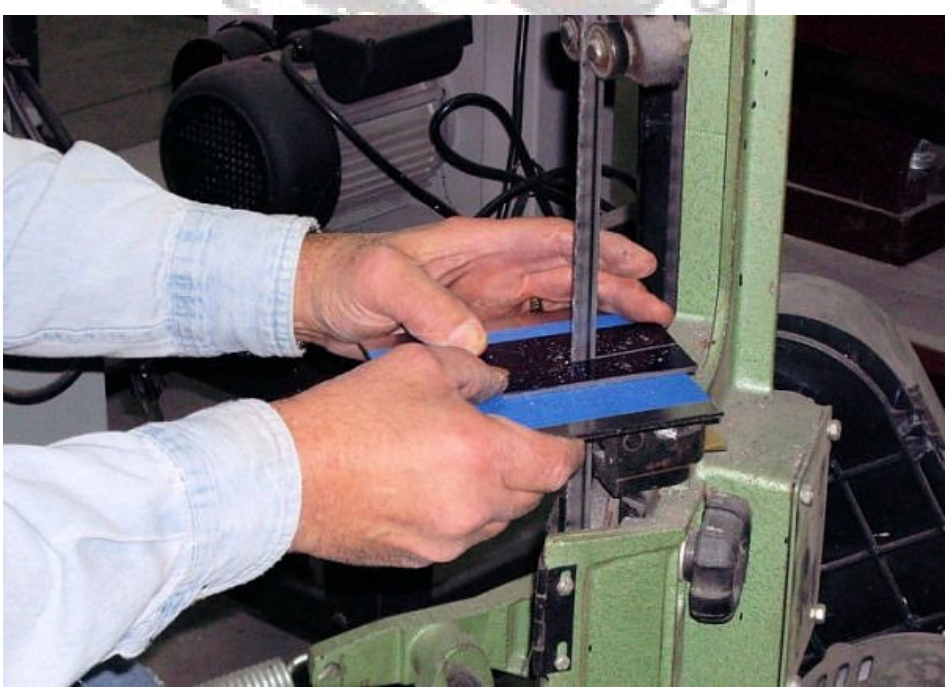
Drilling the blade pivot and spring pin holes.

The spring pattern is aligned with the previously drilled rear pin hole and clamped to the ATS-34. The center pin hole is drilled through the hole in the pattern.



The ATS-34 is covered with layout dye, then the patterns for the blade and spring are aligned with pins and the outlines of the patterns are scribed onto the ATS-34 with an Exacto knife.

Sawing out the blade and spring.



Profile grinding the blade on my KMG belt grinder. I have carefully adjusted the platen to 90 degrees to the work rest.

Using a 6” wheel to profile grind the spine of the blade. I have modified the grinder to hold the work rest in front of the round wheel attachment. The work rest is adjusted to 90 degrees to the face of the wheel.

Using the same set up to profile grind the spring using a 4” wheel.

I have made the same modification to the small wheel attachment using it here to do additional profiling on the bottom of the spring.

Cutting the nail nick in the blade with a fly cutter.

The blade pivot was first drilled with a 1/8” drill to match the pivot hole in the pattern. At this point, I no longer need to use the pattern for the blade. The pivot hole is now drilled and reamed for a 3/16” pivot bushing.

The spring notch in the blade is roughed in using a grinding stone. The face of the stone has been dressed to an 85 degree “V”.

The blade and spring ready for heat-treat.

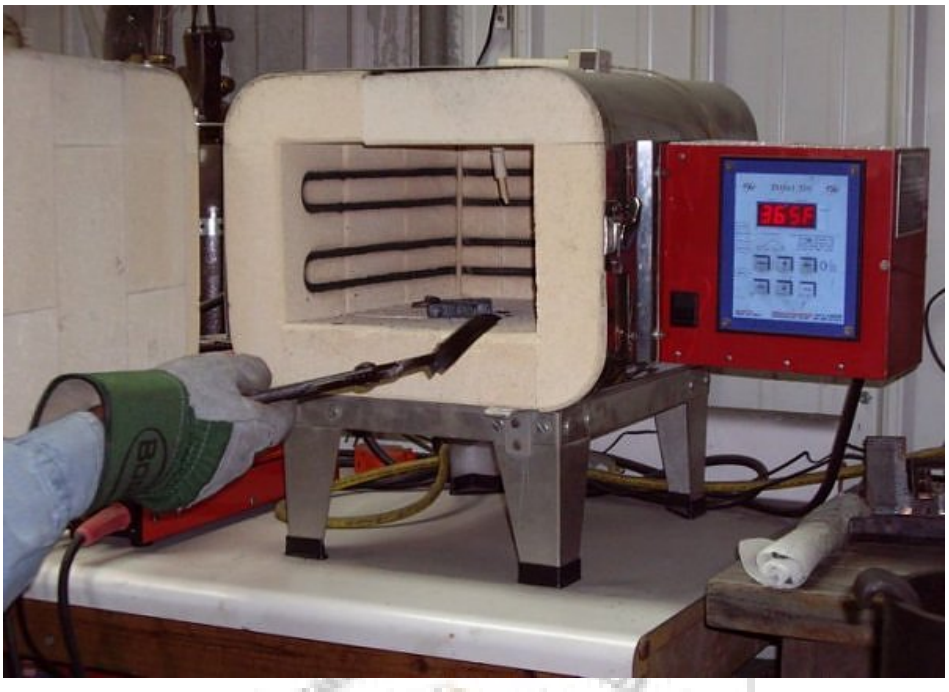
Wrapping the blade and spring in stainless foil for heat-treat.

Blade and spring going into kiln for a 30 minute soak at 1450 degrees. Then the temperature is increased to 1950 degrees for another 30 minute soak.

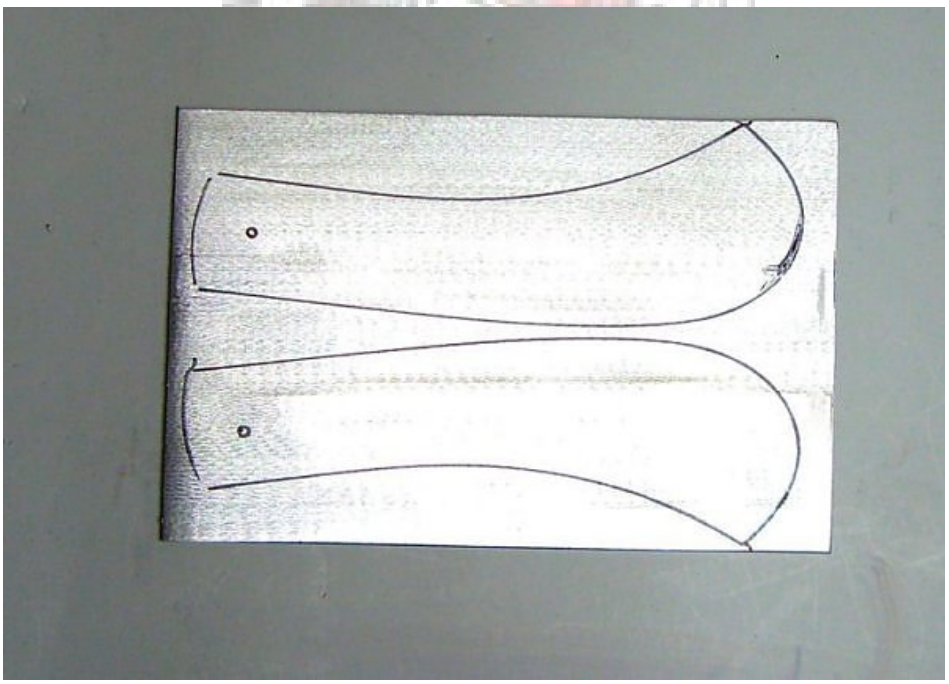
Blade and spring coming out of kiln to air quench.

Blade and spring right after air quench.

The blade is coming out of kiln after tempering for two hours at 425 degrees. The spring will stay in the kiln for another two hours and the temperature will be increased to 1125 degrees.

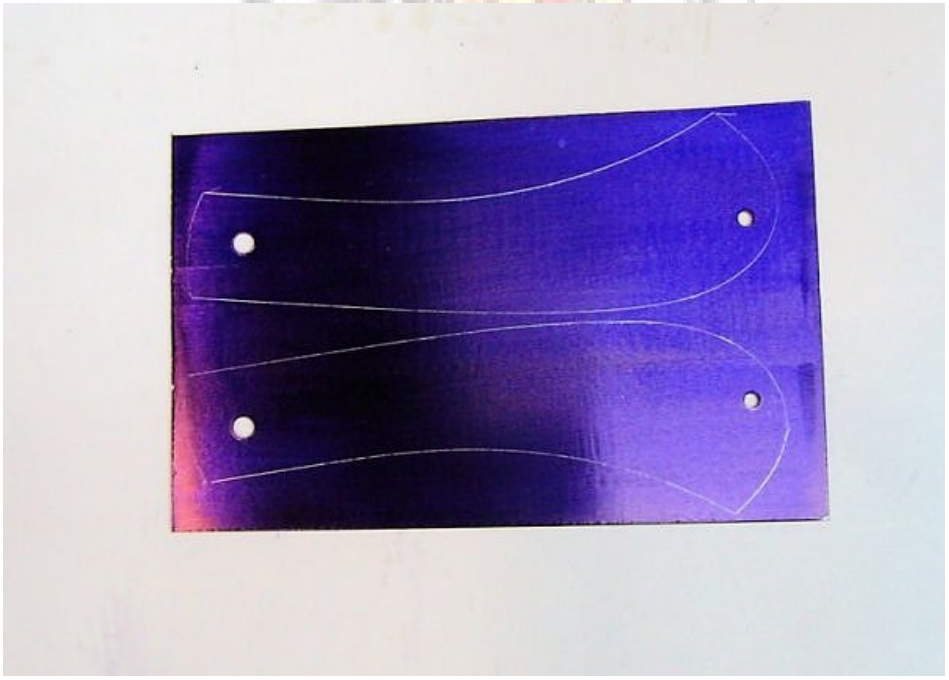


The liner patterns traced onto the stainless sheet for drilling pin holes.



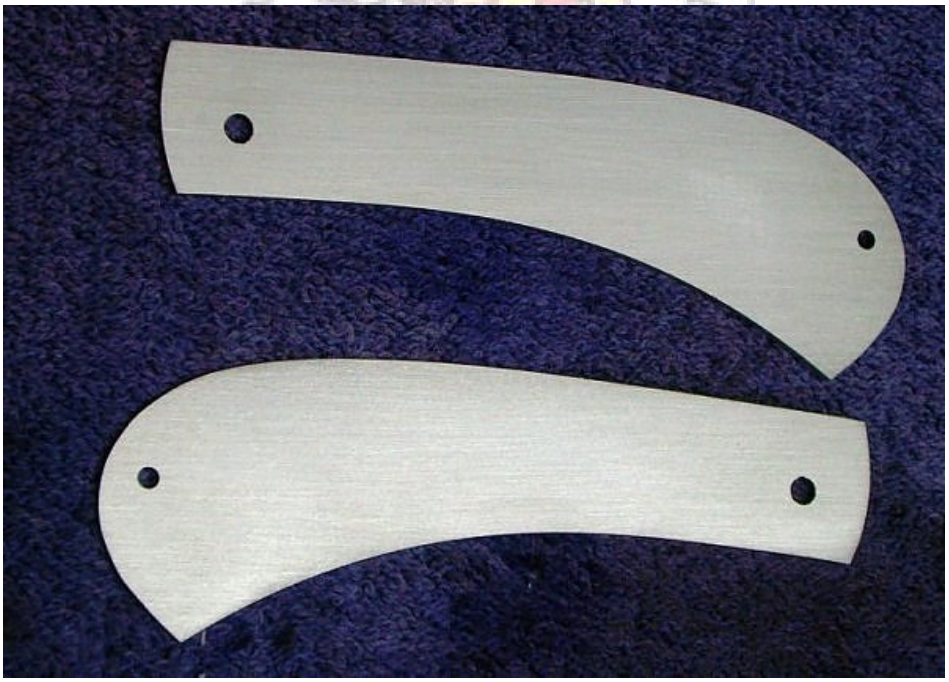
Drilling pin holes in liner material.

The liner material is covered with layout dye and the patterns are scribed for sawing out.



Liners are sanded flat on a sheet of sandpaper that is glued to a piece of flat material.

Liners flat, clean and ready to weld bolsters on.



Grinding one edge of bolster material square where it will meet the handle material.

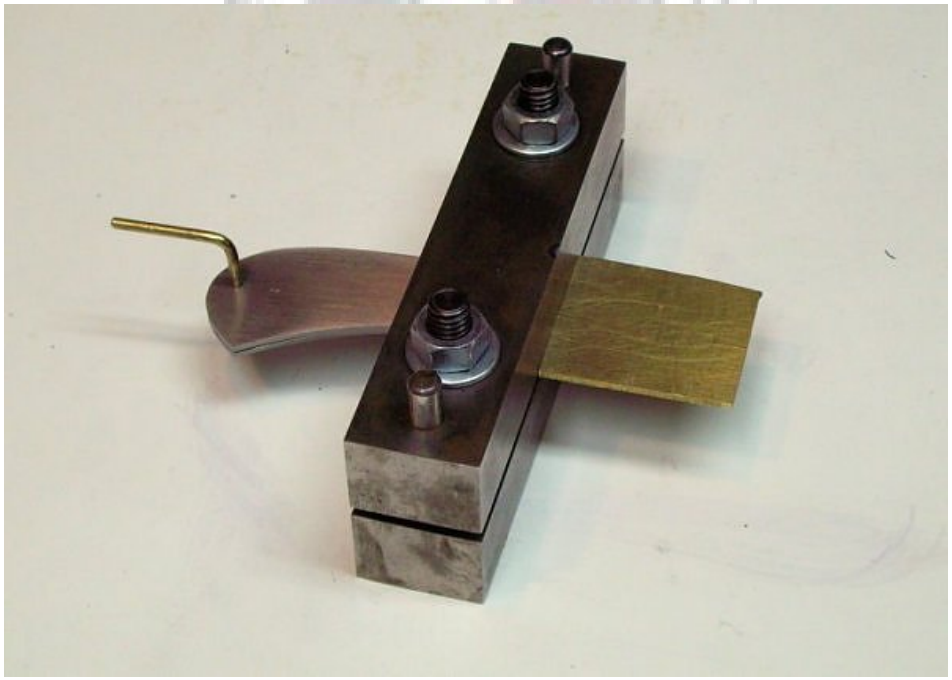
I use one of my guard shoulder filing jigs to hold the liners for welding on the bolsters. A square is used to scribe a line on the left liner where the bolster will meet the handle material. The liner is clamped with the scribed line aligned with the face of the jig.

Spot welding the bolster to the left liner.

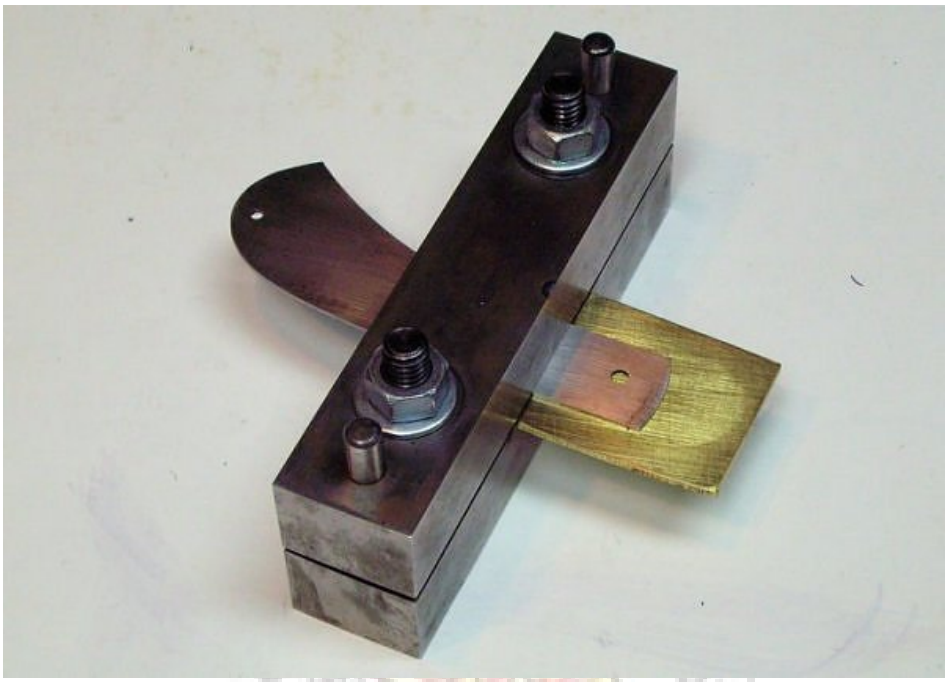
The pivot hole is drilled through the left bolster using the previously drilled hole in the liner as a guide.

Both liners are pinned together and clamped in the jig, with the just welded left bolster against the face of the jig.

A brass plate is super-glued to the right liner to position it in the jig during the next step.



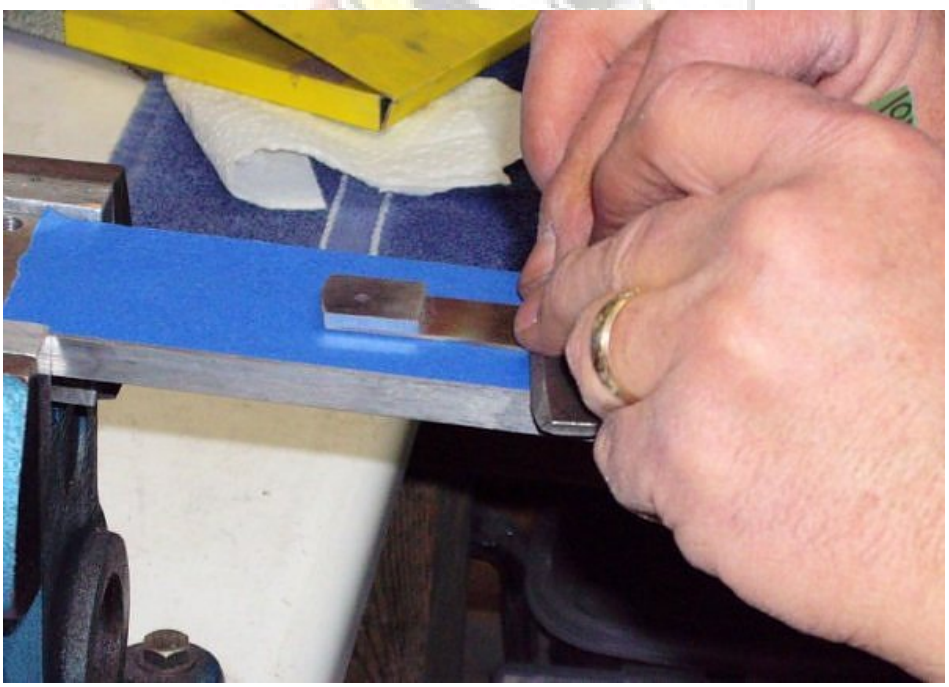
The left liner is removed from the jig. Then, the right liner is clamped in the jig with the brass plate against the face of the jig. The brass plate is removed by heating it with a torch until the superglue releases. The superglue is cleaned from the liner with acetone, leaving the liner in position and ready for welding.



Both liners with bolsters welded in place. The pivot hole in the right liner will be drilled as was the left side.

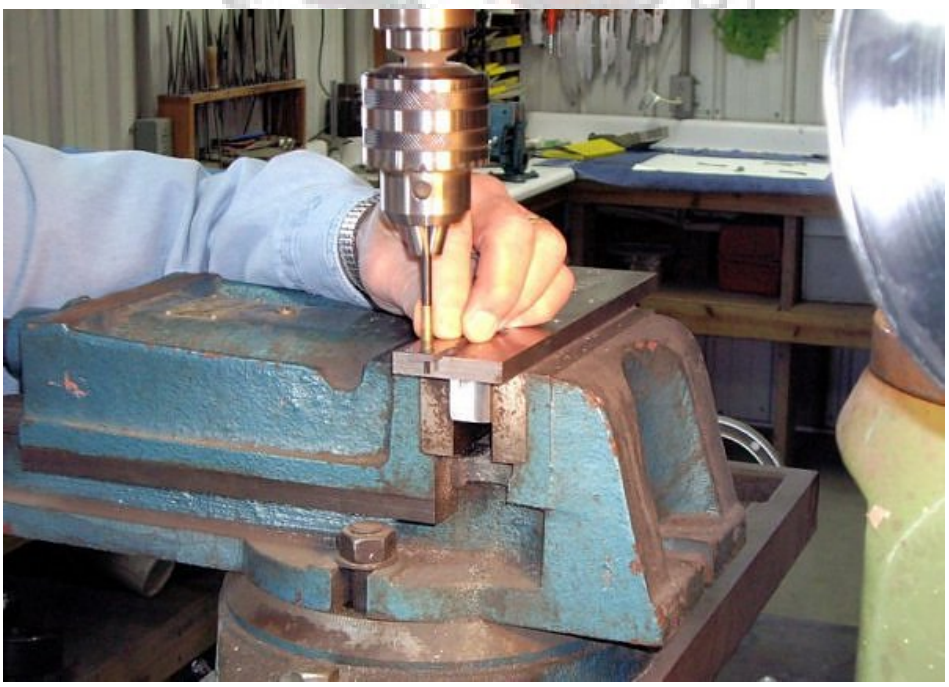
The weld areas tend to harden from the welding process and will cause problems with machining the tang reliefs in the liners and can show on the finished bolsters. So, they are annealed by heating to a dull red with a torch and allowed to cool slowly.

Cleaning up the liners after annealing. I use double sided Scotch tape to affix the liners to a flat plate, then sand them clean.



Surface grinding heat-treat scale from blade and spring.

Cleaning scale from pivot hole in blade using an expandable brass reamer and grinding compound.

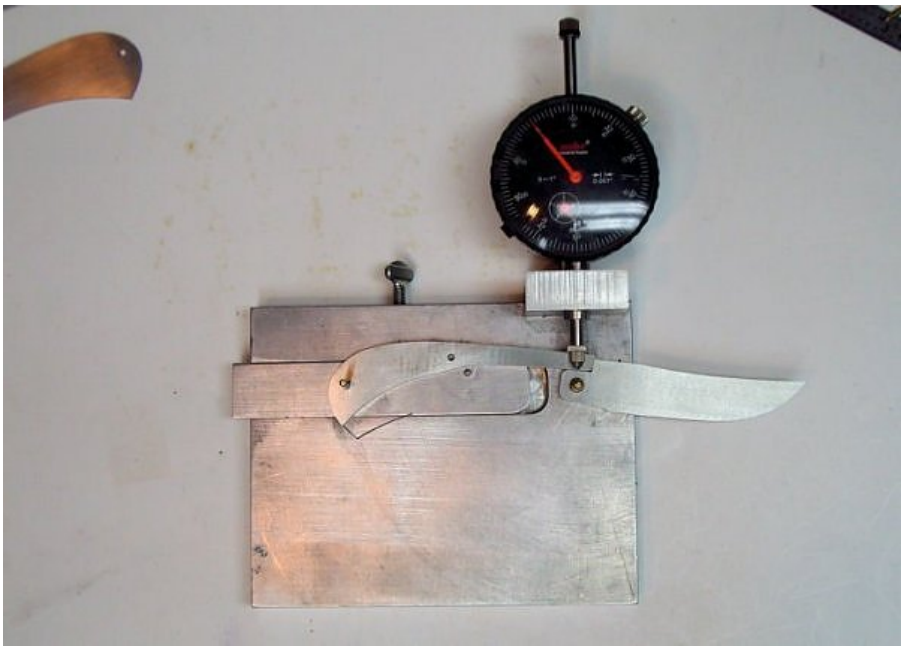


Cleaning scale from the spring notch in blade using stones.

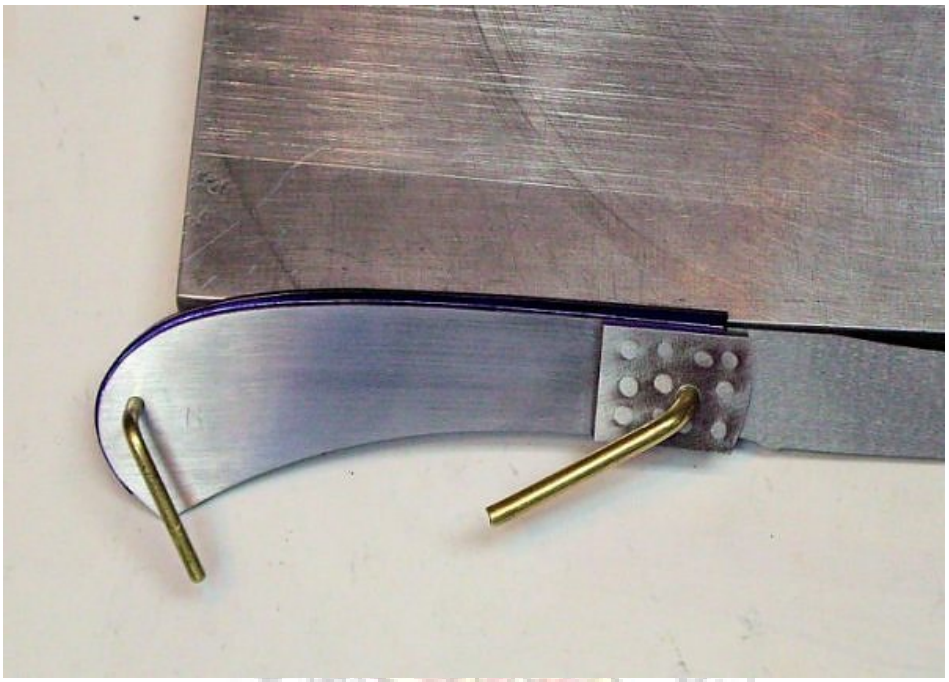
Final clean up of bottom of spring (I hope). Grinding the bottom of the spring where it rests on the tang.

Grinding the rest of the scale from the bottom of the spring. After grinding the scale off, I will then hand sand the bottom of the spring to final finish. This is hopefully the last work I will do on the bottom of the spring. If all goes well, I will not touch the bottom of the spring again, as I am about to start adjusting the tang and spring fit-up.

Using the “Ruple Dial” to set the tang and spring. This device was designed by Bill Ruple. It helps to quickly get the tang to spring fit-up and geometry close without having to assemble the knife repeatedly. The micrometer sets on top of the spring and measures the lift that the tang imparts on the spring. The tang is ground to set the rise of the spring in all three positions of the blade; open, half-stop and closed. The blade kick is also adjusted to fit the tip of the blade into the handle. This will only get the fit-up close; the final adjustments will have to be made after the knife is assembled and the spring is loaded. When the spring is loaded, it flexes, and the position of the blade will be different.



Once the spring to tang fit is set in the open position, the blade and spring are fitted to a liner with the pivot and rear pins. The spring is covered with layout dye and the spring is scribed along the top of the liner. The excess material is then ground from the top of the spring.



The spring is then positioned to pre-load against the tang and clamped to one of the liners. The center pivot hole in the liner is then drilled through the hole in the spring. The amount of pre-load is a bit of guess-work combined with experience. Too much pre-load can be fixed by grinding away some material from the bottom of the spring; too little may require making new liners and trying again.

The center hole in the second liner is then drilled through the hole in the first liner.

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