

## BLACKSMITHING TECHNIQUES

By Oliver Cameron  
with Ole Wik

I'm a little bit of a blacksmith, but I hesitate to get started talking about it. I just learned by experimenting. I don't know if I'm capable of telling somebody else how to do it. I don't know how to describe the process adequately for different kinds of steel.<sup>1,2</sup>

Files, auto springs, leaf springs from the front of a snow-go, and various coil springs can all be heated and straightened out, but you use a little different technique to work with each of them.

There is some kind of stuff you can buy to sprinkle on hot iron to tell you the temperature of the metal. One kind will tell you that the temperature is in a certain range, and another is for metal that's a little hotter or a little cooler. Those are used by professionals, especially when it comes to tempering.

But anyway, if you put your iron in the fire and hammer it out to the shape you want, put it in again, and then stick it in the ashes under the fire or put it on the top of the stove so that it cools off very slowly, that takes the stress out of the steel. If you don't do that, quite often there will be flaws in the steel, and chips will break out of it when you use the tool. So it's important after you forge a piece that you heat it and let cool slowly to anneal it. If you need to heat it again to bend it or something, then you need to anneal it again afterward.

After you got the shape you want, it's easy to shape an annealed piece of steel with a large file. I usually use a coarse twelve- or 14-inch bastard file to shape things down with.

After you get the shape you want, you can heat it past the critical temperature and plunge it into water. Not too cold...you don't want to cool the outside of your steel too rapidly compared to the inside, because it will shrink before the inside does and cause cracks.

In order to slow that down, you can just dip it in, pull it out and let the heat come back into the edge, and repeat that. It only takes a little bit of that to cool it off so you can plunge it, and that will harden the steel.

Then you've got to temper it, which is drawing out the hardness so you have the degree of hardness you want. You heat it dull red, and then let it cool slightly. You can tell by the changing colors.

If you want it to be fairly hard, like knife steel, you plunge it while it's still fairly hot. For spring steel you let it cool a little more before you plunge it, and that will harden it to a lesser degree. It'll take a little more of the hardness out, so that the piece of iron can flex many times without breaking.

Commercial knife makers have electric furnaces. They have a specific type of steel and know how to get it to the right heat to start with. They heat the metal and then cool it, and that's all it takes.

But when you don't have those electric furnaces or some other way of knowing your heat, you have to go by the color of the metal as you heat it. The only way you can tell with an unfamiliar piece of steel is to try it. If you heat it up until it's blue and then quench it and try it, it might not be hard enough, so you heat it a little hotter and do the same thing again until you finally arrive at the hardness you want.

It just depends. If the tool you're making doesn't require an especially hard edge, you can quite often find a piece of steel, even hard, high carbon steel, that is already tempered. Then all you have to do is cut the metal to the shape you want, and use it.

But if you bend and perhaps compact a larger piece of steel as you forge it out to make it the shape you want, that's going to leave stresses in the metal. Then you've got to get it hot again, even though the original tempering might have been suitable.

If you've still got quite a bit of residual heat, you can reheat it and shove it into the ashes or lay it on top of the hot stove and let it cool, and it will be annealed. If you need to do further shaping to it, that's the time to do it, because it'll cut very easily when it's soft.

So you heat it up to red hot, forge it out to the shape you want, and let it cool down. That will build some tensions into it, so you anneal it again, and that softening process lets the tensions go out of the metal.

Then you can heat it above the critical temperature—red hot, depending on the type of steel of course—and then plunge it to make it hard.

Then you have to soften it a little bit. You shine up the surface on it, and then heat it just enough that the color comes into it. Then you quench it again. The hotter you get it before you quench it, the softer it will be. You judge that by what color you allowed it to get to. You just have to learn to play with it there until you get the right hardness in it.

This is step two, tempering—that is, drawing some of the hardness out to the level that you want it. If you draw all of the hardness, that's annealing it.

It is possible to skip hardening and just temper the piece, but it's pretty hard. You have to have a uniform heat through the whole thing, especially for sharpening picks and things like that. I'll draw the pick out, heat it up again, and let the temperature cool slowly to take the stresses out, and then heat it up again to the right temperature.

Depending on the hardness of the tool, I'll sometimes draw the pick out, harden it, and then watch it cool off. What you do is dip the point of the pick in water and pull it out right away to start the cooling process. The heat will then work down into the point from the pick blade that you didn't cool.

As soon as the color that I want comes, I plunge it, and that should be OK. But that might not work on some other kinds of tools that don't have that heat reservoir.

If you have a tool that has an amount of carbon that will only allow it to get just so hard, you can forge it out as long as it's real hot, and then dip the tip of the blade into the water and pull it out. That'll cool the point off and it will be hard.

Then you hold it a little bit and watch the heat spread from the main part of the steel in the pick blade down into that point, and when the color gets just right at the tip you plunge it. By cooling it quickly at temperature, that leaves it at the hardness you want.

I guess we've gone over this part before, but suppose you have a very hard piece of steel, a piece of high carbon steel, and you get it hot and then you quench it. If the outside of that piece of steel cools rather rapidly and the inside isn't cooling off, then the outside is going to be full of cracks. You can avoid that by using the tissue on the water, or use oil or salt water.

You don't quench the steel by just plunging it in all at once and leaving it there to really cool off the outside edge. You stick it into the water to cool it somewhat, pull it out quickly, and wait for the heat to spread through the metal. You do that again, maybe two or three times, so that the heat from the center of the piece can work out to the edge.

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1) This essay stems from a series of telephone conversations that Ole Wik had with Oliver between December 2007 and February 2008. Highlighted text indicates remarks made by Ole.

2) There are three basic blacksmithing techniques involved in making a tool: Annealing, hardening, and tempering. Oliver touches on all of these, but I cannot edit this text into a how-to manual. All I can do is make it readable.