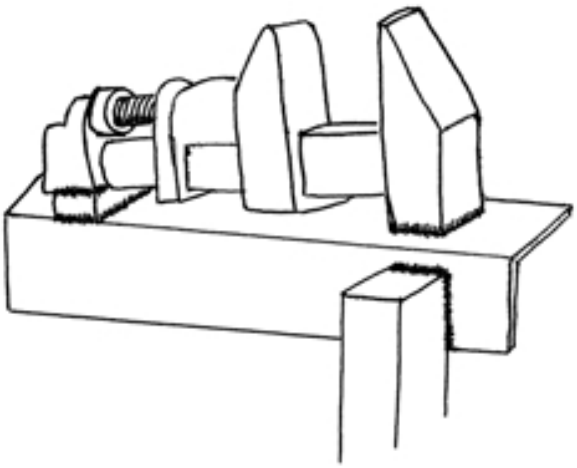
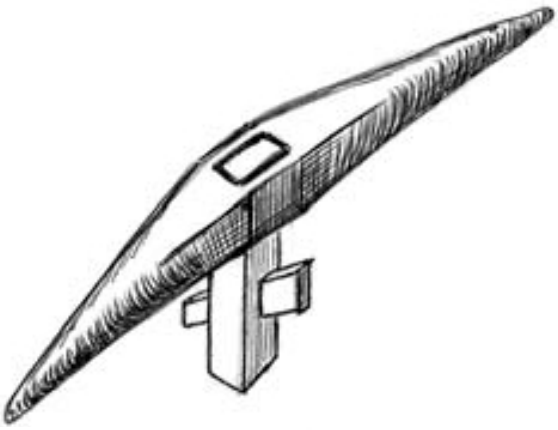
Re-Purposing Tools

Albin F. Drzewianowski,
Blacksmith Guild of Central Maryland

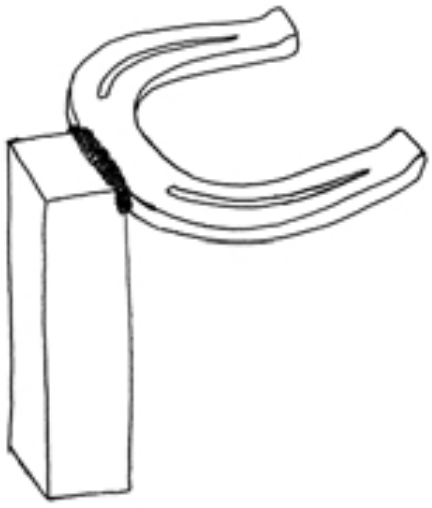
Paul Thorne has cut the handle off a large monkey wrench, chamfered the jaws and welded it onto a piece of angle iron. After welding a Hardy stem to the angle iron, his new mini-vise can either be used on the anvil or in a vise. I will be bolting the Hardy stem onto mine, so I can use a 7/8" stem with my small traveling anvil or a 1" stem with my shop anvil.



Dick Smith came up with an ingenious idea for a bick that would allow him
to fuller deep into a bell. He wedged steel into the eye hole of a pickax and
welded on a Hardy stem containing a wedge slot. He rounded the long edges
of the pick points. (This could also become a stake tool with a bit more modification. ~Ed.)



Fire Shovel Swage
Blacksmith Guild of Central Maryland
Cut a shovel blank to match the outside dimensions of the horseshoe, and dish the blank into the horseshoe swage to bend up the shovel edges. Punch holes for rivets to attach your own handle.



Hinge-bending Tool
by Mike Hriczescse, Klamath Falls, Oregon

(left) The hinge strap (represented by a piece of flat bar) rests on the table portion of the tool, with the length required to wrap around the hinge's pin held tight against the tool's hinge pin. The tool has an adjusting screw to accommodate the thickness of the hinge material.

(center) The tool is set up in a vise.

(right) By lifting the curved handle, the tool is raised from the lowered position as seen in the left photo, to the closed position seen here. In the process, the hinge material is pried up and around the pin as shown.

Mini-Leafing Tool ~ One of Brent Bailey's Favorites

Forging Curved Chisels

By Brian Gilbert
With help from Gary Scasbrick

A good selection of curved chisels is an important part of a blacksmith's toolbox. I realized just how important when I started making the backplate for the lift latch in this issue. I had a few, but I didn't have enough, especially the tightly curved chisels required for the small cuts.

You can make curved chisels either by grinding the curves or by forging the curves. A third option would be a combination of the two techniques… grinding a profile that had been upset and forged to shape. I made some chisels both ways, and each method has it's advantages and disadvantages.

I made these tools out of spring steel. I know, I know… like Francis always said, spring steel is for making springs, use TOOL steel for tools. And he's right. But, I didn't have any laying around at the time, and there are several coil springs out back just begging for a good recycling. Besides, these were experiments. As soon as I get all the kinks worked out, I'll make myself some proper chisels. Really.

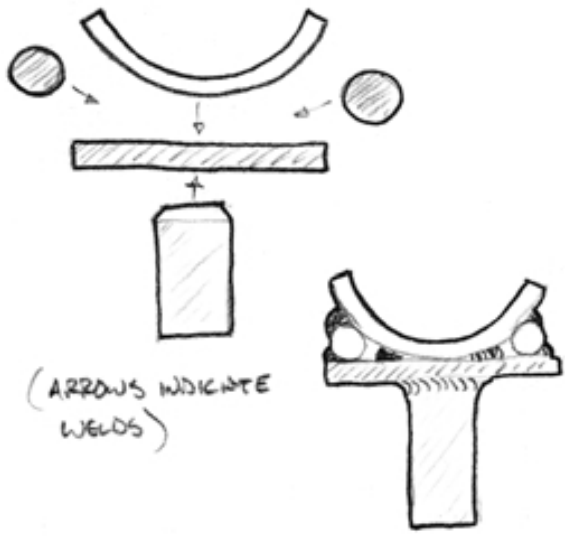


Figure 1–A built-up swage

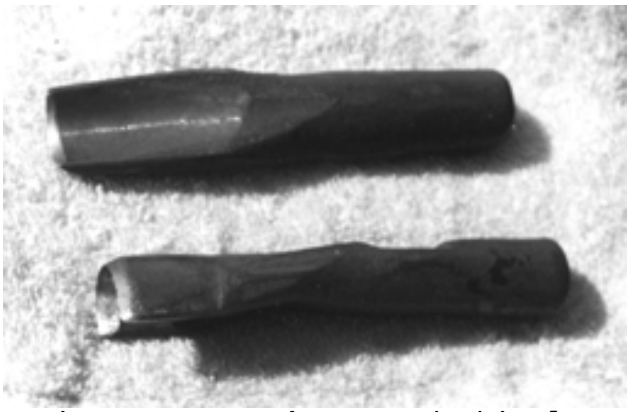


Figure 2- Gary's curved chisels

Gary says that for cold-cutting chisels, coil-spring steel is a good choice. A broad-curved chisel is fairly easy to forge. Just flatten the end a bit, then hammer in the desired curve using a swedge block. As you flatten the tool, take care to hammer equally on both sides of the tool, especially if the blade is thin. This will reduce the chance of warping when quenched. If you don't have a swedge, you can make a passable substitute by splitting a short piece of thickwall pipe, and welding up the sides for support. Leave the edge of the forged blade rather thick, and grind the bevel into place. I sometimes cheat and forge a preliminary bevel… this doesn't seem to hurt as long as you leave some thickness where the cutting edge will be

After you forge a curve, you need to make a test to see if the curve is circular. Push the hot edge into a scrap board a few times, and try to make a circle. If the burn marks don't line up after you've gone around, your curve isn't an arc of a true circle, and it won't be as easy or accurate to use. Adjust if necessary, and repeat this test after you've ground the edge using a block of wax, lead, clay, etc.

There may be cases where you don't want a curve that is an arc of a circle. Gary's chisels for his holly candleholder are elliptical in shape. That's fine, but it's a good idea to try to make chisels that are elliptical because you

want them that way, and not because they "just turn out elliptical." Take the time to make these right, or you'll be paying for your haste many times over as you use these tools.

I made several chisels this way, with the bevel on both the inside and the outside. I guess this makes the chisels "left handed" or "right handed" but I'm not so sure. This did allow me to cut the curves on my backplate with the bevel built in… I had a lot less filing to do because I had made the extra chisels. Gary pointed out a problem with making chisels with one-sided bevels… they're weaker, because the cutting edge isn't supported on the flat side. Since I was using the beveled side anyway, a better approach would be to make a chisel with a thick edge, beveled on both sides. Like a curved cold chisel, I suppose.

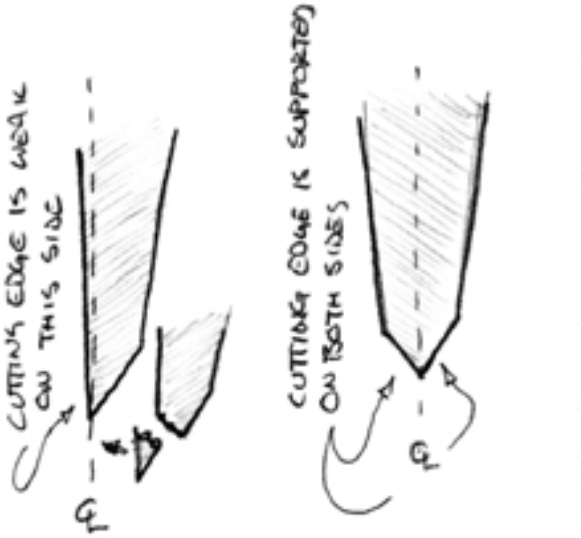
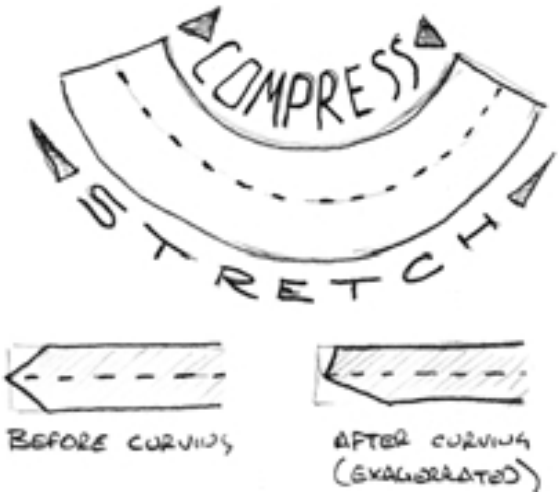


Figure 3–Forging dynamics of small curved chisels

When you start making the smaller curves, things change dramatically. I discovered that the smallest curves are best made by grinding a profile down from solid stock. I figured this out by forging some experimental chisels that had a 3/4" radius. Some interesting things happen when you forge curves this small. The steel on the inside of the radius compresses, and the steel is forced outward toward the cutting edge. Conversely, the steel on the outside of the radius is stretched and shrinks. This pulls the steel away from the cutting edge… take a look at the illustration to see what I'm talking about.

When the bevel is on the inside, it compresses. Its angle increases… that is, it becomes steeper, more like a cold chisel. And the bevel becomes curved as well.

I also discovered something interesting about the cutting edge. If you grind or forge the cutting edge straight across, and then bend it, the corners of the chisel move forward, resulting in a cutting edge that isn't perpendicular to the body of the chisel. You can compensate for this by grinding a slight radius into the edge before you bend it. For some reason, this doesn't seem to be the case if the bevel is on the outside of the curve.



You'll also notice, if you make a chisel this way, that a small depression or hollow forms just behind the blade, where the steel transitions from a blade to the shaft. The reason this happens is that the blade is a slightly conical shape, while the shaft is a cylinder. This little depression bugged me to no end… it just didn't look right. I can minimize it by peening just

behind the blade, but it's always there to some extent.

Whenever I want to figure something like this out, I get out my son's play-dough. I made a few little play-dough chisels, and it looks like it could be forged out, but a special swedge with a flared end might help. (Play-dough, plasticine, or sculptor's wax can also be used for figuring out leaf patterns as well.)

The end result of all this is that you'll have to do some grinding no matter what you do. Grinding is inevitable, because you can't harden and temper a sharp cutting edge… the carbon burns out of the very tip of the edge, which is where you need it most.

Obviously, outside bevels are easier to grind than inside bevels… especially on tiny chisels. Gary tells me that the best way to do this is with a die grinder or a small stone mounted in a drill press.

Another option would be buying a 1/2" grinding wheel and dressing the edge round, and using this to grind your inside bevels.

Start by forging the end square or slightly rectangular, depending on the size of your curve. Grind the inside curve, and remember to keep it circular. Next grind the outside curve, leaving about an eighth of an inch at the edge. Harden and temper, and then grind the bevel either on the inside or the outside, depending on your needs. I suppose you could grind a bevel on both sides if you wanted.

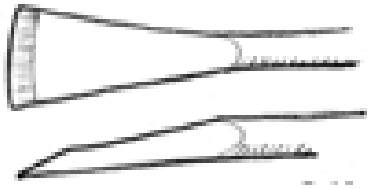
As far as hardening and tempering goes, I'm still experimenting to find the best practical combination. A friend, Gary Scasbrick, has done a bit of work in this area. He tells me that for cold-cutting chisels, 5160 works great. Scrap coil springs are a good source for this.

If you make tools from coil springs, you need to watch out for cracks in the steel. These usually don't show up until you've gone to the trouble of straightening a length of spring, but if you find cracks, throw the whole spring away.

The cracks are a result of the steel work-hardening over the years, and are a clear indicator of steel that is about to fail completely. Even if you did find a section where you didn't see any cracks, a tool made from that section would likely break in use, possibly hurting someone in the process. Don't take chances in the shop!

The good news is that springs are often replaced due to sagging and bending rather than breaking. These springs aren't any good for holding up a car, but they'll still make passable tools.

The way Gary hardens and tempers these is by heating to nonmagnetic, hardening in oil. Gary says that tempering heat should be applied slowly to soak all the way through or the surface of the tool will show the proper tempering color while the core is still too hard. He got into too much trouble tempering tools in his kitchen, so he has an old oven in his shop. The entire tool is heated until a deep straw/bronze color is show-



For an inside bevel, blade should be fairly flat

If you leave the cutting edge straight..

The tips will be thrown forward.(this doesn't seem to happen if the bevel is on the other side)

After forging bevel will steepen and curve

ing, then he turns the oven off and lets the tool cool down slowly. The thermostats on ovens are notoriously inaccurate. To help judge the temperature, Gary drilled a hole through the side and installed a dial type cooking thermometer, but as he says, don't try this at home. If you are using an oven to temper, try soaking the tool at 50 degrees cooler than you want, and then slowly increase the temperature until the color you're looking for arrives on the tool. Often, you won't have to increase the temperature very much. A tool tempered this way seems to get the proper color at a lower temperature than it should. Remember to temper by the color on the tool, not the number on a thermometer.

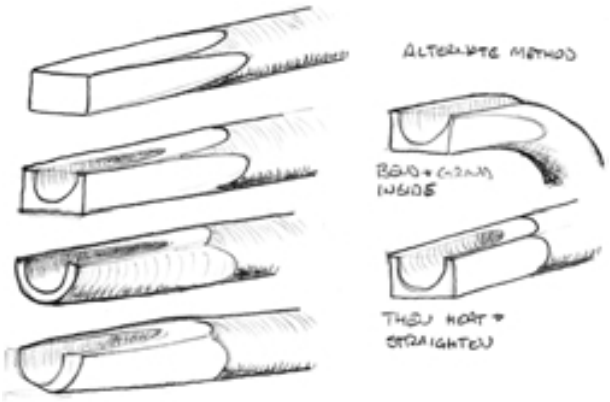


Figure 4–Grinding chisels

I've seen Gary's chisels that he's made using this method, and he's gotten excellent results. Gary's curved chisels were used to make three holly candleholders, and they are still VERY sharp, with no cracking evident at the cutting edge. By contrast, one of the chisels I made (before I spoke with Gary) I tempered in the fire to a light straw. It cut well, but a missed hit on the last cut destroyed the chisel. The entire cutting edge broke off, showing large crystalline- grain growth.

For hot cutting tools, Gary tells me that he's been really pleased with tools made from from a red-heat tolerant steel, like H-13. "I've made a lot of tools and seen a lot of tools made from regular carbon steel. They all work OK, but they can't hold a candle to a tool made from one of these air-hardening steels. I've been using H-13 lately… it is trickier to forge, but when you're done, you've got a tool that works a lot better. If the old smiths had access to red-heat tolerant steels, they would have used it." Frank Turley agrees with Gary. He likes S-7, and gave a demonstration at the 1999 Madison conference on forging it. A curved chisel made by grinding might be fairly straightforward to make, but I haven't tried this yet. Forging tools from H-13 or S-7 is an article in itself… I'll see if I can't get my hands on some and give it a try for a future issue.

Don't forget the other end of the chisel. It should be ground to a dome shape so that any strike with the hammer is directed at the very center of the tool. The corners of the head should be ground off at 45 degrees to minimize spalling or "mushrooming" of the head.

The hammered end of a chisel should never be hardened. Weygers says in "The Making of Tools" (Van Nostrand, 1973) that this is an option "to keep the steel from 'cauliflowering' after long use" but I disagree. Hardened steel should never strike hardened steel. If you do, something is eventually going to crack and fly off. If it's harder than you hammer, then you'll ding up the face, which will in turn ding up your work. In fact, it's not a bad idea to keep a cheap hammer handy to strike tools with, and save your favorite hammer for working hot steel.

SPRING 2000 HAMMER'S BLOW

The One-Brick Forge

Al Bakke, Saskatoon, Canada from his demonstration at ABANA 2012 in Rapid City

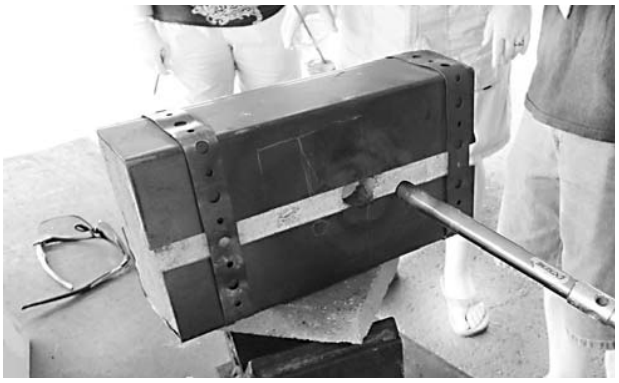
Al Bakke with his one-brick forge

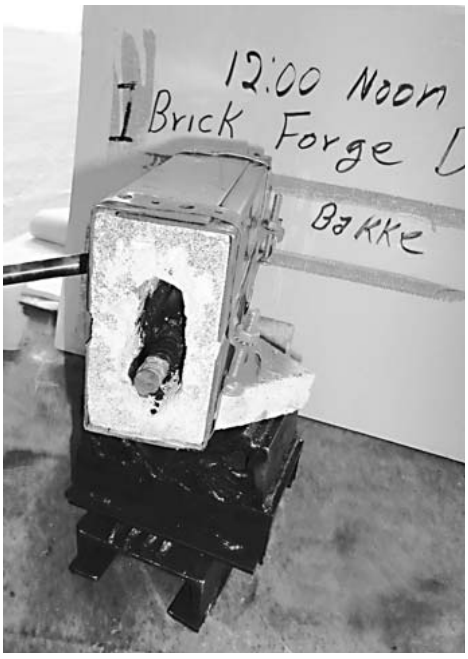
It doesn't get much simpler than this! A one-brick gas forge, capable of producing welding heats. Al Bakke uses this forge to produce small runs of Damascus steel!

At the ABANA conference, Al gave a quick demonstration and a good discussion of his small forge. It's pretty simple: Take a lightweight 9" x 5" x 21 2" fire brick. Hollow it out. Make a hole for the propane torch. Wrap it in a bit of sheet metal to contain everything, and then, go to work.

Use only one brick! Al was adamant that if you used anything larger, there would not be enough heat to obtain a welding heat. The key seems to be to contain the torch output in a small volume, concentrating the heat. The lengthwise hole goes most of the way through the block, stopping about an inch from the end – the hole should be about 1" wide, 21 2" high and about 8" deep. The fire hole is just large enough to admit the nozzle of the propane torch.

Al used a TurboTorch brand torch, a Victor Equipment brand torch designed to give high heats. He said that your hardware store variety propane torch is not hot enough for welding Damascus.





Views of the one-brick forge and torch

Mike Mumford photos

About Al

Al has been an active craftsperson for over 40 years. In addition to blacksmithing and knifemaking, he also does lapidary and wood turning. He looks forward to each day as an opportunity for fun, hoping to end each day with a heart full of giggles from the enjoyment that comes from working with his hands.

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The Ashokan campus is located in Olivebridge, N.Y., several miles west of Kingston, N.Y. The meets are held the first weekend in May and in the first weekend in October every year. The main demonstration is in the blacksmith shop and there is a "Hands On" workshop for beginners. A main demonstrator is brought in for each meet, food and bunk-house style lodging are provided as part of the cost of the weekend long meet.

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