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# Making a Strong Hook Knife

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- Skills and guides - DIY, Making things. -



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## **Description :**

Scott will help explain and show you how to make a hook knife that will keep its razor edge through hardwoods, that is strong enough for two hands, and will not snap.

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**Made with solid knife making techniques. A knife fit for every woodworkers' toolbox. A project one can do at home.**

### Part 1.

Hook, crooked, or bent knives (depending on what part of the world you're in), are exceptionally versatile tools if made well. Carvers, <http://www.robertdavidson.ca>, craftspeople, and woodworkers of every stripe would benefit from having a good sturdy hook in their tool box. I know many who would not be without one, Scott and myself included. A strong hook gets into places nothing else will.



It is the tool for carving wooden bowls and spoons, masks, musical instruments and have been used for aboriginal boat building across North America as a main finishing tool.



First, the steel. Tool steel bought from a supplier is perfectly annealed and easy to work with, or one can recover steel. Scott recovers mill bandsaw blade 30cm wide x 76cm or 12 x 30", or gang saw which is 45cm diameter x 2.5mm or 18 x 1/8 because of its tensile qualities and strength. It is a Swedish steel with a combination of

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molybdenum, chromium, and nickel as well as a high carbon content.



### Smaller hook for carving smaller spoons

When filers (a mill working trade) toss band saw out they cut them up into 120cm or 4' lengths. If you can get some it is well worth using for knife blades, especially for hooks. The exceptional tensile strength of band saw steel lends itself to an excellent edge.



### 30cm (12") mill bandsaw blade.

Scott was taught the harder but more thorough way; filing for shape and hardening and tempering his own blades. Some grinding speeds up the process but one has to be very careful not to burn the steel. The most important factor in making any knife with reclaimed steel, if you're putting your own hardness and temper into it, is the annealing process.



### annealing

For a hook of medium size using sawblade (with any hard high carbon steel the process is the same) cut two pieces (one piece is for hardening and tempering practice) of steel 2cm x 2.5mm x 15cm or 3/4' x 1/8 x 6 . For this step you will need to set up some kind of small brick structure or get some ceramic wool and fashion an alcove or cave. Better yet use both. With a propane torch you'll be able to reach a cherry red and of course have a bucket of water beside you. Be careful. Sitting the two pieces inside of the structure, slowly over 5 or 6 minutes bring the two lengths of steel to a cherry red, not letting it get any hotter or you'll damage the steel, and let it sit at that colour for at least 10 minutes (20 is ideal). Place the cherry red steel into a large coffee can with a lid filled with wood ash or slaked lime, or wrap the steel in the ceramic wool, insulation that completely envelopes the cherry red steel. Let it cool slowly overnight. In the morning you should be able to bend the steel with your fingers.



### Blocking up my forge

Annealing relaxes the carbon molecules. It can now be filed, drilled, sanded and bent...

Now you have two pieces 2.5mm x 2cm x 15cm or 1/8" x 3/4" x 6" long and annealed. Put one aside for now. It will come up later for a practice run of hardening and tempering. Whatever size of blade, it should have the same proportions as above. If, for instance, it is 1.25mm or 1/16" steel, it will be half the length and width of blade as the 2.5mm or 1/8" thick steel. The handle end (the tang) should not be less than 5cm or 2" long. With this idea you can build very small, 1.25mm or 1/16" hooks, 2.5cm or 1" long, beautiful for detail. Smaller hooks require a slightly different process. Dedicate the nicest side, the side with no nicks or scratches, as the back. Then designate one end as the tip end. Draw a line across the middle of the blade. Now there is a back and top and 7.5cm or 3" of tang and 7.5cm or 3" of blade. Now draw a line lengthwise right down the centre of the blade, from end to end. The two lines will cross in the centre of the blade. On the tang, 2.5cm or 1" down from the centre cross line, mark your first bolt hole on the length line, then mark a hole point 1.25cm or 1/2" from the end of the tang, on the centre length line. From the tip end, draw 2 lines, one on either side of the end to end centre line, creating an isosceles triangle to the cross centre line. On the equal sides of the triangle, draw slow curves, using the lines as guides, for the cutting edges. Now grind to the curved lines. Keep the steel cool dipping it into a can of water as the steel heats up.



## Part 2 Setting and putting a double bevel on your hook blade.

You now have a roughed out, annealed blade, holes drilled, medium sized hook blade or a hook blade relative to this size. Set the tang into a handle now so that working on the blade will be easier. Cut a block of hardwood 3.75cm x 4.5cm x 28cm or 1 1/2" x 1 3/4" x 11". Scott prefers cherry or yew for his tool handles.

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This will end up being a well balanced handle capable of fitting one and two hands comfortably. On a 4.5cm or 1 3/4" side and on one end, mark off 2cm or 3/4". From there draw a line at 15 degrees, taking off the corner (see picture). Make sure the new surface is flat and true. File the sides of the blade tangs so they're true. Place your blade on the new surface face down, the tang centred and 2.5mm or 1/8" below the cross line. Outline the tang tight with a sharp pencil. Carve the tang into the block so that the tang is sunk 1.25mm or 1/16" below the surface of the block. You want it to be a perfect fit with depth forgiveness for later when you'll finish the handle. Mark your holes through the tang onto the wood. Drill 2.5cm or 1/8" diameter holes straight through the block. Place your tang into the block. Slip in two 3.75cm or 1 1/2", #6 stainless bolts and snug the blade and handle together with square nuts to make sure it fits.

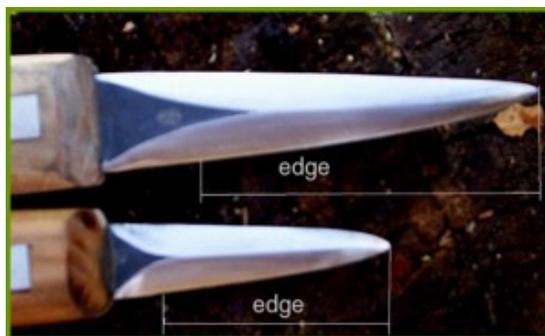


You can shape the block into a handle using these pictures as a guide after the blade is finished and ready to mount but you want this point of completion for the shaping process.

This style of hook knife is strong. It is a double bevelled straight knife with a sturdy hook. The annealed roughed out blade for the hook knife is now ready for the edges to be put on. Putting a double bevel on the blade will be making a mirror image of itself. This technique and the one to follow, in part 5, depends on how well the steel is annealed. Put the blade in a vise securely with the top up. Draw a line down the blade centre and across, mirroring the lines on the back. You'll need files: a coarse bastard to a fine mill. File strokes are important. The idea is to file an edge bevelled to the centre line, from the tip of the blade to the cross line. To leave the blade with a gentle curve up and off 3/4 of the way along, gently drop the outside end of the file and lift up and off for the last 1/4 to the cross line.



There should end up being filed cutting edges on both sides of the centre line (mirroring each other) 3/4 of the way down the blade, then a curve off at the cross line for the last 1/4. You might want to draw some secondary lines. Take a look at the picture. Then repeat the technique with a gradation of files. Use a series of six 2.5cm x 3.75cm x 30.5cm or 1" x 1 1/2" x 12" sticks, each squared on a sander for good corners. Scott wraps each with a sheet of no-fill sandpaper starting with 100 grit to 1000. Wrap the sheets tight and staple on an edge. Staple two ends and the middle. Using the sanding sticks like files, finish the blade. When that is complete, sharpen the bevelled side edges only (top side) on a stone. Sharpen the blade to a razor edge, just taking the burr off the back. Don't worry about the wire edge, not until it is hardened.



### Part 3. Putting a hook on your blade.

The success of this step really depends on how well the steel is annealed. The steel won't bend if it's not annealed, or will be stiff which is when there is the risk of fracturing or breaking the blade. Set the tang into the handle, slide in the bolts, screw on the square nuts finger tight and then give it a 1/4 turn with a wrench. For this hook use a 3cm dia.x 30.5cm or 1 1/4" x 12" piece of hardwood dowel secured in a vise. Square the dowel on 2 opposite sides where it sits in your vise. For smaller hooks use smaller diameter dowel down to 1.25cm or 1/2" then you can use steel rod (eg.drill bits) for smaller hooks. There is another method for even smaller hooks and micro hooks that will be discussed later.



Place the tip of the blade on the dowel parallel to the floor. Using a small wooden mallet, begin to shape the hook with even, rapid taps, bending it evenly around the dowel. Start softly, strengthening your taps until the steel begins to give. As the blade bends around, feed more blade to the mallet. Make sure the mallet taps are square on the blade; otherwise the razor edge will get bent, creating much more work. There are as many variations of hook shapes and sizes as you can imagine. A tool one could make custom for the job at hand. At this point the blade is sharp and very soft, and ready to be hardened and tempered.

## Part 4 Hardening

While the blade is still in the handle, hone it as sharp as possible. Wrap a sheet of 600 grit wet/dry sand paper around a piece of dowel (eg.30.5cm or 12 of broomstick) to clean off the burr in the hook. If there is any damage to the edge and for sharpening the hook after it is hard, make two more dowel sanding sticks with 360 and 240 grit. Use dowel sanding sticks for the inside of the hook and straight sanding sticks for the back (cone and flat stone are great to use). Once the hook is hardened and tempered it will be sharpened from the inside and only the burr would be removed from the back. For the hardening process you will need a coffee can (or something that holds at least 750ml) 2/3's filled with olive or canola oil warmed to body temperature, a propane torch set into a small bucket of sand for stability and safety, a pair of vise grips, and of course goggles and gloves. Have the can with oil and the torch in sand beside each other on a table free of any obstacles. If you're right handed have the torch on the left and the oil on the right. If you're left do it with the torch to the right of the oil. This way when you have your hook at the right colour you can quickly douse it in the oil without burning yourself or losing the temperature. Take the blade out of the handle and place the end of the tang securely in the pair of vise grips. Always be aware of the razor sharp, thin, soft edge. Warm the oil in the can to body temperature. Japanese sword smiths apparently achieved this temperature in the stomachs of slaves. An old timer told us his father would use fresh urine... from a cow. Use canola for the deep fried chicken aroma after dousing. Now you have the vise grip in hand, end of the tang in the vise grips, torch on med. high and secured so it will not move. Do a practice run smoothly and quickly from the flame to where it would land into the centre of the oil can, like a perfect dive, not touching the sides or bottom of the can with the blade (and don't go into the oil yet). You want to achieve an even cherry red in the blade. Now trade your hook for the second piece of steel you annealed. Clean it so that it's bright. Start passing the steel over the flame. Remember the cutting edges are thin and so is the tip on the hook blade so when passing the steel over the flame spend more time on the thicker section in the middle of the blade. Move quickly through the flame creating a circular motion along the blade into the tang at least 3 or 4cm or 1 to 1 1/4" in and out of the flame. Parts will begin to turn colour, straw, dark straw, purple, blue, blue green then shadows will pass over the blade as it begins to glow. Keep passing the steel through smoothly, constantly evening out the colour. At this point the tip and thin edges are vulnerable (letting it get too hot ie. glowing orange means you're burning out carbon. At yellow you're ruining the metal and it is distorting). This situation happens very quickly. Watch that tip closely. When it passes into a pie-cherry red evenly across and from tip to tang, get ready, and in one smooth motion douse it into the oil. Wiggle the steel, stir (the best way is tapping the vise grips against the sides of the can), always keeping the steel submerged. Slow down, gently stirring until the steel can be handled. If you don't get it don't worry. Wipe your steel and do this process again. To test if you have got your hardness, take an older file and pass it over the steel. If it skates, it is hard. If it grabs, it is not. If you're

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confident, harden the hook blade. You might get 1 or 2 extra tries. After that your edge will be distorted so you'll have to anneal again and put the shape and edge back on. The blade right now is as brittle as glass. Now it is ready to be tempered. Wipe off the blade and clean the tang bright.



Aki carving a spoon

## Part 5 Tempering a Hook Knife.

If you make the mistake of drawing too much hardness out it can be corrected. The blade would have to be re-hardened so the last step would have to be repeated. You don't want to do this because there would be a good chance of damaging your blade. The main points are patience and easy does it. Practice first with the second piece. Clean the tang and the back of the blade to show the brightness of the steel. Temper in two stages. First, place your piece, tip down, making sure you have a clear view of the brightness of the steel, temper the whole blade and tang the same; a straw colour in your oven at 240C or 460F for 10 minutes if your oven thermometer is accurate. It is best if you're unsure to check the colour by very quickly cracking open your oven door and looking at the blade colour every 5 minutes or so (do this with goggles on or you will lose your eye lashes). When it reaches a straw colour, douse it in a litre of room temperature water. Though lumber mill band saw steel has tensile strength built into it, the tip of the hook blade is vulnerable to breaking and, of course, it should still be hard enough to keep a sharp point and edge. Taking a touch more hardness out of the tip and blending down into the blade a couple of cm. can give just enough forgiveness to avoid losing the hook tip. It is very easy to burn the tip so be careful. One does not want the tip beyond a dark straw. To strengthen the hook tip go back with a propane torch to take more hardness out of the tip. This technique is called differentially tempering. By passing 10cm or 5" or so away from the tip down the hook 3 or 4 cm, keeping your distance and then circling around to the tip you'll create a motion at a steady pace watching intently at the colour. The minute it begins to turn, quickly douse it into the water. It is always advisable to take some hardness away from the tang to assure the blade won't snap at the handle. This can be done on a stove element. On maximum, place 3/4 of your tang onto the grill. As the colour goes into blue hold your blade with an oven mitt and douse the tang into the water.

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Scott's tempering process is tricky. It took a lot of time, experimenting and effort to perfect but the temper in our hook knives will allow one to carve hardwoods like crabapple, maple, oak and his favourite cherry without losing the knives' razor edge or snapping or permanently bending the fine point off the hook which every commercially bought hook, bent and crooked knife will with a little bit of torque. This process allows us to put longer handles on our knives for the greater control and power of two hands, especially when carving larger projects. One can scribe deeper lines without the threat of losing the knife's edge or snapping the point.

