

“WRABA Tips and Techniques”

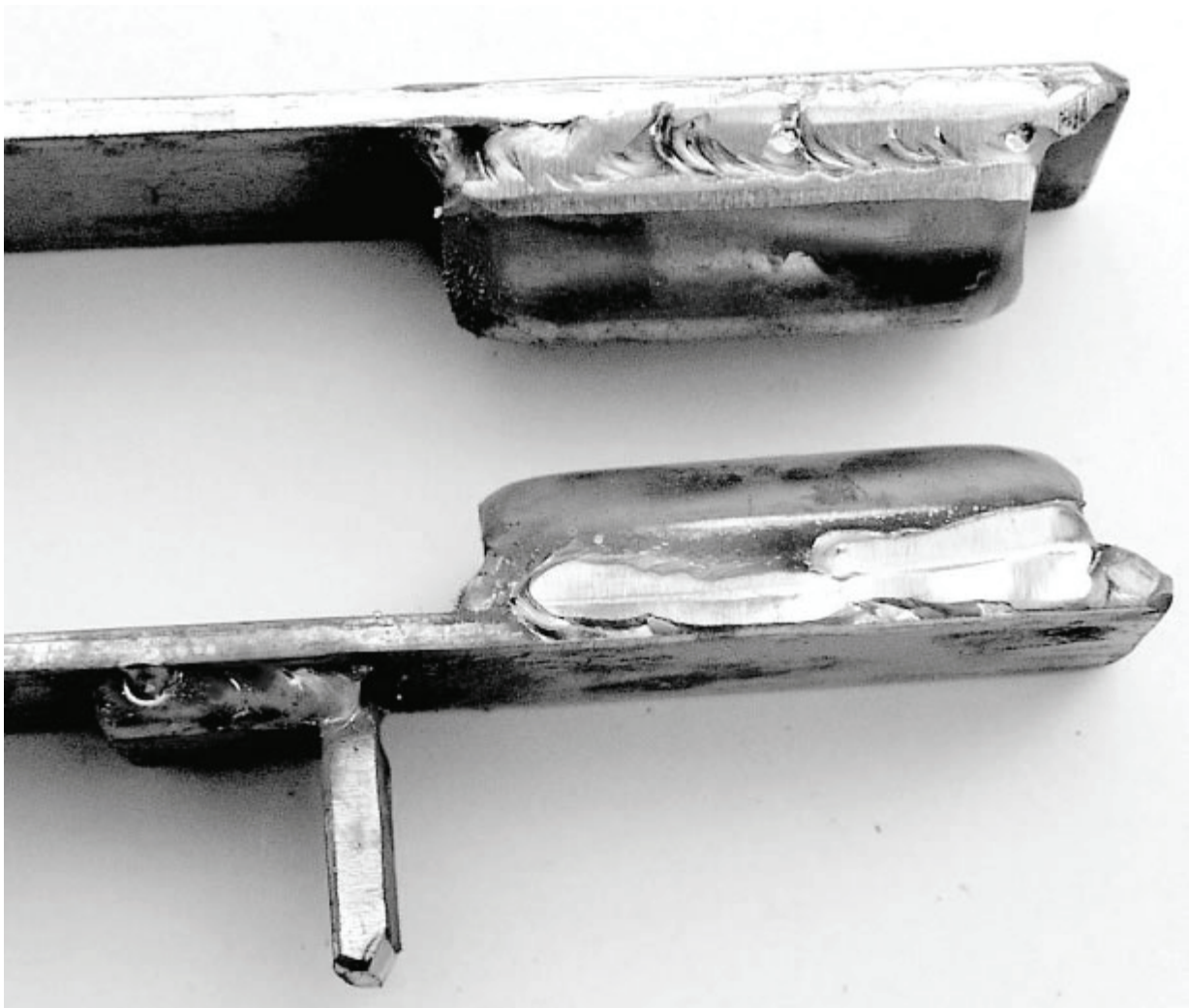


Issue 4 2009

This is a yearly collection of newsletter tips and techniques originally published in other affiliates newsletters

Tire Hammer tools

Also great for treadle hammer or hand anvil use



Spencer

Tools for Tire Hammer

Steels used are mild steel, jackhammer bits, several diameters of spring (5160), 4140 and H-13. The jackhammer bits I have used are high carbon similar to W-1 and therefore are heated to critical temperature, above magnetic range and quenched in water, then tempered at 400 to 500°F. Other bits may be oil hardening. The spring is heated above critical and quenched in oil, then tempered at 400 to 500°F. 4140 is heated to 1200°F, held for several minutes, raised to 1575°F, held for 30 minutes then quenched in oil, cooled to below 200°F and above 100°F, then tempered at 400 to 500°F. H-13 may be heated to 1000°F and air cooled after forging. For welding use low hydrogen rod or MIG, preheat jack hammer, spring and 4140 to 400°F minimum and H-13 should be heated to 1000°F. Parts may be heat treated before welding or after. Handles The handle may be 5/16" diameter round mild steel bent to a U shape and twisted or forged from 1/4" x 1" flat bar mild steel, 8" to 12" long. Self-handled tools are where the handle is drawn out of the stock from which the tool is made. After a handle is welded on the end of a tool, the weld area and about 1" of the handle should be heated to red and allowed to air cool to relieve any stresses from the welding, cool the tool in water to prevent heating above the tempering temperature. **Tool Holder Angle** A small angle, 1/4" thick x 1" wide, 1 1/4" legs is welded to bottom of the 1/4" x 1" so that it may be clamped to the bottom die with the tool clamp. **Narrow Spring for Fullers, Closed Dies or Swages** The 1/4" x 1" is bent to a U so that the two rounds are aligned. A small angle, 1/4" thick x 1" wide is welded to bottom of the 1/4" x 1" so that it may be clamped to the bottom die with the tool clamp. **Wide Spring for Dies** The spring is 3/16" x 2" mild steel, 32" long bent to a U shape. Dies are welded inside the U very close to the ends, Grind a bevel on the ends of the die/swage stock so there is not a sharp edge on ends of the die. Do not weld across the spring, weld along the sides of the die stock.

Wide spring for dies This simple tool is a piece of flat spring steel with a handle and is used with flat dies to make half on/ half-off blows. The spring should be at least 3" x 3" x 3/8" and could be somewhat larger. Does not require quenching/tempering. Place the stock on top of the bottom die exactly where you want to make a shoulder (near or off side) and place the flatter centered over the stock and hammer until the shoulder is deep enough. **Bottom Round Swage** This tool is used to make a fuller/flatter or drawing dies. It is about 2" x 3" with a 2" to 3" diameter hollow in the top. Minimum thickness is 5/8". May be made from mild steel, does not require quenching/tempering. Place the heated stock (usually round) in the swage and hammer it down.

Move it back and forth to keep it even. Reheat, remove the swage and true up the ends. Repeat first and second steps until shape is finished always finishing in the swage. **Tool Clamp** This tool wraps around the bottom die and clamps spring swages, fullers and other tools to the die. A 1/2"-13 nut is welded to the 1/4" x 1" wrap around strap and a bolt with a 3/8" x 6" long cross bar is welded across the bolt head.

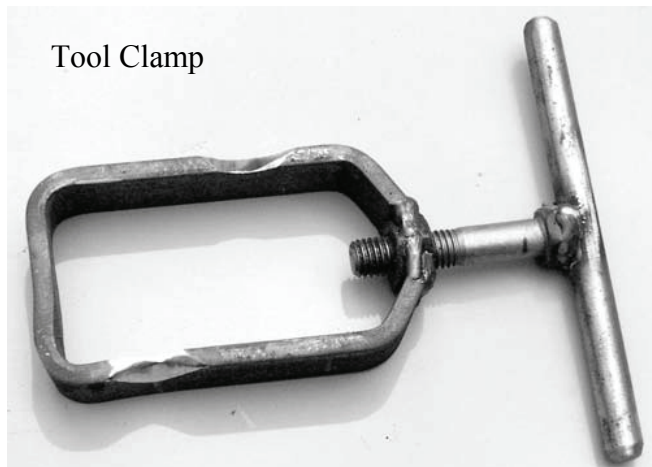
Tool for half on /half off blows



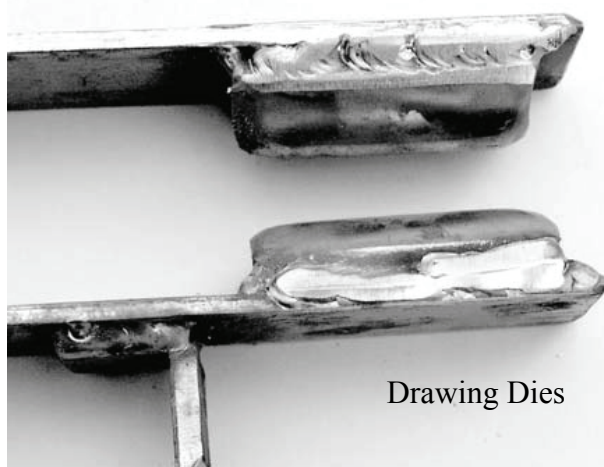
Bottom
Round
Swage



Tool Clamp

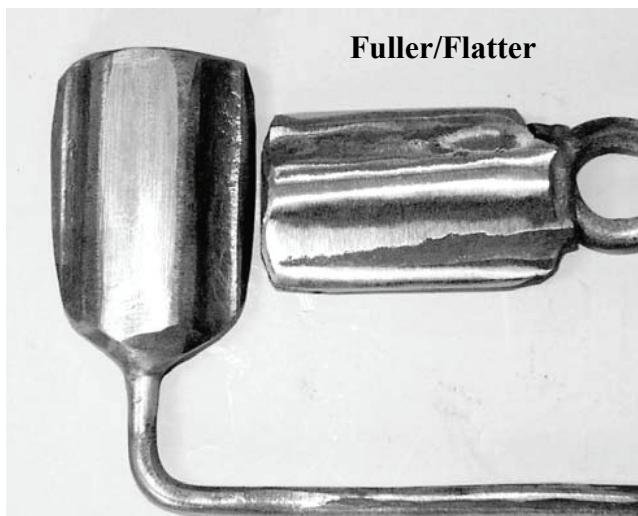


Drawing Dies



You may have to use a 10" length of 1/2" pipe to get additional clamping force. **Fuller/Flatter**, A Fuller/Flatter is flat on one side and round on other side with handle welded to one end. Tool steel such as spring, axle, jack hammer or 4130 should be quenched and tempered. About 2" wide x 2"-3" long x 1/2" to 3/4" thick. This hand held tool may be used as a fuller or flatter with flat dies but is most useful to smooth steps formed by drawing tapers with the front edges of flat dies. One side of the taper is held down on the bottom flat die while the flat of the Fuller/Flatter is held on top of the taper. The round side self adjusts to the slope of the taper. Work all tapered sides. **Drawing Dies** Rounded dies welded to 3/16" x 2" mild steel, 32" long is one way to make drawing stock easier on a hammer with flat dies. Tool steel such as spring, axle, jack hammer or 4130 should be quenched and tempered. About 2" wide x 2"-3" long x 1/2" to 3/4" thick. A small

Fuller/Flatter



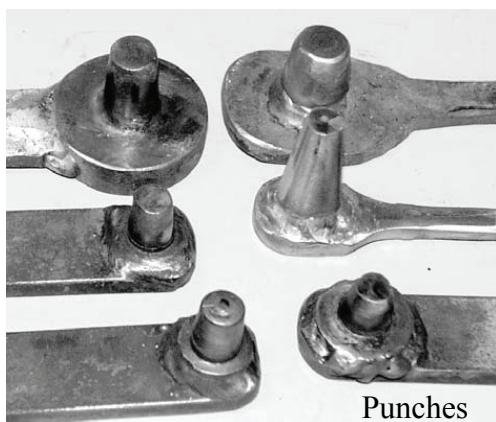
angle is welded to bottom of 3/16" x 2" so that it may be clamped to the bottom die with the tool clamp. You can make a separate set of bolt on drawing dies using large spring or axle to replace the flat dies. Another idea is to incorporate a tool clamp with the spring drawing dies. This tool makes drawing a smooth taper much faster and easier. It is better to pull the stock toward you. If you push it thru the dies it bends up or down. Pull thru, rotate and pull thru. After experience you may be able to rotate 1/4 turn back and forth between each hammer blow. Watch out for stock twisting to go on the diamond, correct by hammering on long diagonal before stock gets too small. After stock is drawn down

to near correct side it is easier to even out, square or round up using the flat dies. **Round Spring Fuller**, 3/4" (3/8", 1/2", 5/8" and 1" diameters are useful) Two 3" lengths of 3/4" round spring or W-1 are welded to a 32" length of 1/4" x 1" mild steel. If you insist on hitting cold metal then quench and temper the fullers. Use this fuller to make decorative fullers or neck down stock, isolate a section of stock, reduce size in a small area. May be used on two or four sides

Round Spring Fuller

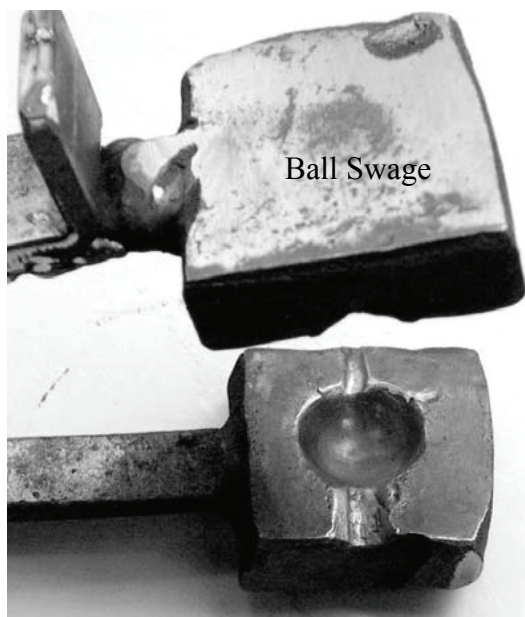


Punch, bolster plate Punches could be any of the tool steels, but I prefer high carbon steels that may be cooled in water. H-13 is best for hot cutting but will upset if hit too hard. Taper and grind to the punch size desired (keep as short as possible) then cool and saw off. Tack weld to a paddle handle made from 1/4" x 1" mild steel. Preheat and weld, grind weld smooth. Heat treat or not, if you do never let the end of the punch get hotter than 500°F. A bolster or punch plate may be 1/2" x 1 1/2" mild steel with several diameter holes drilled or punched in it. Mark location of hole with heavy center punch, heat metal, locate punch and make a light blow and check location. Correct if necessary and strike a couple of blows, cool W-1 punch in water and place a small bit of coal in the hole. Drive punch about 7/8 of way thru stock, cooling punch every 3 or 4 blows. Turn stock over, place over appropriate size hole in bolster and drive slug out. You may use a longer larger punch over a taller bolster to enlarge the hole. Use a bob punch on both sides to smooth out edges of the hole. **Ball Swage**, 1" diameter This closed



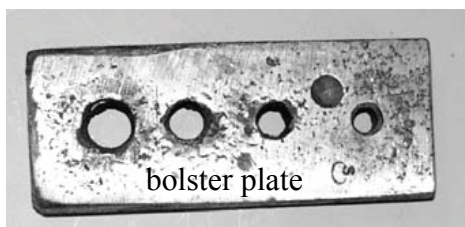
Punches

die will form a ball on the end of a piece of stock, 1" round or square. Mild steel may be used for a limited use swage or tool steel for high use swage. Cut two pieces of stock, 2" x 2" (or 2" round) x 3/4" thick. Mark the center and drill a 1/2" diameter hole 3/8" deep on center. Weld swage blocks to spring with a ball clamped between the blocks. Heat the swage blocks to an orange color, place a 1" diameter ball bearing in the center and hammer the



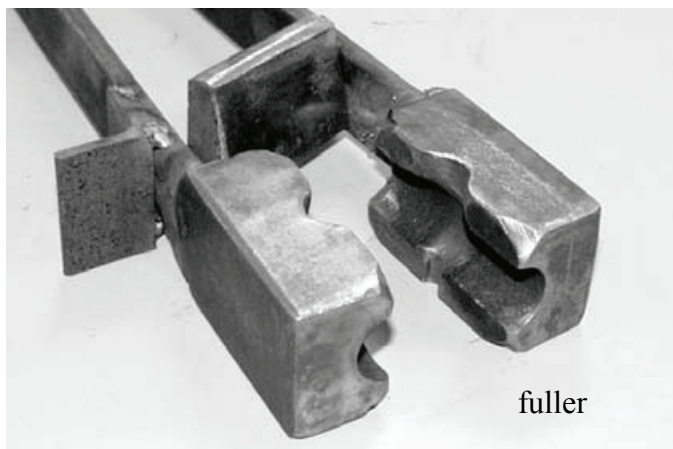
Ball Swage

swage closed. If you can detect any difference in the color of swage blocks, start with hottest swage on the bottom. After 3 or 4 blows turn the swage upside down. Continue hammering, turning over, reheating as necessary until swage blocks are closed over ball. Reheat and place 3/8" diameter round rod between blocks pointing to the center and hammer to form a channel for the stem. Bend spring open and use a die grinder to relieve edges of ball and stem depression. Grind a minimum of 1/4" around the ball depressions and 1/8" along the stem. Grind smooth transition from ball to stem. If necessary, reheat and place ball in swage and refine the swage. To realign the swage, heat several inches of the U at the bend and a clamp a ball in the swage until the spring cools. Another way to make a ball swage is to tack weld



bolster plate

two swage blocks together then center punch one end and drill a hole on the center line of the blocks all the way thru. This hole should be the desired diameter of the ball. On one side drill a smaller hole for the stem to the center. As above relieve The edges of the stem hole but not the ball hole. By rotating the stock you can forge a ball. For any ball die it is recommended to make a **fuller**, 4 sides, to isolate the stock for the ball. Try to get just a little more stock than will be needed to make a full ball.



fuller

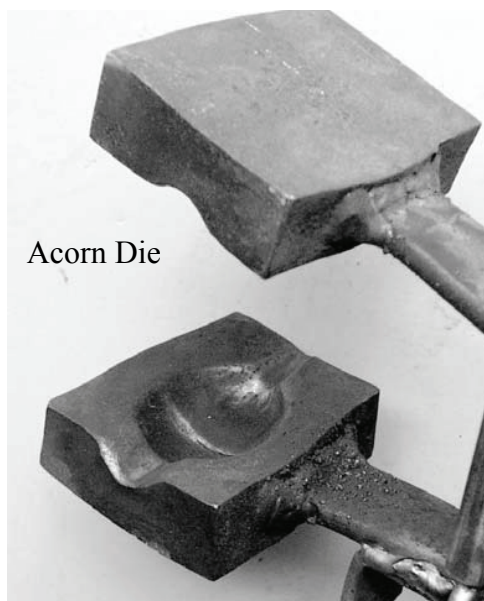
Then rotate every hammer blow until you hear the dies closing. Depending on size of stock and how cool the swage is, it may take several heats to forge a perfect ball. If the ball is rough shaped you are probably not down to finished diameter. Wire brush the scale off the stock before putting it into the die. Keep the die clean of scale and oil the depression. **Acorn Die** This swage or closed die is very similar to a large ball swage. You must have an acorn shape to make the swage using 2 steel blocks about 2" x 2" by at least 3/4" thick. This can be spring steel, mild steel or axle, heat treat not required. Weld the blocks to a spring handle, heat and center the acorn in between the blocks and forge locks closed. It may take more than one heat. Rotate the acorn. Remove scale from blocks and acorn. Lubricate the swage with a few drops of oil. Relieve the edges around the acorn and stem on both blocks, this is easier if you open the spring. Heat the spring and bend back to original shape, put an

acorn between the blocks and clamp together until the spring is cold. To forge an acorn, select a diameter of stock that will fill the swage, determine the length of stock needed (by test) and neck down the stock with fullers. Heat the stock, remove scale and forge in the die. Rotate stock continuously. Reheat, remove scale and continue forging as necessary. **Ball Tool**, handled Preheat the ball to at least 400°F. Weld the ball on the center of the paddle of a paddle handle. No heat treat required. Do NOT allow ball to be hit with hammer die or you will have a permanent dent. This tool is used for decorations or depressions for any reason. Along the stock edge, have the center of the ball inside the stock edge or it will glance off. **Hack/Snapper Hack**: Heat a 2 1/2" length of 3/4" round H-13 and forge a taper edgewise on edge of flat dies to 5/16" at top x 1" wide x 3/16" wide at bottom x 2 1/2" long.

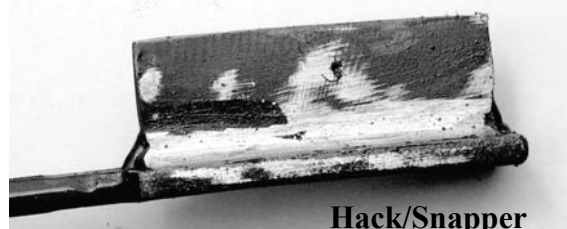
Grind flat and square with sharp edges. Preheat to 1000°F and weld to center of a paddle handle. **Snapper**: Heat a 6" length of 3/4" round spring and forge a flat handle on one end and a 3/8" x 1/2" rectangle on other end. Draw out center to about 5/16" round. Grind the rectangle square and flat. A one piece hack/snapper may be forged from one piece of spring steel or H-13.



Ball Tools



Acorn Die



Hack/Snapper
Hack



. Snapper



This tool is used to hack off a section of stock and it requires skill and experience to do more than a hack job. Cut 3/4 of the way thru with the hack then rotate the stock 180° and place the snapper exactly over the cut made by the hack and hopefully knock out the slug cleanly. Be careful that the stock does not fly out and hurt someone. Sometimes you can use the snapper to part off the slug remaining attached to one or the other of the pieces. Otherwise you can grind it off. The shape of round stock will be better preserved if you support

the round with a shallow bottom swage or V block. In any case the stock will be somewhat mangled and will require some cleanup forging. If a smooth cut is desired then try a cut off tool described below. **V-Block** Cut a 3" length of 1 1/2" diameter spring or axle. Heat and forge to a rectangular block about 2" x 2 1/2" x 1 1/2" (or close). Mark the crosswise center of the long top by forging or grinding a shallow groove. Reheat and forge a 1/2" deep groove, then drive a V shape tool or square stock into the block, about 3/4" or more. Take another heat and dress the ends by forging. Reheat and refine the V. No heat treat required. A nicer shape V block is made by forging the top of the block about 20% narrower before starting to forge in the V shape. When you drive in the V tool the top of the tool widens out and this compensates for that. You can forge triangular or hexagonal shapes or make bends in flat bar, gentle up to 90° or straighten stock. **Radical Drawing Dies** Saw two sections of 1" diameter coil spring about 2 1/2" long. Saw or grind a flat bottom on inside of the spring. Heat treat and weld to narrow spring. 1 1/2" diameter coil spring may be used. These dies have a small, elongated contact area so they are like a heavy ball peen or a heavy narrow

cross peen. Lot of force on a small area moves the metal quickly to each side. They are great for leaves or making really wide shapes and can pinch out a spot on an edge. Another version of these dies uses a **domed round die** on each side.

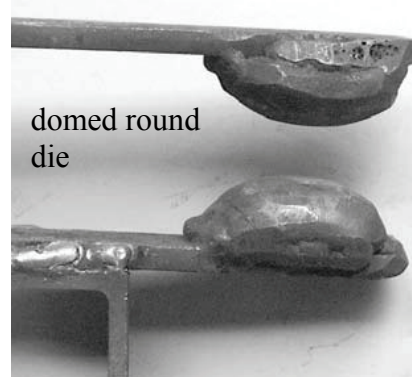


V-Block

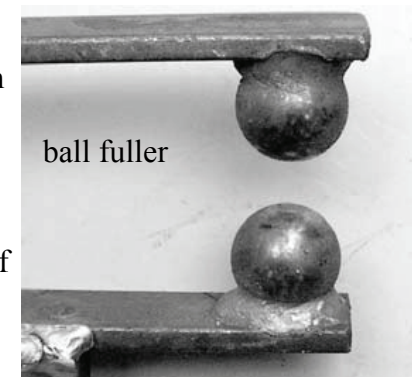
It forges like a heavy ball peen hammer. And then there is the **ball fuller** using two 1" diameter ball bearings (or round heads of railroad track bolts) on a narrow spring. These are the tool for making noses on rail spike faces or wizard heads. **Tenon Swage**, 3/8" diameter (also 5/16" and 1/2") and **Monkey Tool** Cut two matching pieces of 4140, axle, spring or jack hammer bit, 1" wide, 5/8" - 3/4" thick x 3 1/2" long. Clamp two pieces together with a business card between pieces. Tack weld the two pieces together. Center punch for five 3/8" diameter holes at 1/2", 1", 1 3/4", 2 1/2" and 3" from one end. Pilot drill 3/16", then drill 3/8". Separate the pieces by grinding the welds. By grinding/filing/milling, remove the metal between the pairs of holes to the depth of the holes. On one of the rectangular holes, grind/file/mill a slope from the front to the rear, 1/2" deep on both pieces at the rear. Widen the slot at the front to 5/8". Heat treat, clamp parts together with a 3/8" bolt or rivet in the center hole and weld to narrow spring. Monkey tool is easiest made from jack hammer bit with a hole through it. Cut a 3" length, Face ends in a lathe or by carefully grinding and checking with a square.



Radical
Drawing
Dies



domed round
die



ball fuller



Tenon Swage

Drill 3/8" hole at least 2 1/2" deep. Drill in a lathe or hold vertical on a drill press. Chamfer the edge of the hole. A 1/4" diameter sighting hole at 2" is handy to be sure your tenon is not sticking too far into the monkey tool. No heat treat required. Some jack hammer steel may be too hard to drill. Heat above critical and cool slowly in ashes or vermiculite to anneal. Make a tenon shoulder stop from a 10" and a 3" length of 3/4" pipe. In the 3" length, drill a 7/16" hole

at the center. Center a 3/8" nut over the hole and weld to the pipe. Weld a 2" length of 3/8" round stock to the head of a 1" long 3/8" bolt head. Mark a spot on the side of stock where you want the shoulder. Position the end of the 10" length of pipe at the mark and set the clamp. Remove the 10" pipe, heat the stock. replace the 10" pipe and place the heated stock in the tapered hole of the tenon swage. Forge the stock down while holding the pipe against the edge of the tenon die and rotating the stock. After taper is forged, move the tenon end to the rectangular, straight hole and

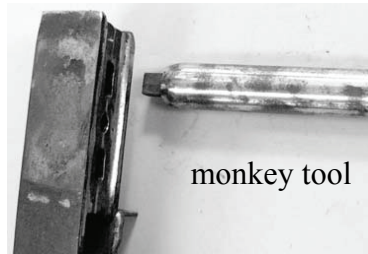


monkey tool



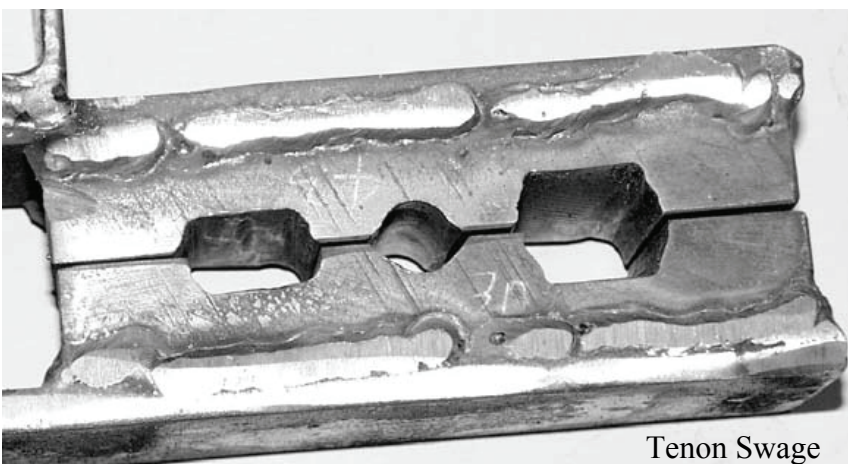
Tenon Swage

forge stock square then rough round. Finally remove the pipe, move the tenon to round hole, rotate the stock and move the tenon in and out if necessary due to the tenon length. In some cases it may be necessary to heat tenon again and reforge to size. Heat the shoulder and tenon and insert the tenon in the monkey tool. Hit the end of the monkey tool and rotate the stock



monkey tool

after each hammer blow. It is critical to forge the tenon shoulder square to the stock, rotating helps very much. Look at the monkey tool and stock to see that all four sides of the stock are parallel to the monkey tool and the stock is straight. **Slitter** for 1/2" diameter hole, H-13 On the end of a length of 3/4" diameter H-13, forge a tapered point about 5/16" thick x 3/4" wide x 1 1/4" long. Grind point to U shape or slightly pointed U with



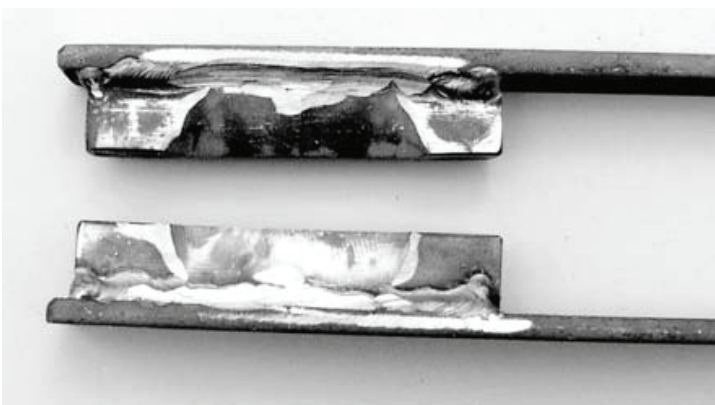
Tenon Swage

sharp edges all around tip and sides. Cool and saw off at 1 1/4" long. Position on paddle handle, inline or square to handle, and tack weld. Heat H-13 to 1000°F and weld to handle. You can heat the H-13 to 1000°F and let air cool or use as is.



Slitter

Cutoff Tool Cut/forged two 3" lengths of H-13 or other tool steel 1/2" thick x 1" wide. Mark a 3/32" wide stripe on the centerline of the 1/2" edge of both pieces and mark crossways at 1/2" from each end. Grind (or mill) a 2" wide slope from the 3/32" line to the base on both sides. Heat treat if required, preheat and weld to narrow

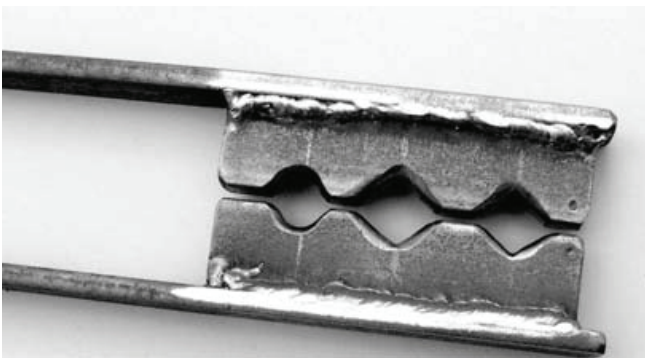


spring. Be sure cutting edges are aligned. Heat steel to be cut to orange, open cutoff tool and position.

Hammer a few blows, rotate the stock, hammer more, rotate, continuing until stock is cut. You may have to twist the two pieces or cool with water to make brittle and break apart. **Pipe Swage, 3/4"** This tool swages a 3/4" black pipe down to a neck to form a candle cup. Cut 2 pieces of 1/2" x 1" about 4" long. Place the 1/2" edges together, clamp and tack weld at the ends.

Center punch at the center of the joint and center punch two other points 3/4" on both sides of the center then drill 3/16" pilot holes at each punch mark. Drill

1/2" thru at the center, drill 13/16" at left mark and 15/16" at right mark. Grind V shapes at left and center positions, largest, deepest at center. Grind/file full radius on all 3 holes. Plug opposite end of pipe, heat the end of the pipe and use a round hammer on the tip of the anvil horn to thin out the end of the pipe and roll it back. Heat pipe, open swage and position pipe in largest V opening. Hammer

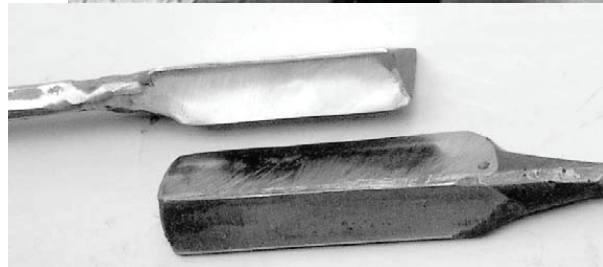


very lightly and rotate pipe after each blow. Move pipe to smaller V and continue. As pipe cools you can hammer harder. Finish in round hole. You can

make two necks about 3/4" apart so that it resembles a ball. You can heat one or both necks with a torch, hammer end of the pipe and hide the necks. **Shoulder Tool or Side Fuller**, handled Forge a 1" square block at least 2" long from H-13 or 4140.

Grind scale off and check squareness. If you have a few of degrees of diamond, that is OK. Set up to cut lengthwise in a vertical band saw with the long diagonal horizontal so that the saw cuts 2 triangles. You want to end up with two pieces with the large angle at 85°. If you forged a perfect square then you will have to grind or mill to get the 85° angle. Heat treat, preheat and weld a paddle handle to one end of the block. Clifton forges his in a V block of appropriate size.

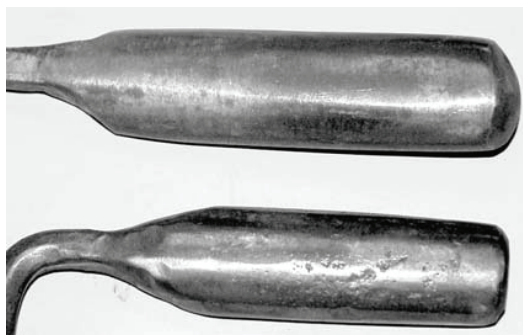
Shoulder Tool, spring This tool has two V blocks welded on a narrow spring handle for cutting shoulders on both sides of stock at one time. If one side does not cut as deep as other, then use a handled tool to cut deeper on shallow side.



Round or Half Round Handled Fullers These are usually made from spring steel or W-1 with a round Handle Forged from the original stock (self handled) or welded on handle. Diameters range from 1 /4" to 2" or 3". Half round are made in a bottom



Round or
Half Round
Handled



round swage. **Texture Tools** These tools forge a pattern on the surface of stock. Most are made from a small square or rectangle of flat spring about 2" x 3" more or less. It is more efficient to make a spring tool to work 2 sides at one time and the flat dies do not mar the opposite side. The most common design is to make a bark design on round stock. Make a series of straight cuts with a hot cut, they may be short, about 1" long or several inches long, straight or slightly angled to each other, very close together or slightly spaced apart. Other designs are closely spaced, narrow grooves made with a thin cut off wheel on an angle grinder or short, wiggly weld beads. You can heat a blank and hammer one of the textured blocks into it to make a complimentary design. If you see a pattern in nature or elsewhere copy the design. Heat the stock to be textured and hammer the design into the metal, rotate stock and repeat. Holding the stock at an angle gives a different effect from holding it straight to the dies. Hammering light is different from

hammering the texture in heavy. Adjustable Guide on tapered **fullering Tool** Two ideas are shown on this tool. One is a **spring handle tapered fullering tool**, (steep angle Requires use on thick stock) makes tapered groove and curves the stock. The other idea is having an adjustable edge guide on a



Texture Tools

round swage. **Texture Tools** These tools forge a pattern on the surface of stock. Most are made from a small square or rectangle of flat spring about 2" x 3" more or less. It is more efficient to make a spring tool to work 2 sides at one time and the flat dies do not mar the opposite side. The most common design is to make a bark design on round stock. Make a series of straight cuts with a hot cut, they may be short, about 1" long or several inches long, straight or slightly angled to each other, very close together or slightly spaced apart. Other designs are closely spaced, narrow grooves made with a thin cut off wheel on an angle grinder or short, wiggly weld beads. You can heat a blank and hammer one of the textured blocks into it to make a complimentary design. If you see a pattern in nature or elsewhere copy the design. Heat the stock to be textured and hammer the design into the metal, rotate stock and repeat. Holding the stock at an angle gives a different effect from holding it straight to the dies. Hammering light is different from



Texture Tools



spring handle tapered fullering tool

spring fuller tool. This allows you to accurately position the tool's Working surface from the edge of the stock. The adjustable guide could be attached to different tools. Tapered fuller could be any of the tool steels and should be quenched and tempered. **Bob Tool** The bob tool is a short round tapered punch. The most frequent use is to forge a short taper on the edge of a punched (or drilled) hole. A blacksmith's countersink or chamfering tool. W-1 is good steel or make from a ball peen hammer by grinding a taper on the side of the ball. Saw off most of the head to reduce the height.



Bob Tool

Set

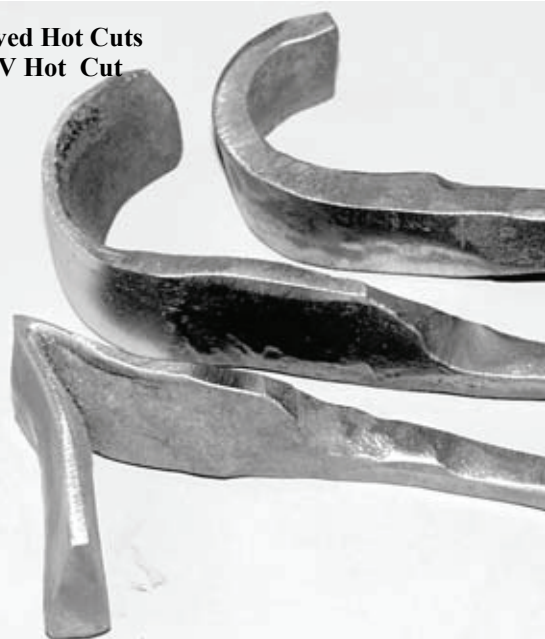


Set This set is very short and has a flat working surface, either round or square and can make a depression in the stock surface or set an edge. W-1 is good steel here. **Cold Cut** This handled tool nicks thin stock for breaking off. Make a V cut in stock about 1/4 to 1/2 way through and break off. Makes a ragged break. W-1 is a good choice for this tool as it can be quenched and tempered very hard. Paddle handle is best for small round stock.

Cold Cut



Curved Hot Cuts
and V Hot Cut



Curved Hot Cuts and V Hot Cut Taper a length of spring or H-13. Similar to a hack, curve or bend it to desired shape. This cutter has a flat cutting edge about 1/8" thick at the working edge so it doesn't cut into the die face. You can draw the handle out of the spring or weld a separate handle to the cutter. You can shape it so that the outside or the inside of the blade makes a straight cut. Make a snapper with the same shape.

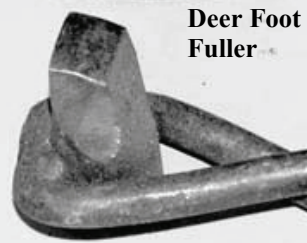
Straight Side Hot Cut This sharp, straight-sided hot cut will make a short cut with a straight side on the off side (away from the handle) and is best made from H-13, can be W-1 if you can remember to cool it in water frequently. Paddle handle is best or small round stock.

Deer Foot Fuller This tapered bottom fuller may be used to slope a surface after it has been cut by a straight-sided hot cut. This makes the adjacent material appear to stand above the fullered material. W-1 or spring works well with a paddle handle. Quench and temper. **Collar Grooving Tools** These 2" x 3" x 3/8" thick blocks of spring steel have 2 or 3 grooves made by 1/4" round stock. Weld a paddle handle on the side or end. Bend a length of 1/4" round once or twice so the rounds are side by side. Heat the spring steel and drive the round stock into the spring. Run your collar stock through the block several times lightly and overlapping to make one or two grooves. **Square Fullers or Blocks** These are square blocks of mild steel 2" to 3" long with a round handle welded on one end. Usually a radius is ground on one or more corners.

Not heat treated. May be used to make a shoulder as in making a shoulder for tongs or as a set after a shoulder has been cut with a hot cut. If you have a section that is too narrow for the dies you can fuller with this. Set on the diamond it can be driven into stock to make a V depression or V block.

Square and Slot Punches These square and rectangular (maybe with rounded ends) punch square holes or slots in stock. W-1 (keep it cool with water) or H-13 (cool in wax or oil) are good. After a depression is made, put a small bit of coal or coal dust in the hole for lubrication and cooling

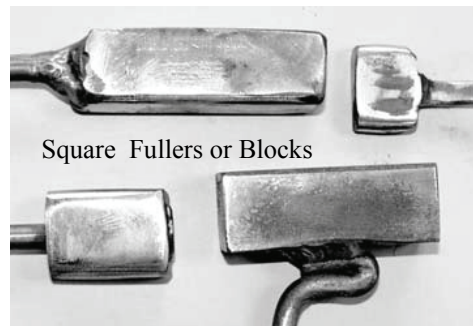
Deer Foot
Fuller



Collar Grooving Tools



Square Fullers or Blocks



Paddle handle. A square punch is used to square up a round hole. Punch $\frac{3}{4}$ to $\frac{7}{8}$ of the way thru, turn stock over and knock out the slug or biscuit. Drift to final size. **Taper Tool, Bottom Die** This tapered block fits over the bottom die and taper is formed between top die and this tool. If the angle of the slope is higher than

Taper Tool, Bottom Die



coefficient of friction the stock will be kicked back toward you. Stay out of the path. You can use a higher slope if you hang a section of stock being worked over the back edge of the taper tool. You cut this off and discard after the tapering. Large spring or large axle, no heat treat required. This tool may also have a handle welded to one side for use as a hand held tool. **Rope Swage** This closed die forms grooves in two sides of square stock, then you rotate and groove the adjacent

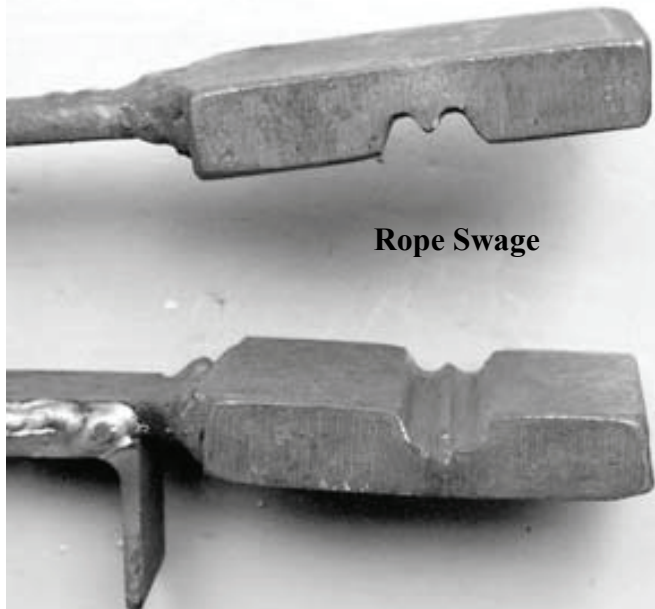
sides and finally twist the stock to get a rope pattern. Use 2 steel blocks about 2" x 2" by at least $\frac{1}{2}$ " thick, flat spring is a good choice. Bend a length of $\frac{1}{4}$ " round stock until they are touching for a 3" length. Heat the individual blocks and drive the round stock part way into the blocks but not full deep. Use an angle grinder to deepen the grooves to $\frac{1}{4}$ " while leaving the ridge between the grooves high. Weld a spring handle to side of blocks. Heat the $\frac{1}{2}$ " square stock and run thru the die with light blows, rotate 90° and run thru the dies on the second set of sides. Continue until dies are closed. Heat the grooved section and twist evenly.

Square Spring Fuller Useful for working in a narrow section of stock, narrower than die width. These are mild steel. **Rounded Wide Spring Fuller**, Straight Acts a narrow set of dies for working stock lengthwise.

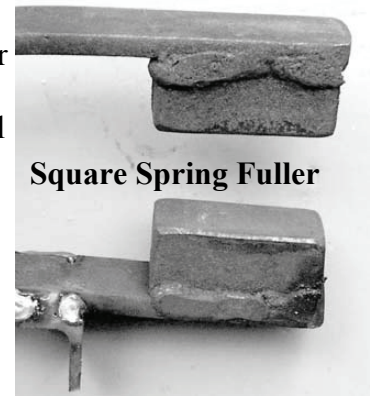
Fuller Swage on Spring This is for cupping a length of top rail for a handrail.

Round Fuller, Spring, Straight Similar to spring fullers above. Spring or W-1 tool steel.

Round Fuller, Spring, Straight Similar to spring fullers above. Spring or W-1 tool steel.



Rope Swage



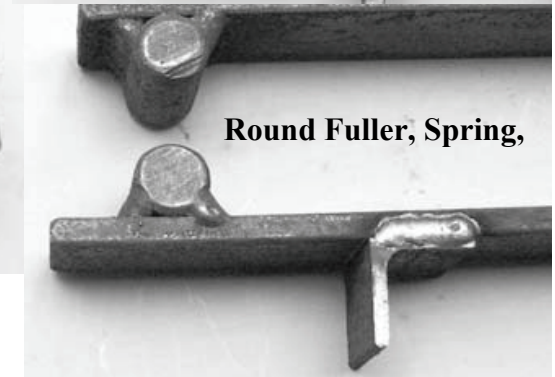
Square Spring Fuller



Rounded Wide Spring Fuller

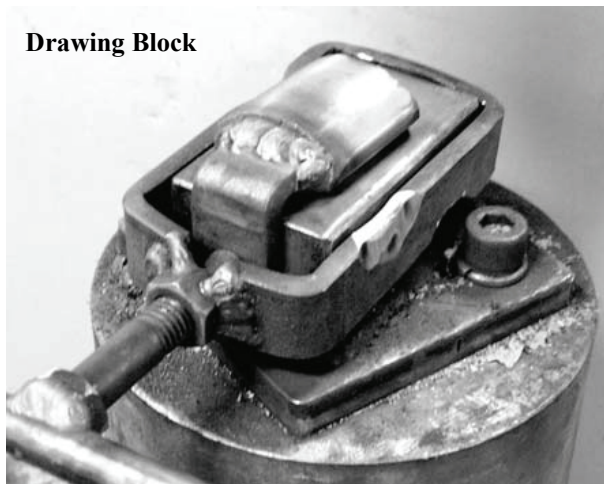


Fuller Swage on Spring



Round Fuller, Spring, Straight

Drawing Block



Drawing Block clamped to flat die This curved block allows limited drawing with a flat top die. The material is jack hammer bit, Water quenched or oil quenched spring steel. Works well as drawing die with top flat die.

Shoulder Cutting Tool This tool makes sharp cut round shoulders on round, square or rectangular stock. It should be used with the clamp and removable pipe for establishing the Shoulder without making false cuts which always result in cold shuts. Clifton says holes should be elliptical. **Star Punch**

For decorating or putting an accent on stock. A **heart punch** is another idea.

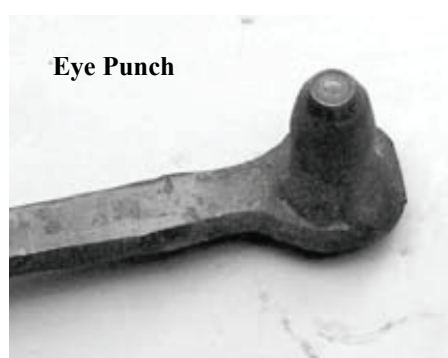
Kilroy Stamp A stamp made by Allan Kress. **Eye Punch** Spring steel or W-1

Leaf Vein Die Positive veins can be forged in a leaf blank. **Flat spring Square Corner**

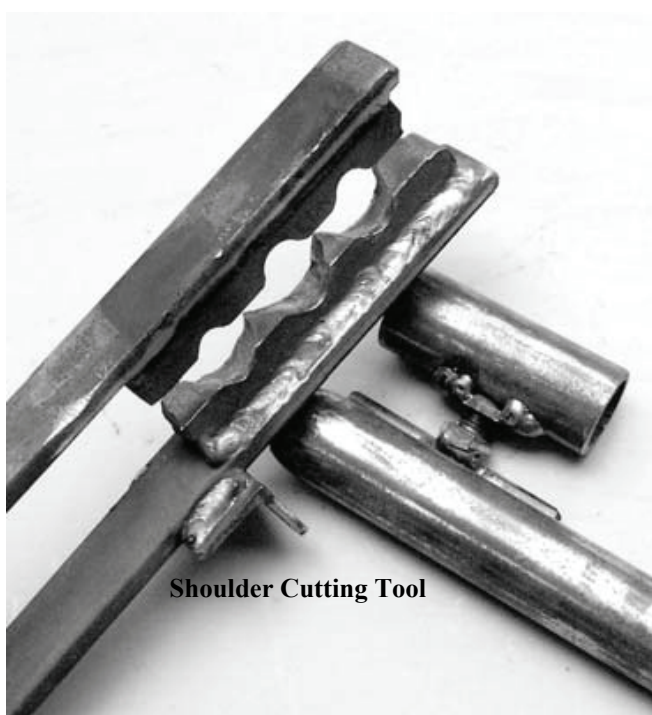
Block on V Block This Combination bends a sharp 90° corner in 1/4" flat bar. With a small round fuller, gentler bends may be made.

Drawing Dies This set of drawing dies was forged and ground from two 3" long pieces of large spring. They are not quenched and should never hit cold steel. Hammer on a piece of paper to check die match and alignment.

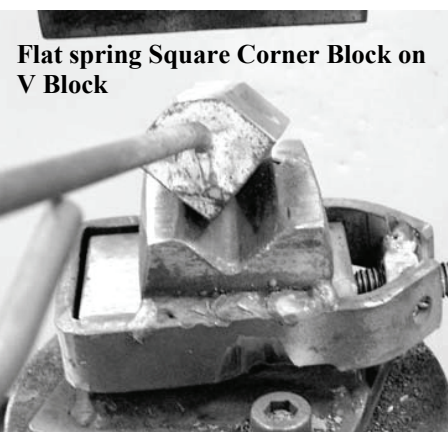
Eye Punch



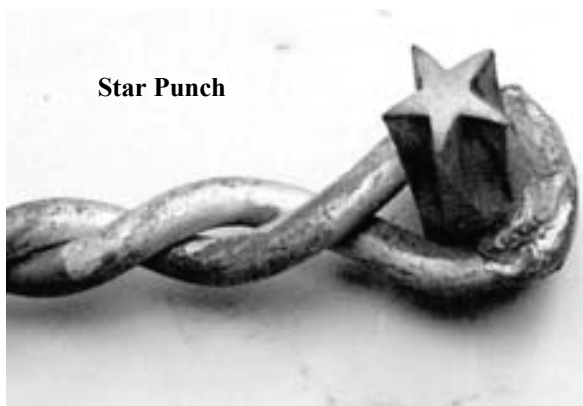
Leaf Vein Die



Shoulder Cutting Tool



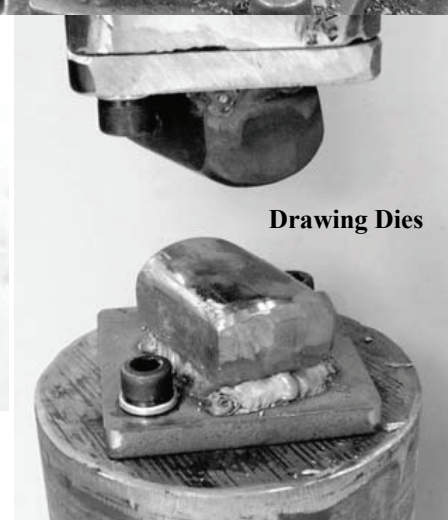
Flat spring Square Corner Block on V Block



Star Punch



Kilroy Stamp

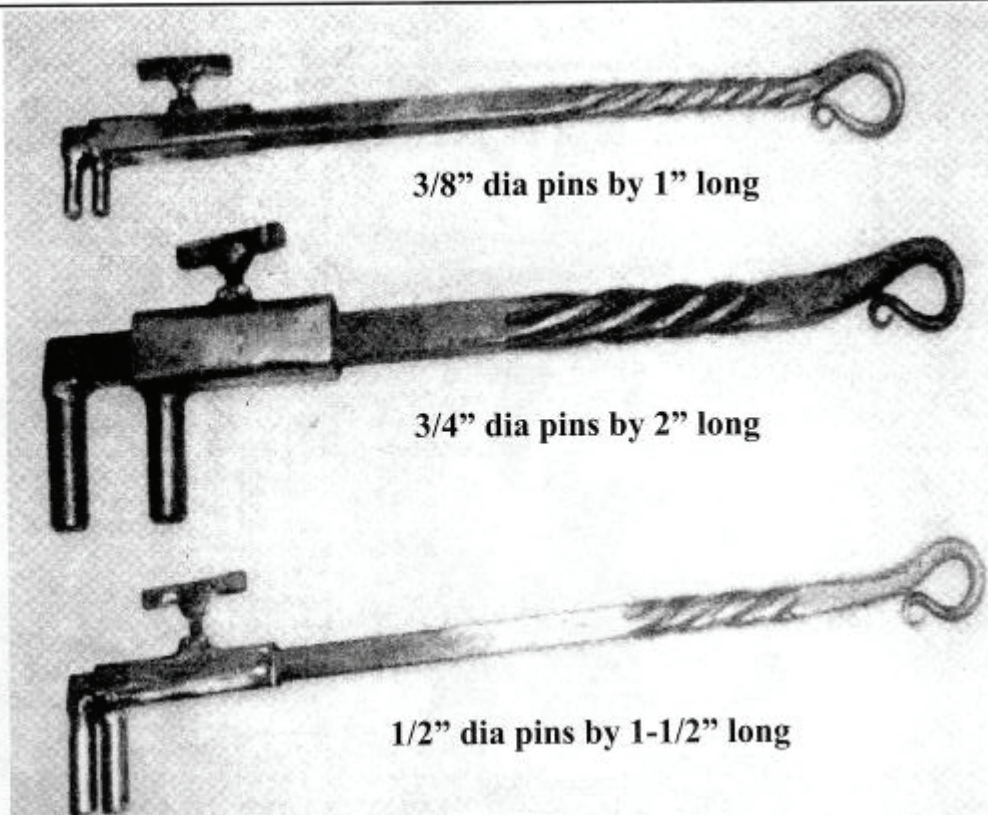


Drawing Dies

This 1/2 page article is reprinted from the Tuyere, Newsletter of the Illinois Valley Blacksmith Association. May/June 2009

Adjustable Bending Forks With 18" Handles

By Dennis Anderson



3/8" dia pins by 1" long

3/4" dia pins by 2" long

1/2" dia pins by 1-1/2" long

This 1/2 page article reprinted from, The Hot Iron Sparkle, Apr/May/June 2009, Newsletter of the North Carolina ABANA

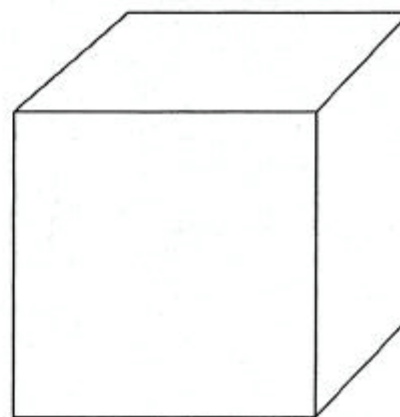
Making a Wood Block Swage by Randy Stoltz

Let's face it, we never have enough space in the shop and a large stump swage just eats up too much of that valuable floor space. As an alternative the wood block swage gives you six sides to work with in a small convenient size. This tool can be used in the hardy hole of your anvil or clamped in your vise.

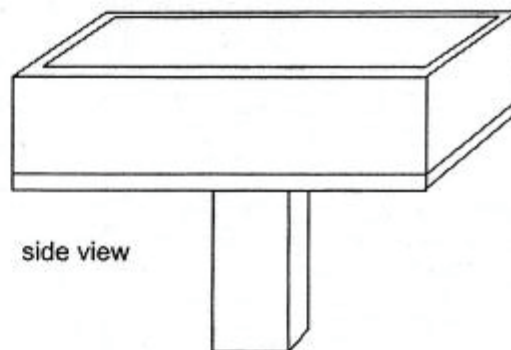
Start with a wood cube, all sides of equal length, which gives you six sides to work with. 6" x 6" x 6" is a good size though any size will work. You can glue up smaller pieces of wood to make the cube. Warning do not use pressure treated lumber.

Weld a frame 1" to 2" tall to a base plate. Make the frame large enough to hold the wood cube. Attach a post sized to fit the hardy hole on your anvil.

Use the wood cube as a non-marring swage for leaves and other items where you want to add depth or cupping. Carve or burn different depressions in all 6 sides for the various things you make.



wood cube



side view

Horseshoe Nail Cross

by Bill Clemens, Hammer & Tong, March-April 2007, Maryland

I was asked by our minister to repair a cross pendant that he always wears. It appeared to be made of horseshoe nails, but close examination revealed that it was cast of some soft alloy. In preparing to solder the cross back together, I decided that I would first try to make a replacement cross from actual horseshoe nails just in case I couldn't repair his cast cross. What follows are the steps I took to make a cross pendant by forge welding four horseshoe nails together. So far, I've only made three crosses, and I've learned something with each one. If you make one, I'd love to hear about it and any refinements to these instructions you may discover.

I started with four number 16 Mustad horseshoe nails. Three nails make up the cross, and a fourth one, with the head removed, makes the loop for hanging it. Begin by cutting the head off one of the nails and forming a taper/scarf on the end. Since the nails are tapered along their length and you'll be placing this nail upside down behind the central nail of the cross, you'll need to taper it to match and thin the head end.

Turn the nail over and form the loop. Forming the loop before forge welding it to the back of the central nail gives you a means of positioning the two nails for welding and protects the tapered point while in the forge. Place the loop tightly against and behind the head of a second nail. After the cross is completed you can reposition the loop slightly so that it is not tight against the head.

Hold the nails by the head and loop. I used a pair of round bit farrier's fire tongs that have domed bits that accommodate the head and loop while holding the two nails firmly just below the head. I used a tong clip to hold them securely. You will need a small clean fire and a slow air flow. Place the nails in the forge and heat to orange; brush and flux. After fluxing, insure the nails are in contact along their length. Return to the fire and heat slowly, rotating them to insure uniform heat. At welding heat remove from fire and tap gently. If done right, the pieces have actually welded in the fire, and your gentle taps are just to make sure the weld is complete, any small gaps are closed and any remaining flux is expelled from the weld joint. This is fire welding as opposed to hammer welding, in which the two pieces to be joined are heated separately in the forge fire and joined at the anvil with hammer blows.

Once welded, remove the tongs and place the head and loop end in the fire to complete the weld on the remainder of the shank and at the head. Take care not to burn the thin loop or to distort it with a misplaced hammer blow. These welds exercise both fire management and hammer control. Lay this piece aside.

Take the remaining two nails and place them back to back. You might want to practice placing them in a vise (2A) like this



1A



1B



1C



2A



2B



2C



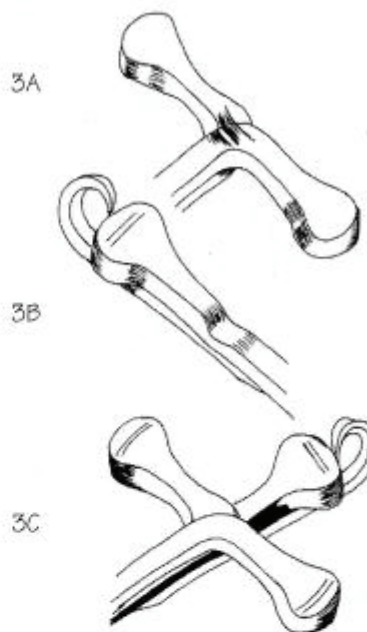
Horseshoe Nail Cross

while still cold. You want about 1" protruding above the vise. With a hammer, form a 90° bend in both nails. By placing them back to back in the vise, you are ensuring that both arms of the cross will be the same length. Square up the bend on each nail independently making the inside corner as tight as possible, but be careful that the length of both arms remains the same. Forge a scarf at the bend of each nail as shown in 2B, with one scarf face up and the other face down, so that when the nails are placed together, both face up with their shanks on top of each other. Their scarfs will overlap, as indicated in 2C. Place the nails in tongs, and weld the points first, following the same procedures as for the central nail and loop.

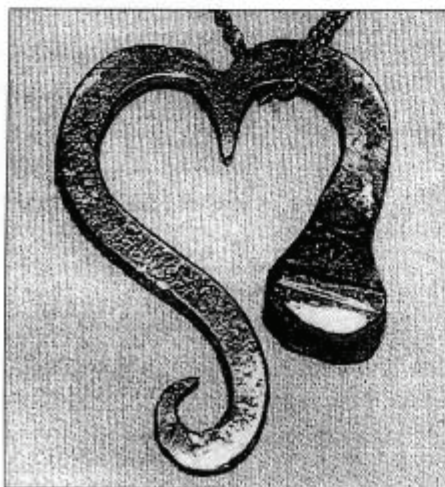
While completing the weld on the top of these nails, forge a scarf from the backside as shown in 3A. First make sure the thin tops of the arms are flush on the front, and then thin the shaft below the arms, leaving a bulge on the lower half of the arms.

Align the arms on the central nail and forge a slight indentation to accept the bulge on the arms. With the arms and central shaft positioned, repeat the forge welding process one last time to join the two parts of the cross together. Again after welding, thin the central shaft of the cross below the arms while maintaining the proper width and cleaning up the sides.

Trim the bottom of the cross to $2\frac{3}{4}$ ", and then upset the bottom end, leaving only a slight taper (if any) in the width and thickness of the bottom of the cross. I think it looks better with a slight swelling at the very bottom. ♣



Horseshoe Heart Pendant



This little heart appeared without fanfare in Hammer and Tong. It seems to be made out of two horseshoe nails, tips forge-welded together, with head removed from one of the nails. Try this with one forge weld before advancing to the cross with three forge welds. ~ Ed.

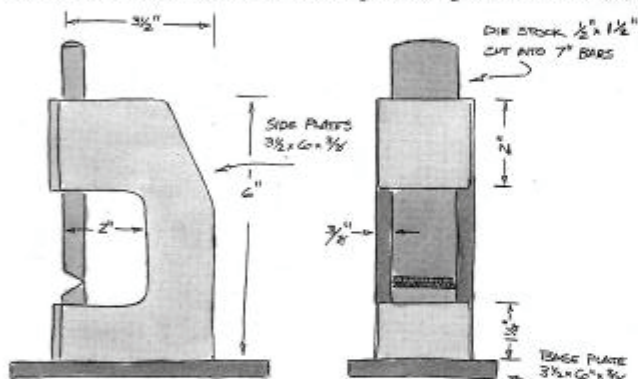
Guillotine Tool Revisited

by Brian Gilbert and Jim Carothers

Chattanooga, Tennessee

I recently received some photographs from Jim Carothers of his re-designed guillotine tool. My guillotine tool design appeared in the *Hammer's Blow* ten years ago (!) in my first issue as editor. The inspiration came from Jerry Hoffmann at *Blacksmith's Journal*. He had a great design, but I was after something simpler to make. I "designed" it, as I recall, with a piece of chalk on the layout table, adding marks and taking away until it "looked about right," so it's naturally ripe for improvement. (*Hammer's Blow*, vol 8 #1, Winter 2000.)

I demonstrated making these in Oklahoma a few years back, where I met Jim Carothers and the other fine people at Saltfork Craftsmen. Jim has made several improvements on the design, but of course, you're more than welcome to make your own changes and improvements. The original design is shown below:

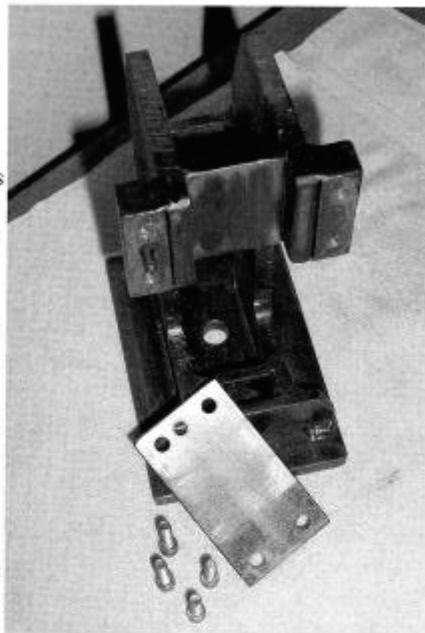


The ones I make these days are a little taller. This allows the dies to slide with a little less "slop," or front-to-back wiggling when used. For most applications, this isn't a huge deal, but should you want to try making something like a hot punch, you should try to minimize the slop. This means making the die slots as accurate as possible.

Since the construction of this tool is primarily welded, there is a limit to the accuracy you can expect, since the welding distorts the metal. Pre-heating and post-heating reduces this distortion and makes the welds stronger, but it doesn't eliminate it entirely. Accuracy can also be improved by using all cold-rolled steel, though this is really pricey for the main side plates. To save money, I use cold-rolled for the die stock and the "keeper plates," or the small pieces of steel that touch the dies in front and in the back.

A big limitation of my design is that the top dies can only be the size of the die stock... no larger. But Jim wanted something that could use larger surfaces on the top die, like a fuller. He made the opening a little larger and added two bars of 5/8" square stock to the sides, drilled and tapped for 1/4-20 bolts.

While the construction is slightly more complex, it makes the tool much more versatile. An extra bonus is increased accuracy, since only the back keeper is welded on. The front keeper is held on by bolts, so if you want to get really accurate, you can adjust the fit with shims. If you want to get really crazy, bolt in the back keeper, hand-scrape the sides, and add bronze bearing surfaces. But that would be a bit silly... especially for a tool that gets blasted regularly with a hammer.



By adding a pair of 5/8" bars with tapped holes, Jim has made the top die easily removable. This allows a working surface that's larger than the die stock.

For those of you who don't have ten years of back issues of the *Hammer's Blow*, here's the basic rundown of the construction.

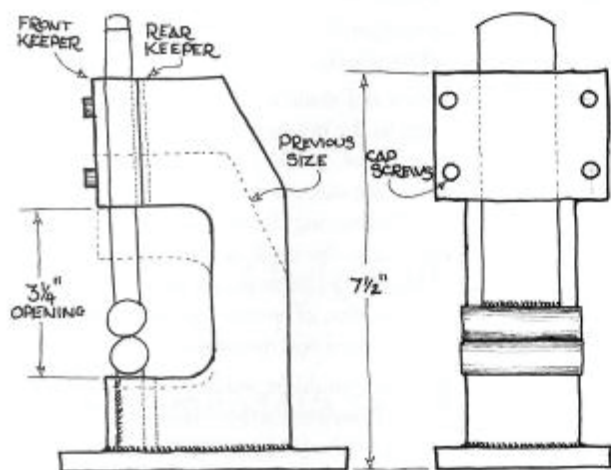
Start With The Die

Always start any tool like this with the die stock, which can be any size that you want. I've found 1 1/2" x 1 1/2" to be a good size. Many smiths want to make these too big (insert Tim the Tool Man grunt here... "AAARGH, argh, argh, argh..."),



A few of Jim's dies. He often uses this tool under a hydraulic press.

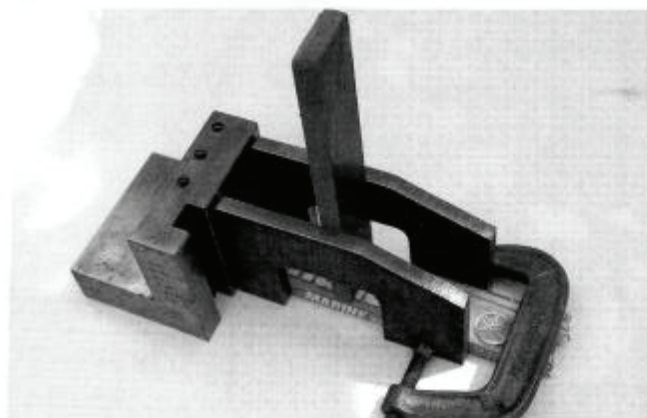
**If you haven't seen this article before, it's because you are not an ABANA member.
You might ask for a membership for the holidays**



Jim's redesign of this tool is taller with a larger opening. Note that the sliding surfaces that hold the dies have been lengthened a little as well. This will improve the die's accuracy.

but this often results in a tool that is heavy, expensive, wasteful, and needing a sledgehammer in order to be effective. If you regularly work 2" stock then you should make it bigger, but this size works well for 1/4" to, say, 3/4" or 1". Tool steel isn't necessary for these dies unless you want to make a cutoff tool or something with a sharp, thin edge. Since only hot steel is used under this tool, mild steel dies can last a surprisingly long time. Using cold-rolled steel will give you a tool with much less slop in the dies.

I start by cutting a length of die stock and wrapping it with two layers of newsprint for clearance, but even a single layer might be preferred with Jim's new design. You'll also need a short piece of die stock to use as a spacer. The rear keepers are both made from a single length of 1/4" thick cold-rolled steel that is the same height as the tool.



The initial welding setup involves clamping the sides to the diestock while keeping the base square. A second piece of diestock keeps the sides parallel.

Welding Setup

Setting up the first weld requires some creative clamping. I have an old cheap drill press vise that I use for this, but the larger opening will require a different approach. Any flat, smooth surface, such as a layout table, combined with some 6" C-clamps, can work fine. Wrap the die stock with a single layer of newspaper. Clamp the side plates to the die using a second C-clamp, using a second piece of die stock as a spacer. This will prevent the sides from pulling inward as the welds cool and shrink. Be sure to deburr and bevel the die stock, since they may need some persuasion with a hammer to be removed from the lower die slot. Place the rear keeper on top of the die, and clamp these down firmly to the table. Snug everything up, and spot-weld the corners, and perhaps a spot in the center. We want everything locked down before we burn all of the paper away.

Next you'll need to weld on the lower front keeper plate. This piece is made from 1/4" x 2" or similar, also cold-rolled. Clamp it tightly against the die before welding, and again, spot weld the corners and the center.

Unclamp the assembly and pre-heat in the forge, then full-weld the keepers to the side plates. Much of the paper will burn away, but it's done its job at this point.

This completes the only critical welding where accuracy is required... the rest is pretty basic. You'll need to weld the two bars to the sides that will take the threaded holes. It's best to thread and tap these before welding. One of Jim's design changes will be replacing the bolts with allthread studs that will be locked in place with a thread lock compound. Should you want to build yours with studs, drill the holes just large enough to fit your studs and plug weld them in place from the back. Jim says using large wing nuts will be faster.

Drive Out the Die

Before welding the body of the tool to the baseplate, you'll need to remove the die stock. The original design, with fully welded upper and lower keepers, required a substantial amount of hammering to get the die out. This is due to shrinkage and deformation of the metal at the weld zone. Usually once the die is out and the burned paper is removed, the dies would often slide in and out of the tool nicely, though sometimes some sanding and filing was needed to either the die or the slot. Jim's newer design should minimize this sort of fiddling, since only the lower die is fully surrounded by welding, though some cleanup and final fitting with a file and/or sandpaper will always be necessary.

Drill and Weld the Baseplate

It's a good idea to drill a hole in the baseplate in the approximate area of the bottom die, just in case a lower die with a burr on its surface gets pounded into the tool. Jim also drills a second hole in the center of the baseplate for mounting the tool to a bench. Other mounting options include a square base for a hardy hole, or a length of flat stock welded on edge that can be clamped in a vise. Since the new design is taller, though, clamping in the vise might result in a tool that's too high to comfortably strike, so be

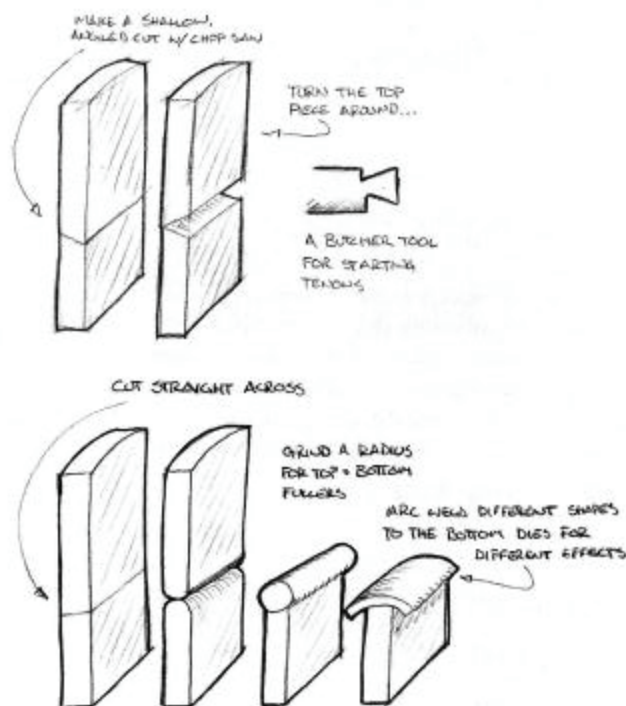
sure to check the height of the tool before deciding on the final mounting method.

Weld the frame of the tool to the baseplate. Be sure the dies slide smoothly without binding before you weld, because modifications to the inner surface of the tool are much harder once the base is welded on. Again, tack weld all four corners, preheat the whole assembly, and then finish the welding.



Making Dies

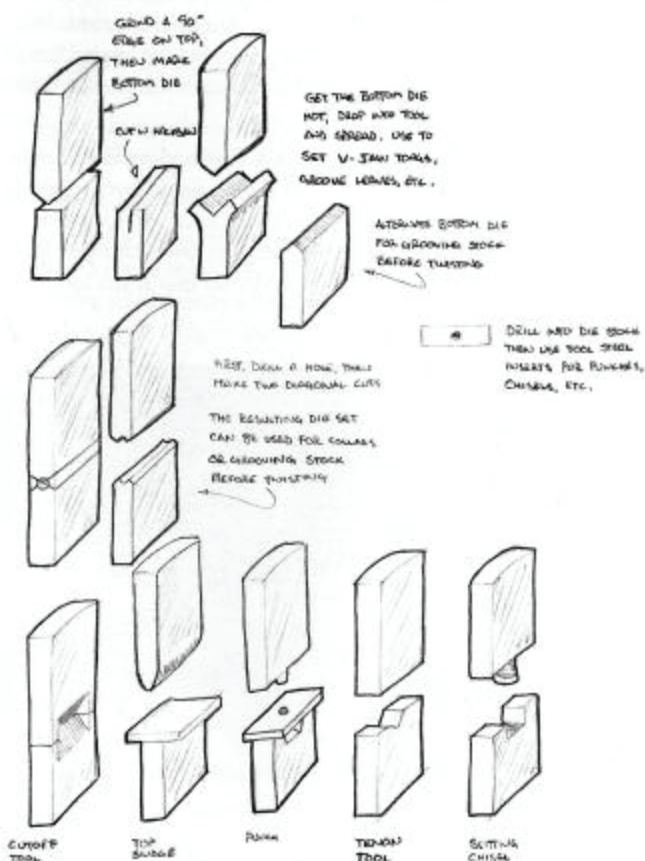
The dies for this tool range from simple to complex. Making the top keeper removable opens up a host of possibilities for the upper dies. Three different types of dies can easily be made by cutting a length of stock with a chop saw at different angles. A pair of dies cut at 90 degrees makes a useful edge for forging inside corners, like a tenon. A shallow angle makes a good butcher tool, and a steeper angle makes a cutoff. Round the edges and the die becomes a fullering tool.



I've always used a chop saw for this job with good results, but it's important that it cuts straight. If not, then you're in for some extra time at the grinding wheel.

Jim has gone a bit further and made a collar bending die that incorporates a stock stop in the bottom die. The die itself is basically a rectangular hole. To use, you heat a given length of stock and place in the tool, making sure the back edge of the collar stock touches the stop. Hammering the top die (or pressing under a hydraulic press) forces the stock into the hole and bends a U-shaped collar that's ready to use around a gate. Different size collars will require different dies, of course, but for a gate with dozens of collars, this could be a real time-saver.

Another handy trick for dies would be welding bits of tool steel to a mild steel base, should you need a thin cutting tool or a punch. This tool doesn't have the accuracy required for a cold punch, but a punch for hot steel might be a workable possibility. Old tool and diemaking books are loaded with ideas that could be adapted to this tool. Have fun!





Mario Baggiolini photo

Leaf Napkin Ring ~ CBA Level I

December 2008

by Mario Baggiolini, Sonora

Processes

Taper, fuller, spread, chisel, swage, bend, twist.

Tools Required

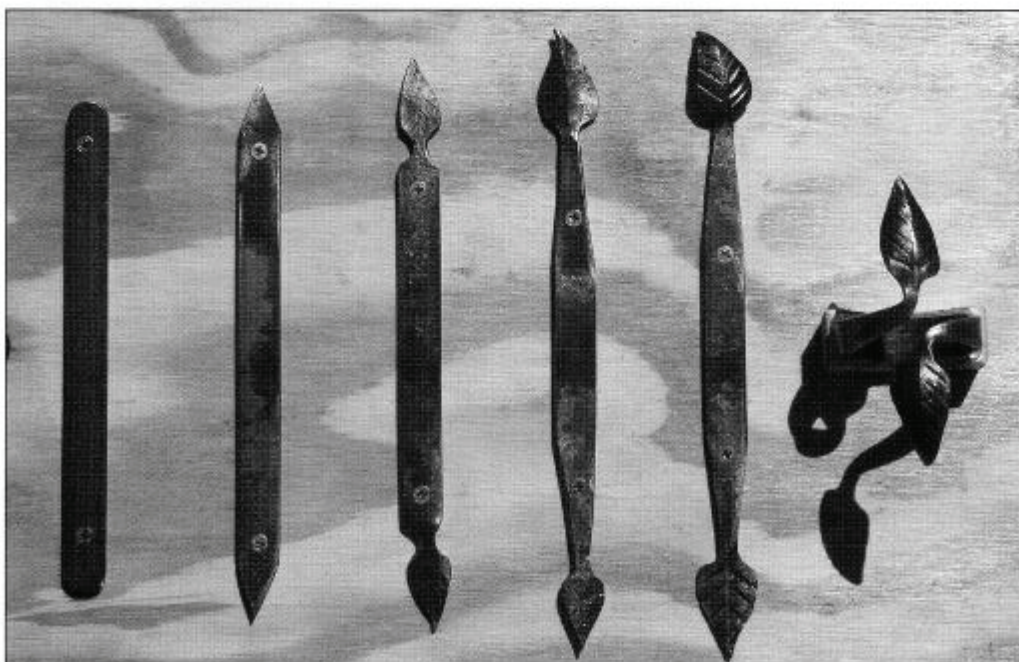
Hammer, tongs, scrolling tongs, small chisel, $\frac{3}{8}$ " spring fuller, $1\frac{3}{8}$ " mandrel, rounding hammer, 16-ounce ball peen hammer, block of wood.

Material

$\frac{1}{2}$ " x $\frac{1}{8}$ " x $5\frac{3}{4}$ " (or similar) flat stock.

Procedure

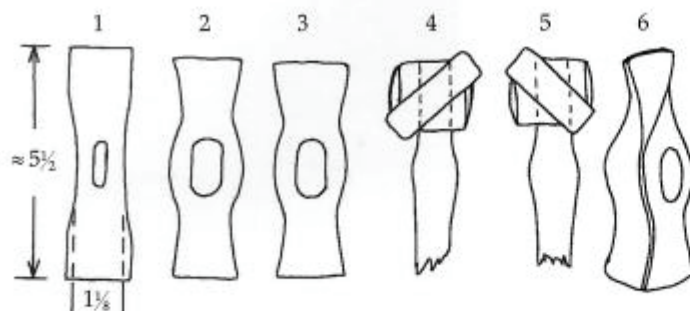
1. Radius the ends of the material to prevent *fish lips*.
2. Forge short points on each end.
3. Fuller back about $\frac{3}{4}$ " and down to about $\frac{3}{16}$ " to $\frac{1}{4}$ " neck at each end.
4. Draw a long taper approximately $1\frac{3}{8}$ " long, back from the fullered ends. The blank should be about $7\frac{3}{8}$ " long, overall.
5. With the rounding hammer, spread the leaves to a pleasing form.
6. Chisel veins into the leaves for some texture (*or not*).
7. With a ball peen, hammer on the backside of the leaf against a block of wood.
8. Over a mandrel or horn, hammer the center section into a ring approximately $1\frac{3}{8}$ " in diameter.
9. With scrolling tongs, twist the leaves so that they are perpendicular to the ring.
10. Wire brush and hot wax. (*Do not use nut oils*). ♣



Eden Sanders photo

Reprinted from California
Blacksmith Association Newsletter

Jeffrey's Diagonal Peen Hammer



1. Begin with $5\frac{1}{4}$ " of $1\frac{1}{2}$ " square stock, or forge $3\frac{3}{4}$ " of 2" round stock to $1\frac{1}{2}$ " square. I frequently use old truck axles for this, or if you have it, 4140 or W-1 will work well. The actual weight of the blank should be about four ounces greater than the weight of the finished hammer head you desire to allow for losses due to scaling and grinding.
2. Forge to a slight hourglass shape, as viewed from the top, so that the center of the blank is about $1\frac{5}{8}$ " x $1\frac{3}{4}$ " in cross section, and the piece tapers back to the ends, which remain $1\frac{1}{2}$ " square. The blank will grow in length to about $5\frac{1}{2}$ ". This forging prevents the subsequent eye punching from swelling the cheeks of the hammer too much. (Figure 1)
3. The eye will be punched with a flat-bottomed $\frac{1}{4}$ " x 1" slitting punch, which is driven exactly in the center of the blank. Center punch marks on the two sides from which the punch will be driven will help locate the position from each end. Your eye, however, is the best judge for the position side to side.
4. At a bright orange heat, drive the punch very carefully into the blank from both sides, making absolutely certain that the depression it makes is perfectly centered. Minor corrections can be made at this point, but once the hole is deeper, there is no repositioning.
5. Now, at a bright orange heat, drive the punch about 1" into the piece from the top, taking care to remove and cool the punch every three or four sledge blows. To prevent sticking, the punch must be lubricated with graphite or coal dust each time it is cooled.
6. Take another heat and drive the punch from the other side clear through to remove the plug. If punching alignment was good, the plug ought to come out easily. If it sticks, try shearing it with the punch at a dull red heat.



7. At a good bright heat, open the hole with a tapered rectangular drift over the Hardy hole, driving the drift from both the top and bottom to keep the hole symmetrical.
8. Again at a good heat, drive the finished oval blacksmith handle drift to nearly the depth required for final handle fit. As before, work from both top and bottom. You may want to drive the drift slightly farther through the eye from the top of the hammer to ensure the eye is well fitted to the handle when wedged. Figure 2 shows a top view of the drifted hole.
9. Now, with a local heat on the end which will be the face of the hammer, upset it to about $1\frac{5}{8}$ " square. This should put the face about $1\frac{3}{4}$ " from the front edge of the eye. (Figure 3)
10. Diagonal peen hammers are specifically right or left handed. It is important at this point to decide which you want to make and mark the blank clearly so that when the piece is pulled from the fire for forging the peen, it is properly positioned. With the face down on the anvil, a right-handed cross peen hammer looks like Figure 4. A left-handed cross peen looks like Figure 5.
11. Now, at a bright orange heat, draw out the peen on the diagonal with a gently curved cross peen sledge over the horn of the anvil or between two drawing dies under the power hammer. I generally forge it to come out to be about $\frac{3}{4}$ " x $2\frac{1}{8}$ ", with the distance from the eye about $2\frac{1}{8}$ ". The overall length of the hammer is now about $5\frac{5}{8}$ ".
12. Now, heating only the peen end, upset it slightly to refine the form. It is good practice to allow for some grinding on both the face and the peen, not only for finish shaping, but to remove the *rind* of metal on these important surfaces that could have lost carbon in the forging process. (Figure 6)

Jeffrey's diagonal peen hammer

13. Now, drift the eye to its final dimension, top and bottom. Brush, and allow to cool slowly.
14. Grind the peen and the face to their final forms. Sand smooth.
15. Preheat the entire head to about 800°F (*no color showing*) and then heat the face only to slightly above the nonmagnetic temperature (*light cherry red, or about 1600°F*) and quench only the face half of the hammer in clean water. Keeping the face under water, heat the peen and quench the entire hammer. (*I quench hammers in water. Oil-hardening steels can often be carefully quenched in water if you only heat the faces as described above since the heat in the body of the hammer will slow the cooling.*)
16. After sanding the peen and face with Scotch-Brite® or wet-and-dry sandpaper, preheat the entire head to about 300°F (*boils water instantly but does not show temper colors*), and temper the edges of the face to a light purple with a touch of straw going into the face. Draw purple on the ends of the peen with straw in the center. The tempering is done with a slightly oxidizing oxyacetylene torch flame. Exact heat treating depends on the steel used and personal experimentation.
17. Wire brush, mount on handle and enjoy! ♣

Jeffrey's Choice of Steel

To figure the length of stock required for a particular hammer weight, simply divide the intended hammer weight by the pounds per lineal inch for the diameter stock to be used (*see chart*).

Example: To make a 3-lb. hammer from 1½" stock: 3 lb. ÷ .638 lb per inch = 4.7"

I generally use truck axles, cat track pins, old coil springs and the like to make hammers and anvil tools. Other useful steels include 4140, 4142, S-1 and W-1. Whether you are certain or not of the steel type, it is useful to test it for harden-ability in different quenching mediums. It is also important to do all forging in as few heats as possible to avoid excessive grain growth and decarburization.

Heat-treating need not be as precise as in edged tools, but take care to get the center of the face suitably hard and the edges safely tempered. Experimentation is required to find what is best for any given steel and hammer size. I generally preheat the entire head to about 800°F and then bring the face to the desired temperature quickly using either the coal forge or the torch. Then I quench only the half of the head just heated and immediately heat the opposite end and then quench the entire head. I temper only the edges of the face to light purple, allowing a bit of straw color to go into the face. The tempering of the peen end depends on the shape. ♣

Useful Data for Making Hammers

Bar Diameter		Weight in Pounds /Lineal Inch	
Fraction	Decimal	Round	Square
1"	1.000"	0.223	0.283
1-1/8"	1.125"	0.262	0.358
1-1/4"	1.250"	0.348	0.443
1-3/8"	1.375"	0.420	0.536
1-1/2"	1.500"	0.500	0.638
1-5/8"	1.625"	0.588	0.749
1-3/4"	1.750"	0.681	0.868
1-7/8"	1.875"	0.783	0.997
2"	2.000"	0.890	1.134
2-1/8"	2.125"	1.005	1.280
2-1/4"	2.250"	1.127	1.436
2-3/8"	2.375"	1.255	1.599
2-1/2"	2.500"	1.391	1.773
2-3/4"	2.750"	1.683	2.145

Shovel Form

By Robert Millsaps

I recently attended John C. Campbell Folk School on a scholarship provided by the Alabama Forge Council. The class I attended was “Forging for the Hearth and Home” and was instructed by Jeff Mohr.

The project that I chose to make was a fire- place set, which included the stand, poker, broom, tongs, and shovel. Part of my scholarship requirement was to pass on something that I’ve learned while in this class. I’ve chosen to show how we made a jig for the shovel pan.

I started out with a piece of 1/2” X 1 1/2” or 2” bar 15 inches long and center punched it.

1. The middle of this piece was then put in the fire and brought up to yellow heat, then it is bent over the horn at approximately 30 degrees. If more pitch is wanted in the back of the shovel, then bend piece to a more acute angle. After piece has been bent, then return piece to fire and bring back to yellow heat.

2. It is then placed on the vise in this position. Use bending wrench near end. Pull pieces forward and down trying to keep legs even.

3. Piece should look like this.

4. Legs should be adjusted to be as even as possible.

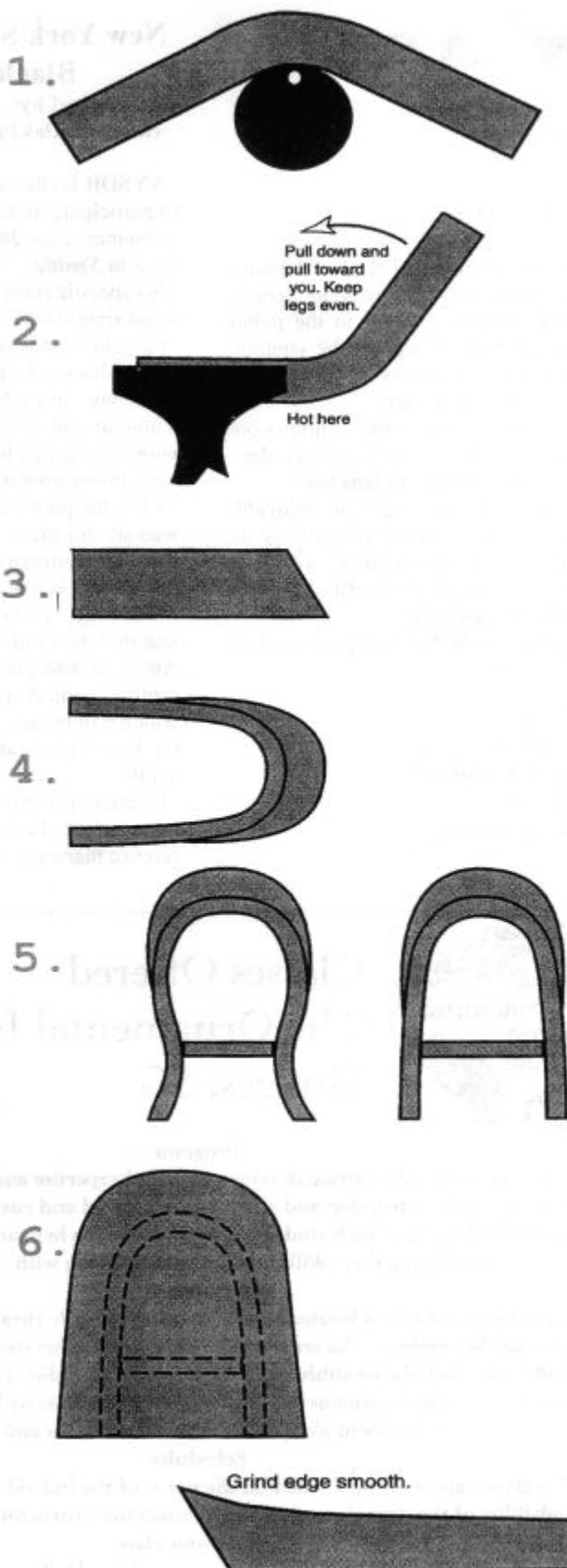
5. Legs can be straight or curved, either way a brace needs to be welded between the legs to keep them from moving. The shovel blank is then cut one inch bigger all around than the jig. Place jig and blank in vise. Cold bend sides around jig.

To bend the back, heat one half at a time and beat over until as many wrinkles can be taken out.

6. The pan will look like this. Grind the edge even all around.

I want to thank the Alabama Forge Council for providing me with the opportunity to improve and build on my blacksmithing skills.

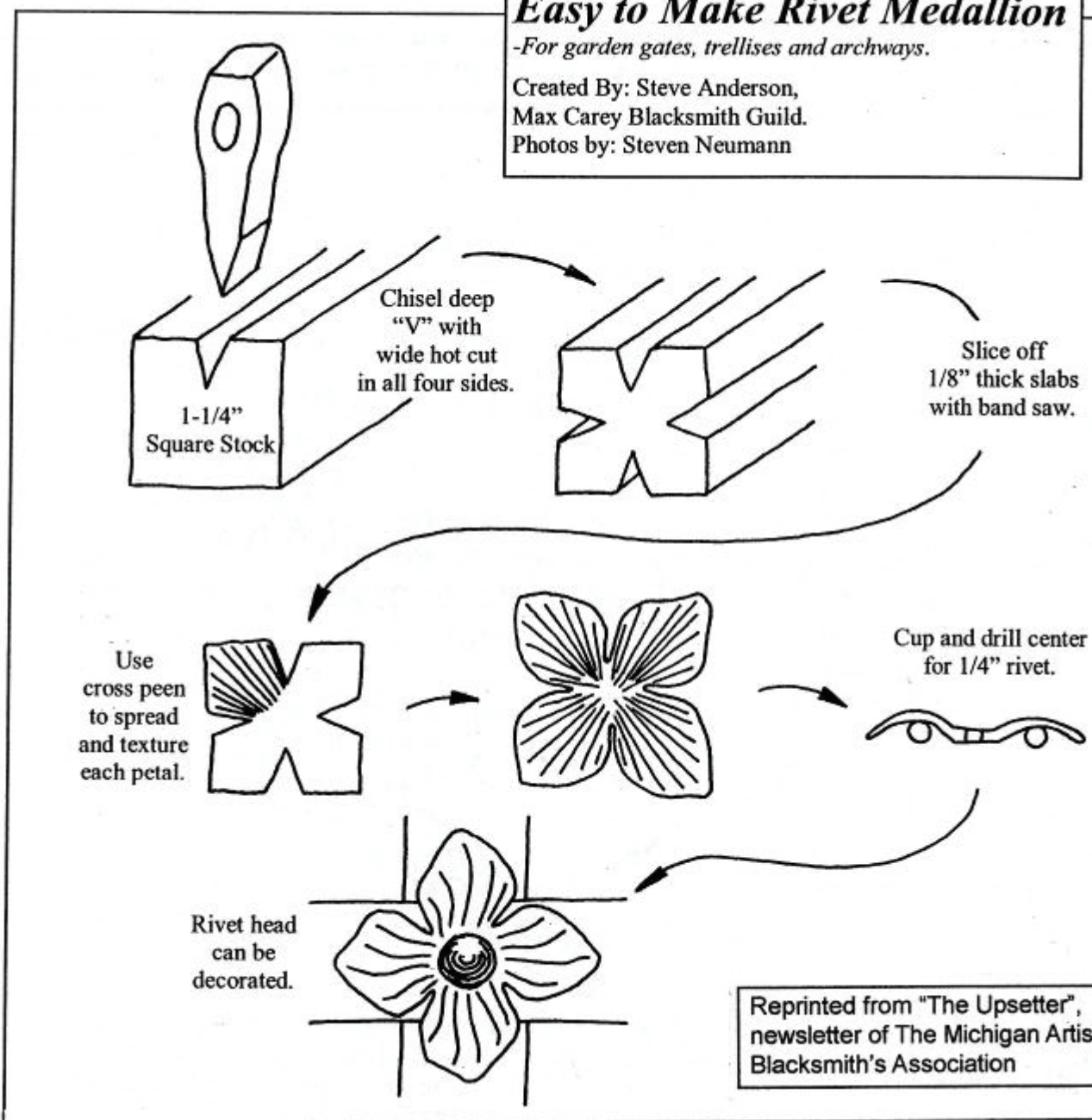
Thanks, Robert Millsaps



Easy to Make Rivet Medallion

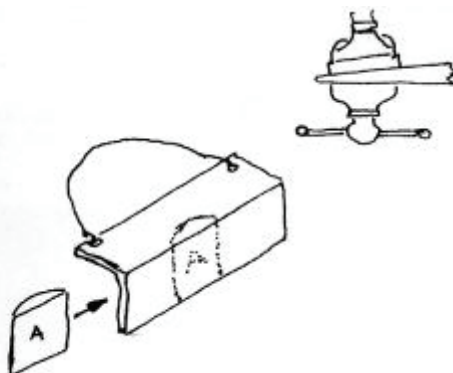
-For garden gates, trellises and archways.

Created By: Steve Anderson,
Max Carey Blacksmith Guild.
Photos by: Steven Neumann



A Vise Tool that will help you hang on to those slippery tapers, from Doug Kluender and the Anvil's Horn

Weld a piece of half round (or you can forge your own) to a piece of 1-1/2" angle iron. Use this as a "floating jaw" to grip tapered stock. The wire "hanger" will keep it from falling off when you loosen the jaws.



Please consider becoming a member of ABANA. If your interested in Blacksmithing, then you should be a member of the national organization

Forged Horse Head

By Kirk Sullens

From Blacksmith of Missouri Newsletter

If you want to learn to forge and carve animal heads for tool handles and other applications, there's no better primer than "Iron Menagerie", put out by the Guild of Metalsmiths. It's filled with solid foundation information. This forged horse is slightly modified from the one in the book, giving it what I feel, is a more realistic appearance.

STEP 1: Start with a piece of stock twice as wide as it is thick. This could be as small as 1/4"x1/2", or 1"x2", or as big as you want to forge, as long as the proportions are the same. I've found that a good size for horse-head hoof picks is 3/8"x3/4". Begin over an anvil corner with some radius and shoulder a length equal to 1/2 the thickness of the bar down to roughly square. A little bigger is OK, but smaller is probably not. This will be the nose/mouth end of the head.

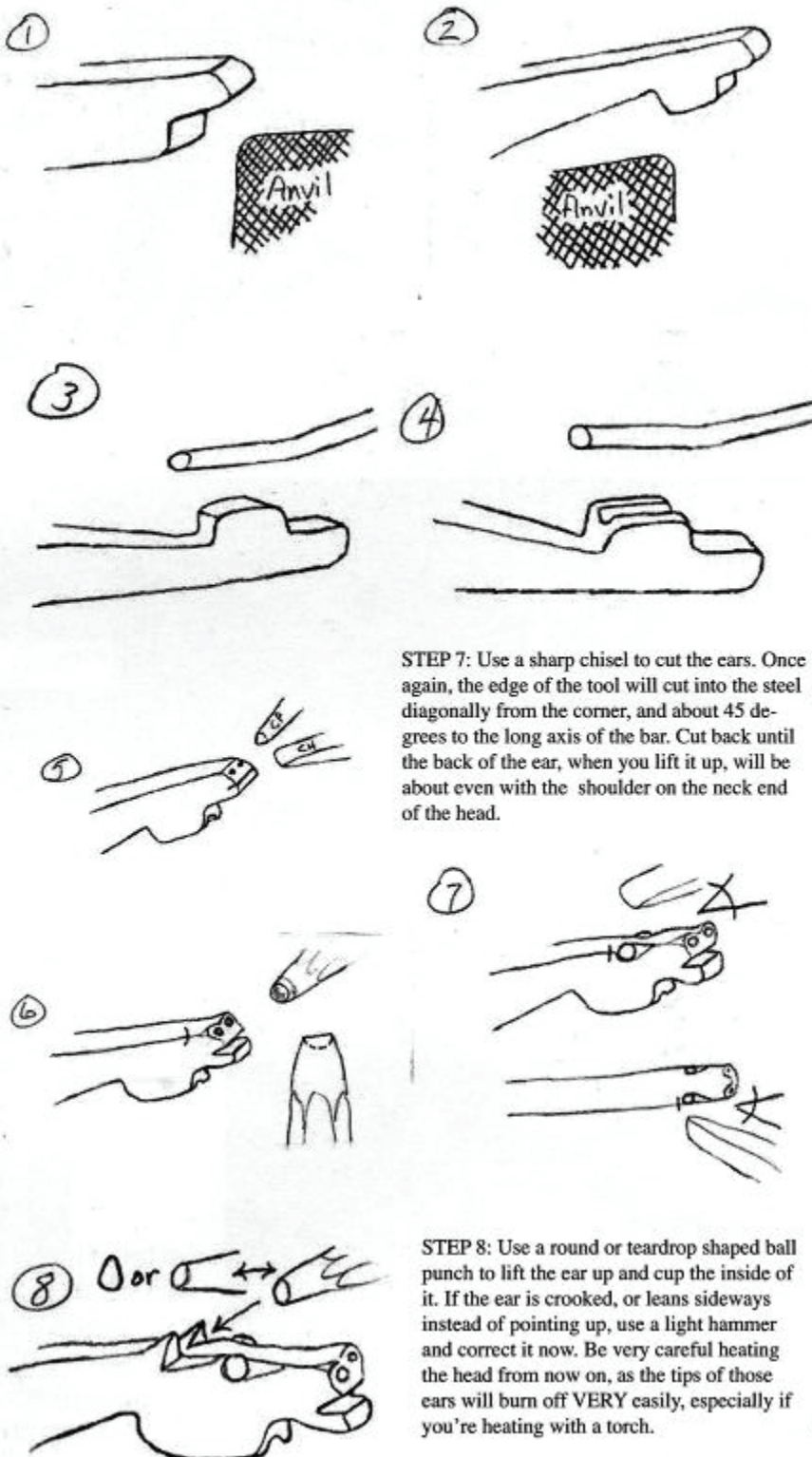
STEP 2: Leave a length about equal to the width of the bar untouched, then forge the neck section over a radius on the far edge of the anvil. Leave this slightly more than half-width, and taper it into the full width over about 2" or so.

STEPS 3 and 4: Turn the piece over with the shoulders upward, and fuller the full-width section between the shoulders lengthwise. I use a piece of round stock to fuller, and proportion it to the size of stock I'm using for the head. For 3/8"x3/4", I use 1/4" round to fuller. For 1"x2" I'd use 5/8". This makes the hollow spot that horses have under their jaws, where many of them like to be scratched.

STEP 5: Heat the nose tip and put the head in a vise. Use a blunt centerpunch to make the nostrils, and a sharp chisel to cut the mouth. The center-punch marks should be near the upper corners, but not so near they tear the corners out when you hammer in the nostrils. Don't cut the mouth too deep. If it's not enough, you can always go back and do more later, but once it's cut, it's cut.

STEP 6: To make the eye, you need a special eye punch. To make your eye punch, use your preferred tool steel and make the end flat. Mark the center with a center punch and heat the end. Put the flat end of the punch on a ball-bearing, using the centerpunch mark to index the bearing in the center of the punch, and tap it down. Do this as many times as necessary to get a concave hemispherical hole in the end of your punch. Grind the excess material around the concave hole to make a chisel edge, then heat-treat suitably for the steel you're using.

Set your eye chisel at a diagonal into the corner of the bar, and at about a 45 degree angle to the bar's long axis. I find it easiest to tap the eye punch to make a mark while the steel is cold, so I can be sure I get the right spot when the steel is hot. Your set mark should be even with the shoulder nearest the nose, and you should forge the eye backward til you have a nice round orb that is just less than halfway back in the middle of the shouldered area. For the very last blows, I turn the eye punch almost perpendicular to the bar to give the impression of eyes looking sideways and not directly forward.



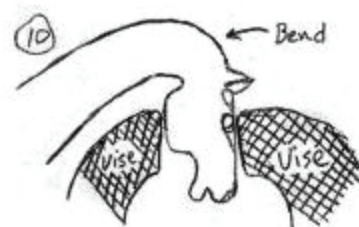
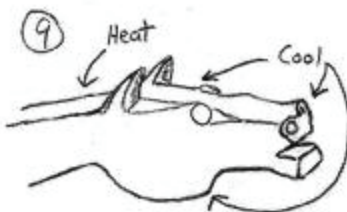
STEP 7: Use a sharp chisel to cut the ears. Once again, the edge of the tool will cut into the steel diagonally from the corner, and about 45 degrees to the long axis of the bar. Cut back until the back of the ear, when you lift it up, will be about even with the shoulder on the neck end of the head.

STEP 8: Use a round or teardrop shaped ball punch to lift the ear up and cup the inside of it. If the ear is crooked, or leans sideways instead of pointing up, use a light hammer and correct it now. Be very careful heating the head from now on, as the tips of those ears will burn off VERY easily, especially if you're heating with a torch.

Continued on next page...

Horse Head continued...

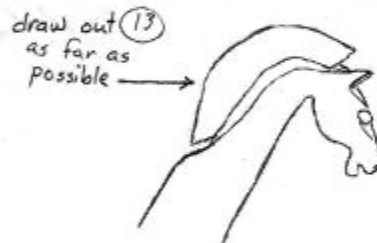
STEPS 9 and 10: Heat the neck area (careful of the ears!) and quench the nose end almost to the ears, then place the nose in the vice, hardy hole, or any other thing that will give you leverage, and bend the neck into a graceful curve. If you don't quench the face, the bending process will mess it up.



STEP 11: To make the mane, use a sharp chisel to cut the neck from just behind the ears to almost the thick end of your neck taper. You should keep the face portion of the head off of the anvil for this, so you don't crush or distort the side of it while cutting or drawing out the mane. Cut between 1/4 and 1/2 the width of your bar. If you cut too close to the edge, the mane will shear off when you draw it out; too close to the middle and you'll have trouble drawing the mane out long enough to cover the cut.



STEPS 12 and 13: Use something to open the cut so you can draw out the mane with a fine cross-pein hammer. I use a small ball punch to push the material far enough that I can hit it with the hammer. Hammer it with the pein parallel to the neck, and get it as thin and big as you can manage.

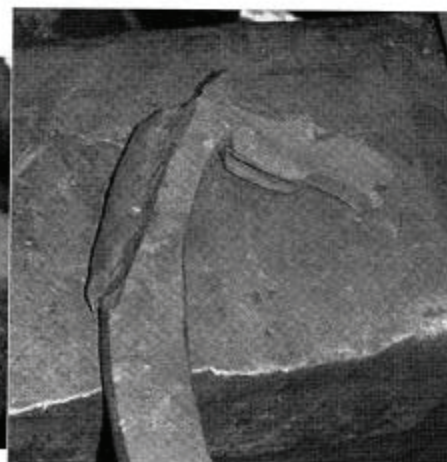
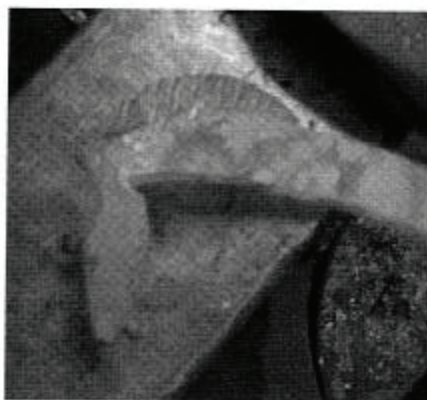


STEP 14: Turn the head over, and with only the mane on the anvil, hammer radially around the mane with the same fine cross-pein, to make hammer marks to represent the hair of the mane.



STEP 15: Now fold the hammered mane over the cut side of the neck, hiding the area the mane was cut from. If the other side of the neck still has enough corner left to bother you, file or sand it to a rounder contour and reheat to oxidize it to match the rest of the head. Because the mane stretched when you drew it out, there should be some folds in it, which is a good thing. Try to tap the front point of the mane over so it lays between the ears (as close to a forelock as you're going to get), and if the other end is sharp, which it almost certainly will be, be sure to tap it down so it touches the neck and won't cut anyone.

The horse head looks good whether you hand brush it or power brush it. Just apply your favorite finish and you're done!



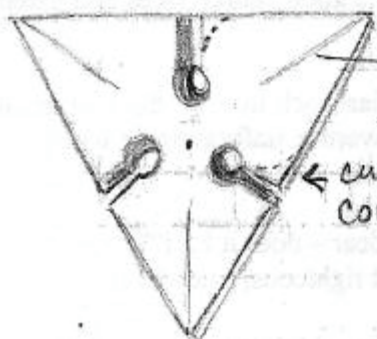
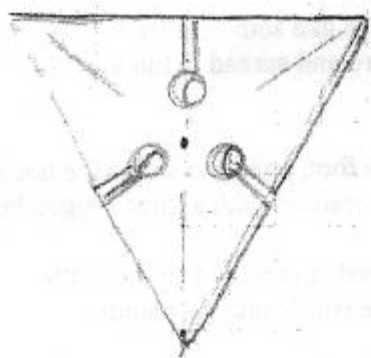


Sketch Book

Candle holder

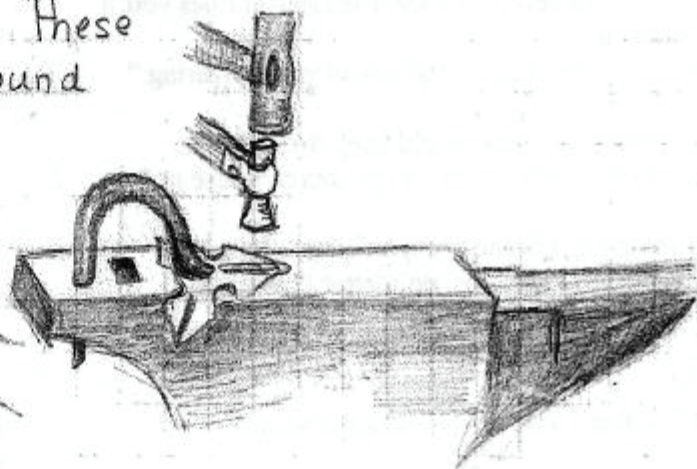
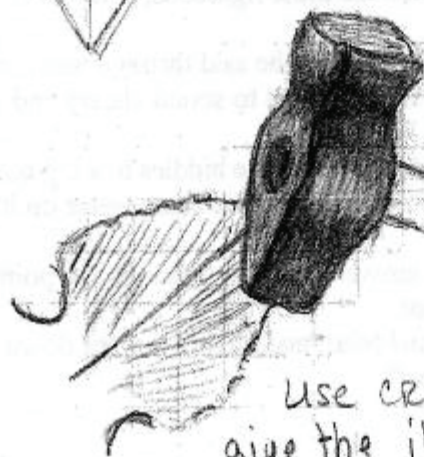
By Diana

By Brian Gilbert



chisel lines in cold, then heat and deepen

← cut or file these corners round



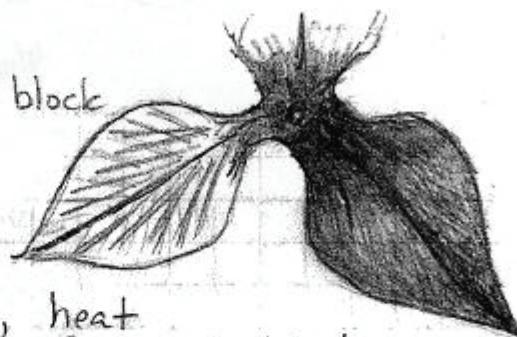
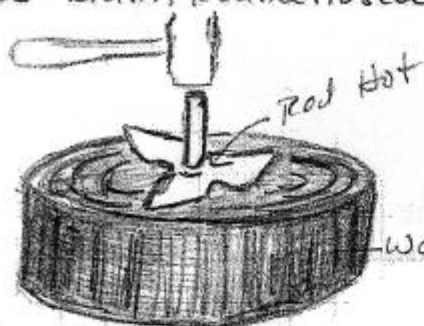
use cross pien to texture each leaf. helps give the illusion of veins and also scallops.

the edges of the leaves some.

next form center using a wood block as backup

Heat center,

Place blunt, round nosed punch in center, and form a shallow bowl.

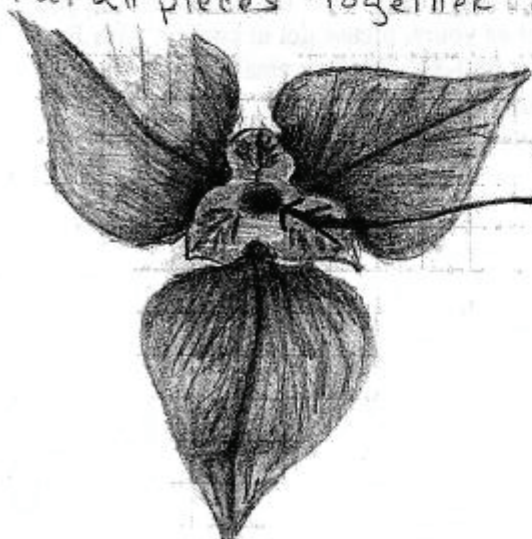


next: keeping center cool, heat each leaf and using edge of wood block curl ends over

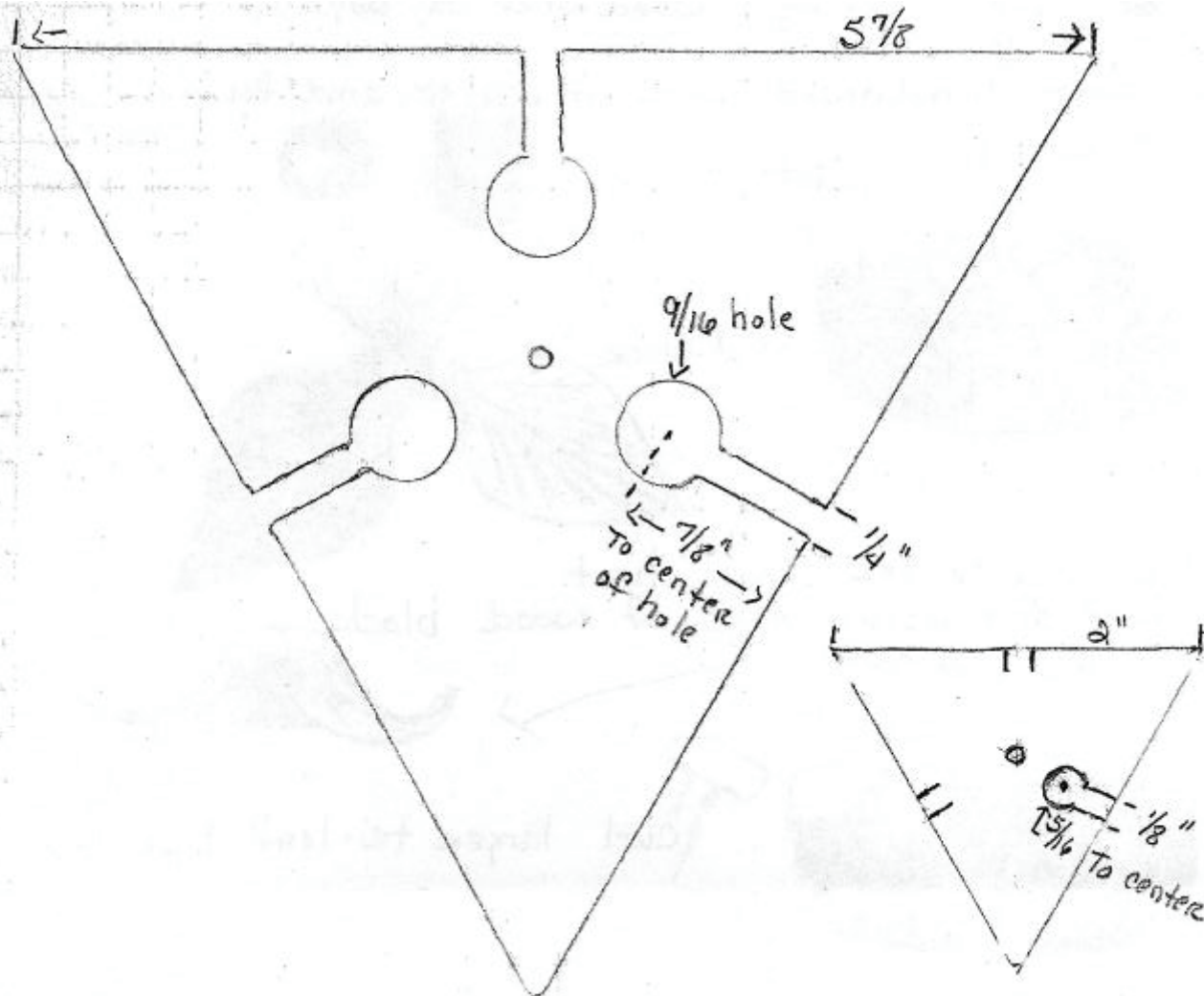


curl larger tri-leaf tips up

Repeat each step on small, tri-leaf part. curl tips of each leaf on the small tri-leaf down. They should be placed between each of the large leaves when assembled. Put all pieces together adding the candle cup and rivet together.



Make sure to rivet it tightly so they don't move.



Williamsburg Paraphernalia

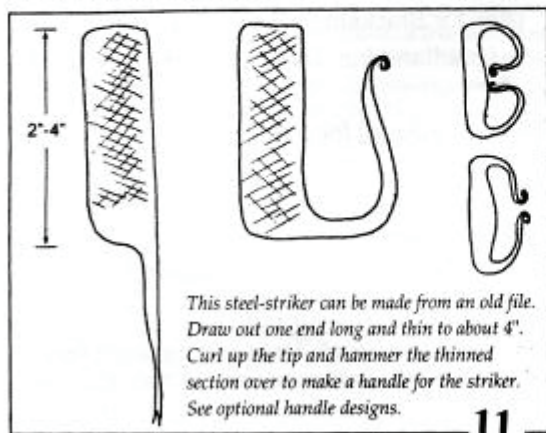
by Jay Close, *The Blacksmith's Guild of the Potomac, Summer 1992*

A tinderbox would usually consist of a small tin box of about 4.5" in diameter that held tinder. Tinder was often charred linen cloth. The tinderbox also contained a steel striker, a piece of flint rock, two covers and a candle holder with candle stub. A small amount of tinder was placed in one cover. The spark caught by the tinder was transferred to the candle. Tinder was quickly

extinguished by the two covers to save as much tinder as possible. The lighted candle stub then supplied the wanted flame.

The teeth of a file will produce a nice spark when struck against a piece of flint. The striker can be made in a range of sizes from 2" to 4" long. Fit it to match the size of your tinderbox or the size of the user's hand.

Harden the striker by heating it in a quiescent fire until a magnet won't stick. Quench the face about $\frac{1}{4}$ " back, and set it aside to cool. Do not draw a temper. The harder it is, the better it sparks. High carbon steel of about 0.95% carbon becomes nonmagnetic around 1350-1475°F when the steel is a dark to medium red. Quenching the striking face in water at this temperature will harden it. Quenching only $\frac{1}{4}$ " of the face and allowing it to cool to ambient on its own allows the residual heat in the rest of the striker to draw a partial temper on the face. It will also keep the handle portion in an annealed state. Quenching the entire piece would require tempering the handle to keep it from breaking. ♦



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