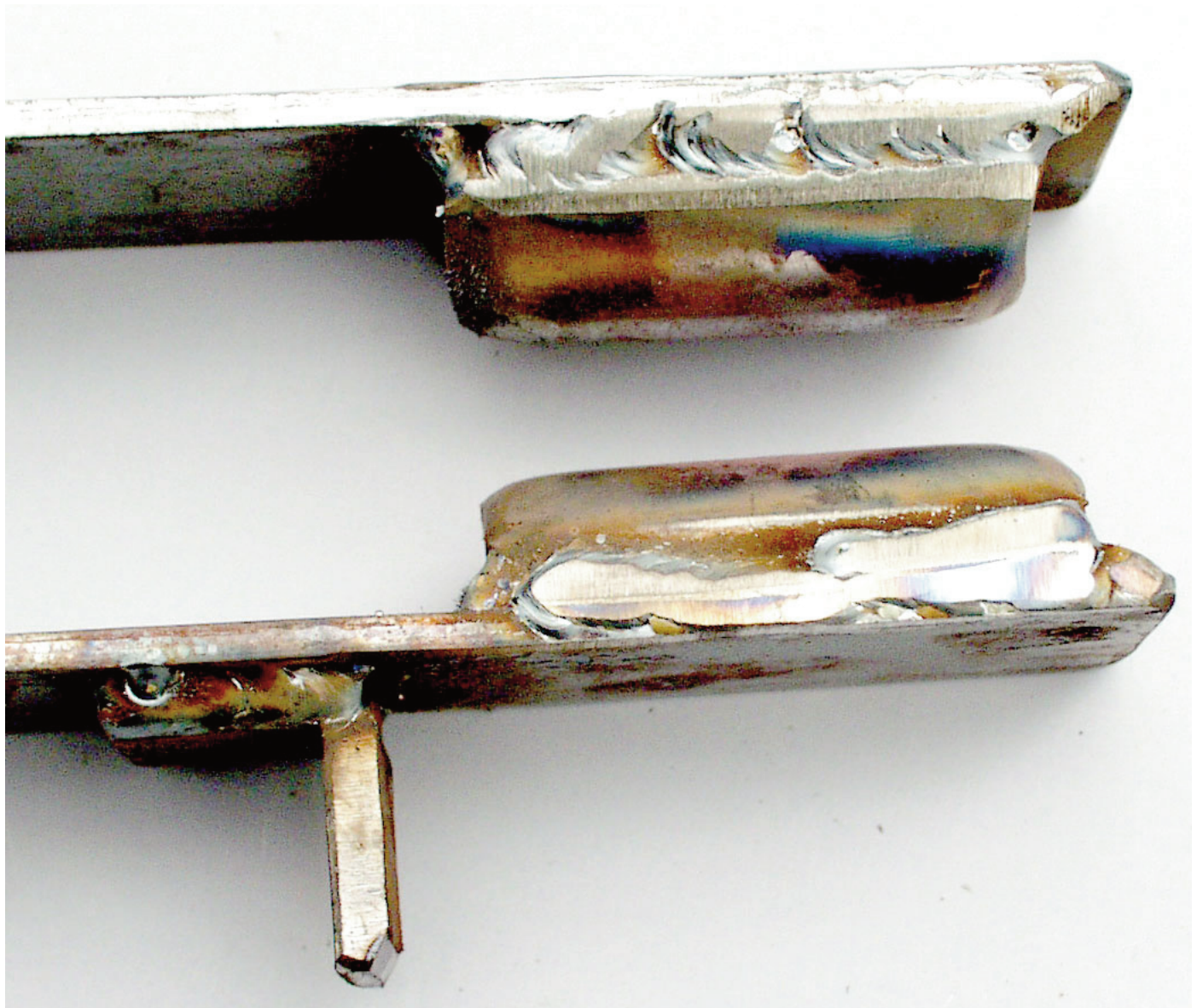


Tire Hammer Tools

May 15-16, 2009
Clay 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.

Flatter



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

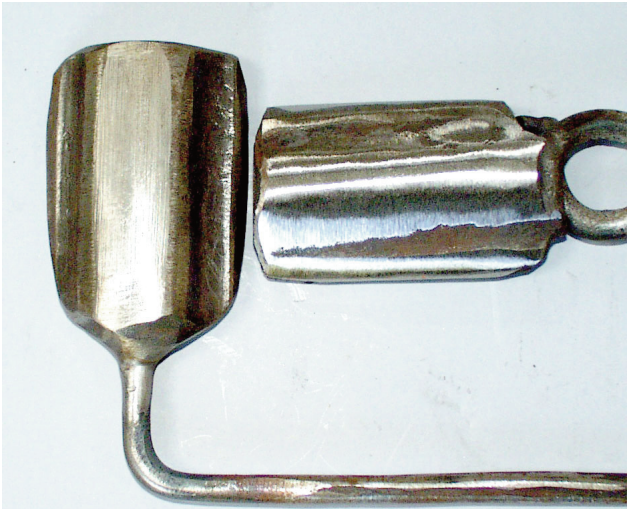
This tool wraps around the bottom die and clamps spring swages, fullers and other tools to the die. A 1/2"-13 nut is welded to the 1/4" x 1" wrap around



strap and a bolt with a 3/8" x 6" long cross bar is welded across the bolt head. 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

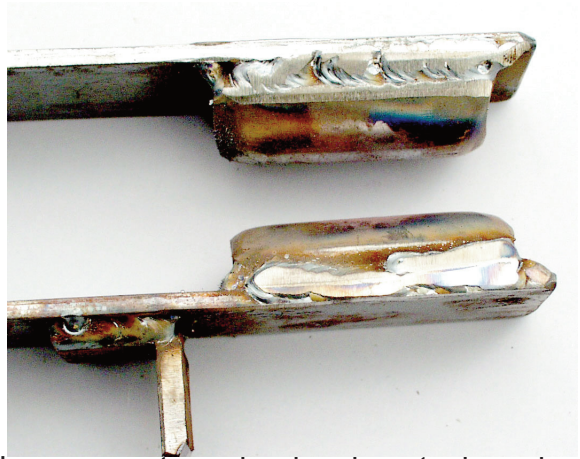


such as spring, axle, jack hammer or 4130 should be quenched and tempered. About 2" wide x 2"-3" long x 1/2" to 3/4" thick.

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 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 size 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)

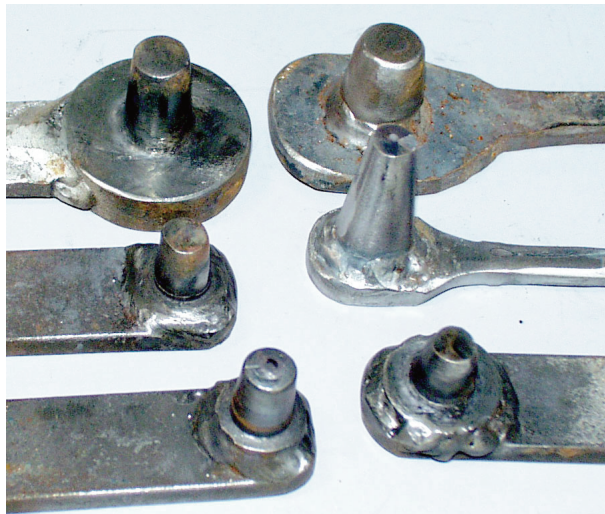
Two 3" lengths of 3/4" round spring or W-1 are welded to a 32" length of 1/4" x 1" mild steel. If you insist on hitting cold metal then quench and temper the fullers. Use this fuller to make decorative fullers or neck



down stock, isolate a section of stock, reduce size in a small area. May be used on two or four sides

Punch, bolster plate

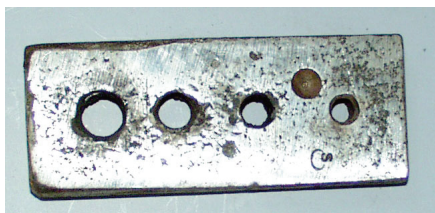
Punches could be any of the tool steels but I prefer high carbon steels that may be cooled in water. H-13 is best for hot cutting but will upset if hit too hard. Taper and grind to the punch size desired (keep as short as possible) then cool and saw off. Tack weld to a paddle handle made from 1/4" x 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.



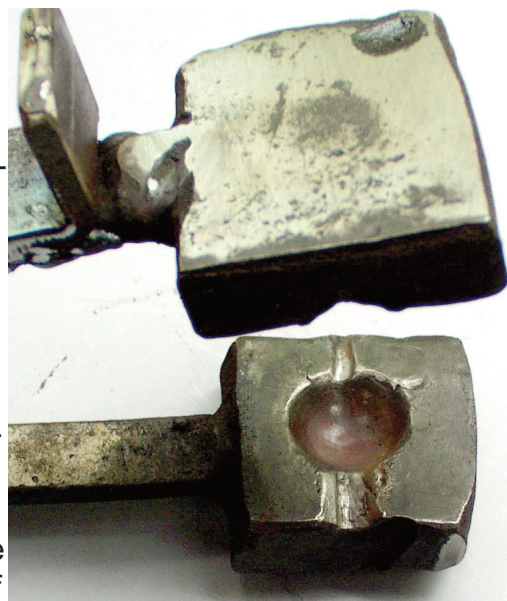
Turn stock over, place over appropriate size hole in bolster and drive slug out. You may use a longer larger punch over a taller bolster to enlarge the hole.

Use a bob punch on both sides to smooth out edges of the hole.

Ball Swage, 1" diameter

This closed 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 swage closed. If

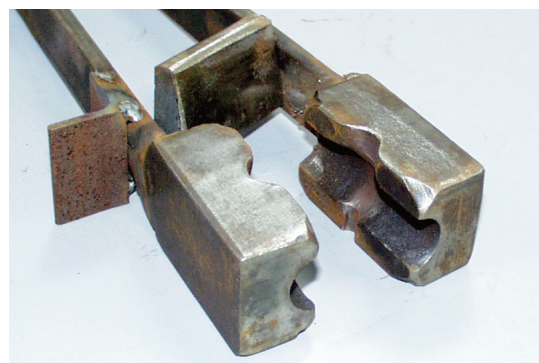
you can detect any difference in the color of swage blocks, start with hottest swage on the bottom. After 3 or 4 blows turn the swage upside down. Continue hammering, turning over, reheating as necessary until swage blocks are closed over ball.

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 realine 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 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. 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 blocks 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

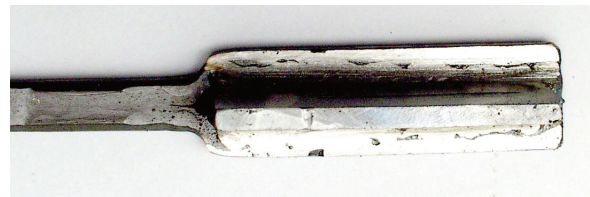
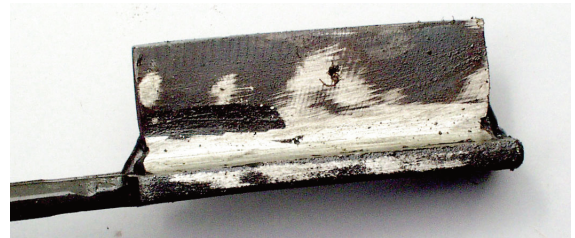
the center of the paddle of a paddle handle. No heat treat required. Do NOT allow ball to be hit with hammer die or you will have a permanent dent.



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" rec-



tangle 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.

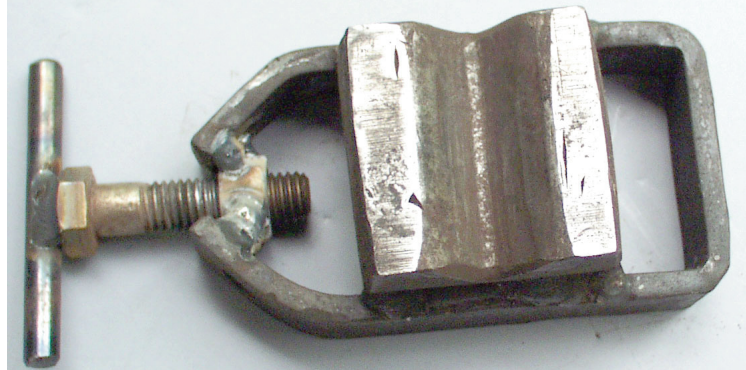


This tool is used to hack off a section of stock and it requires skill and experience to do more than a hack job. Cut 3/4 of the way thru with the hack then rotate the stock 180° and place the snapper exactly over the cut made by the hack and hopefully knock out the slug cleanly. Be careful that the 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 re-



quired. 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.

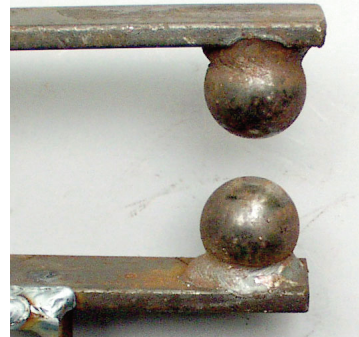


These dies have a small, elongated contact area so they are like a heavy ball peen or a heavy narrow cross peen. Lot of force on a small area moves the metal quickly to each side. They are great for leaves or making really wide shapes and can pinch out a spot on an edge.

Another version of these dies uses a domed round die on each side. 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.

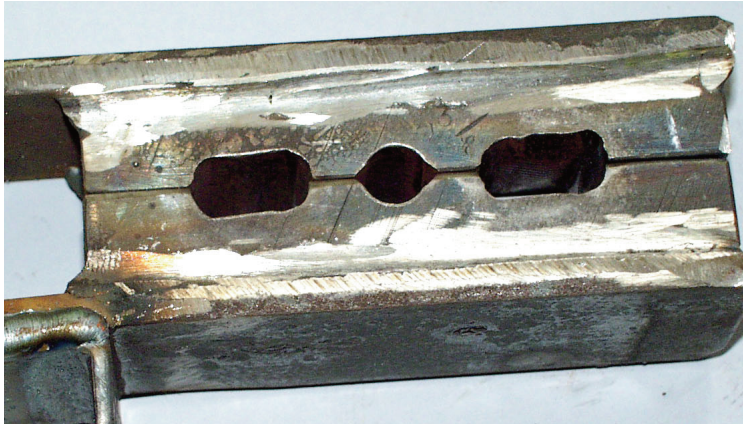
On one of the rectangular holes, grind/file/mill a slope from the front to the rear, 1/2" deep on both pieces at the rear. Widen the slot at the front to 5/8". Heat treat, clamp parts together with a 3/8" bolt or



Ground

As Drilled

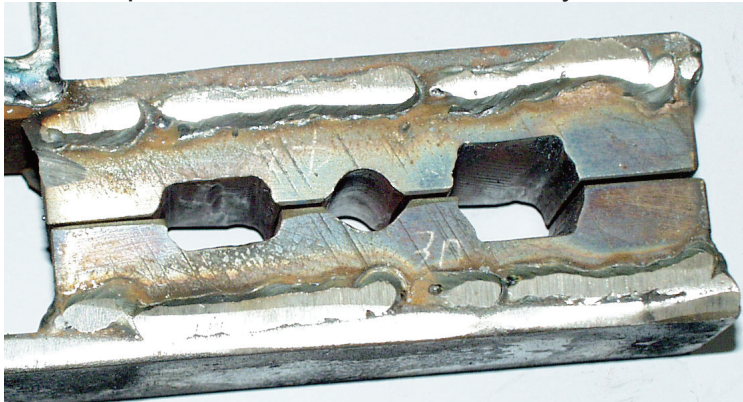
rivet in the center hole and weld to narrow spring. Monkey tool is easiest made from jack hammer bit with a hole through it. Cut a 3" length, Face ends in a lathe or by carefully grinding and checking with a square. Drill $\frac{3}{8}$ " hole at least $2\frac{1}{2}$ " deep. Drill in a lathe or hold vertical on a drill press. Chamfer the edge of the hole. A $\frac{1}{4}$ " 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



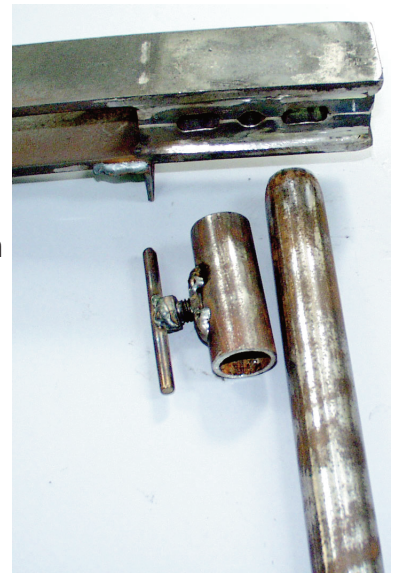
jack hammer steel may be too hard to drill. Heat above critical and cool slowly in ashes or vermiculite to anneal.

Make a tenon shoulder stop from a 10" and a 3" length of $\frac{3}{4}$ " pipe. In the 3" length, drill a $\frac{7}{16}$ " hole at the center. Center a $\frac{3}{8}$ " nut over the hole and weld to the pipe. Weld a 2" length of $\frac{3}{8}$ " round stock to the head of a 1" long $\frac{3}{8}$ " bolt head.

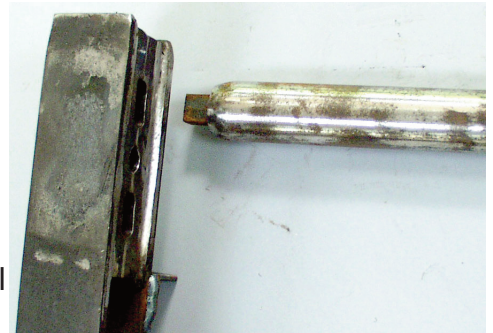
Mark a spot on the side of stock where you want the



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 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 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 $\frac{1}{2}$ " diameter hole, H-13

On the end of a length of $\frac{3}{4}$ " diameter H-13, forge a tapered point about $\frac{5}{16}$ " thick x $\frac{3}{4}$ " wide x $1\frac{1}{4}$ " long. Grind point to U shape or slightly pointed U with sharp edges all around tip and sides. Cool and saw off at $1\frac{1}{4}$ " 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.

Cutoff Tool

Cut/forge 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.

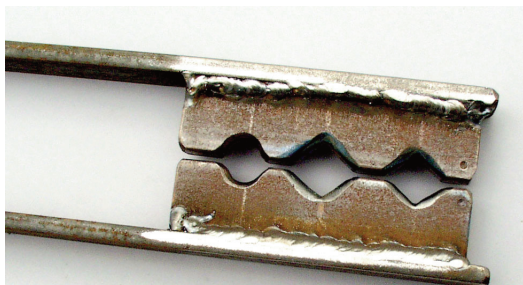
Heat treat if required, preheat and weld to narrow spring. Be sure cutting edges are aligned.

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.

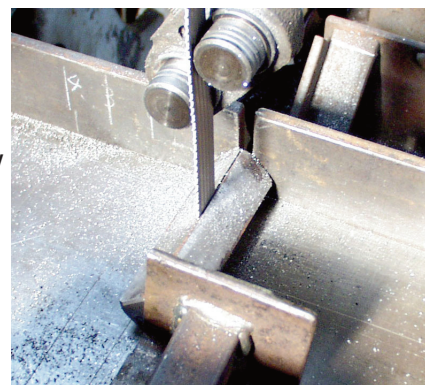
You can make two necks about 3/4" apart so that it resembles a ball. You can heat one or both necks with a torch, hammer end of the pipe and hide the necks.

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 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 to 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.



1 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. Di-



ameters range from 1 /4" to 2" or 3". Half round are made in a bottom round swage.

Texture Tools

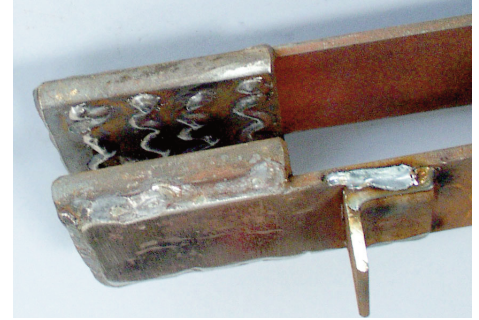
These tools forge a pattern on the surface of stock. Most are made from a small square or rectangle of flat spring about 2" x 3" more or less. It is more efficient to make a spring tool to work 2 sides at one



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 groves 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 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 re-



duce the height.

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 or small round stock.



Curved Hot Cuts and V Hot Cut

Taper a length of spring or H-13 similar to a hack and 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 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 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.

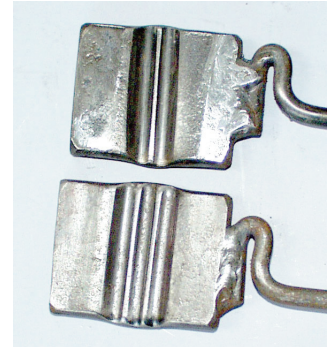


Collar Grooving Tools

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. 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 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.



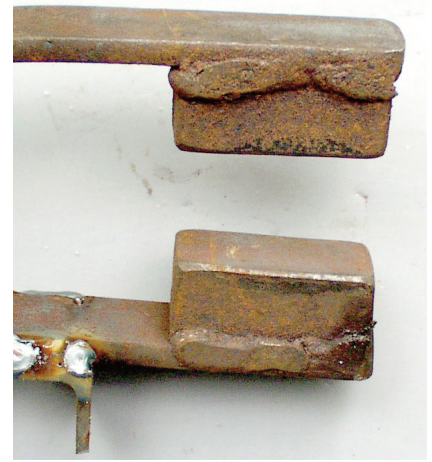
Rope Swage

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.



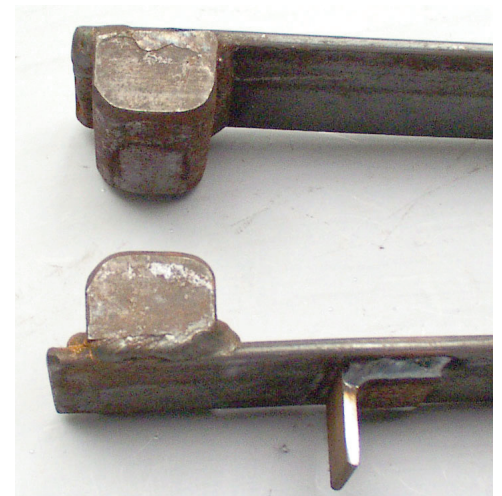
Heat the $\frac{1}{2}$ " square stock and run thru the die with light blows, rotate 90° and run thru the dies on the second set of sides. Continue until dies are closed. Heat the grooved section and twist evenly.

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 as a narrow set of dies for working stock lengthwise.



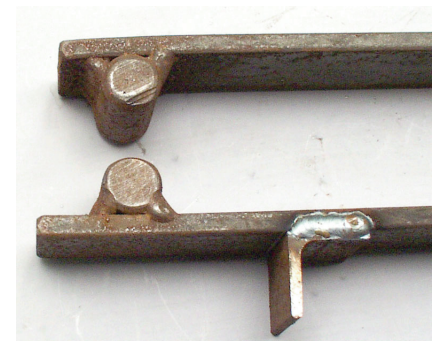
Fuller Swage on Spring

This is for cupping a length of top rail for a handrail.



Round Fuller, Spring, Straight

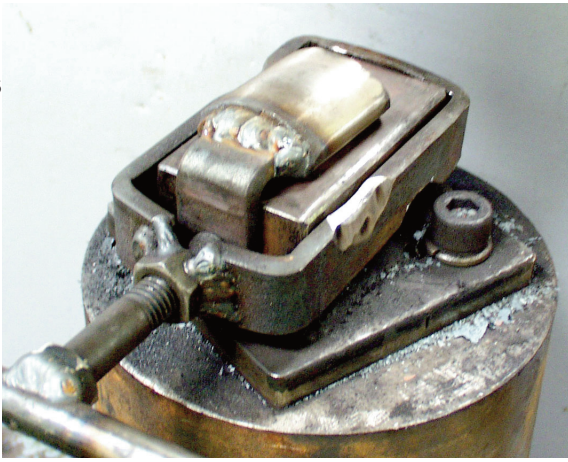
Similar to spring fullers above. Spring or W-1 tool steel.



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 Stanp

A stamp made by Allan Kress.



Eye Punch

Spring steel or W-1



Leaf Vein Die

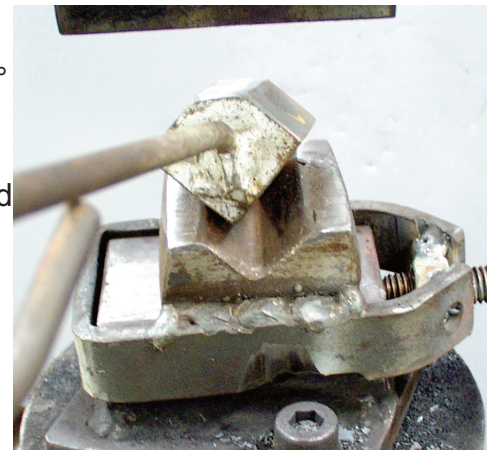
Positive veins can be forged in a leaf blank. Flat spring



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.

