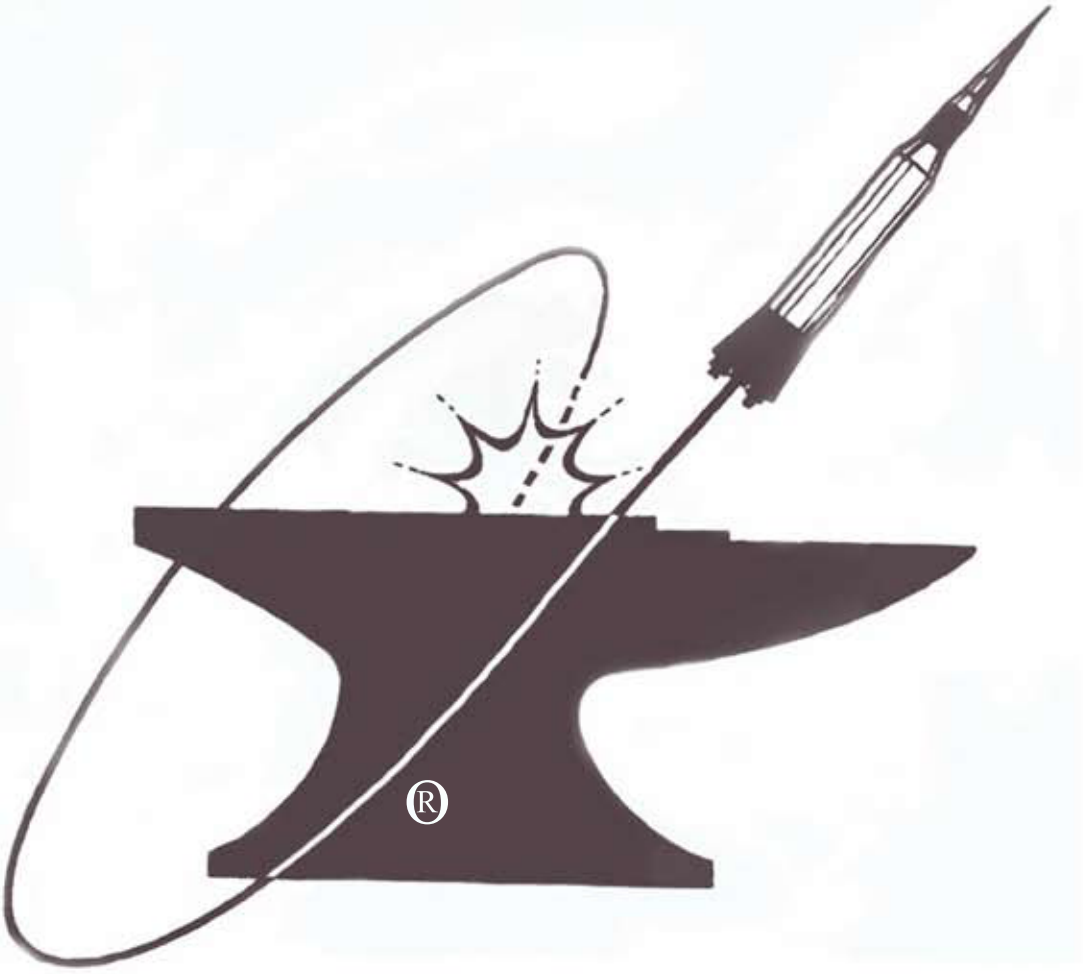
Orange County Blacksmith Guild



It can truly be said that the first rocket to the moon was virtually launched from the face of an anvil

Basic One Lesson Plan

VER DEC 2016

CHANGE TO PAGES 4,6, AND 17

Index

Orange County Blacksmith Guild

We have tried to present these projects in a way that will keep the lessons interesting. You will spend a little time working through the basics of blacksmithing, make a few tools in one lesson that will be used in another. This Project package is a combination of lessons borrowed from Dave Vogel's Basic I classes in Vista, some home grown drawings, and files from ABANA's web site. You are encouraged to look at the CBA web site, resources, techniques for training and ideas. ABANA also has a Controlled Hand Forging section part of which is included here.

Safety

In Santa Ana, the First Aid kit is located in the wooden cabinet just inside shop on the left.

The nearest clean water is in the restrooms.

Nearest urgent care center information is located with First Aid kit.

Safety Glasses are required

Use impact resistant lenses with side shields.

Ear Protection is your option, but recomended

Clothing

Synthetic materials can melt to your skin when near hot metal, or flame. Wear cotton or wool clothing. Loose rolled up sleeves, or turned cuffs on trousers, are good for catching flying hot materials. Steel toe shoes with a thick sole are a good investment. Aprons will save clothing.

Look over the shop area

Note locations of fire extinguishers, slack tubs, exit doors. If you see a safety issue, tell the instructor. If it needs immediate attention, and you can do so, take care of the issue. Be careful and watchful for others in the blacksmith shop. Hot metal should be treated with great respect. If the shop is crowded and you have a need to show your work to an instructor, set it on the forge, and have the instructor come to you, don't carry a piece of hot metal through a crowded shop.

Burns or Injuries

Inform your instructor of any injuries.
Burns are common in a blacksmith shop.
If you should get a burn, immediately cool it in the orange water buckets or wooden slack tubs placed around the shop.
Cool water will draw the heat away from the burn.

Read the ABANA Safety, Ergonomics, and Shop Layout section before beginning any lessons.

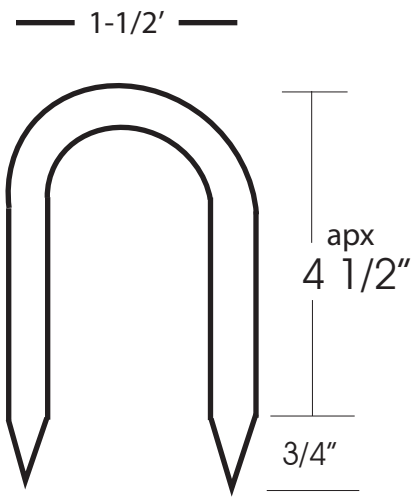
Staple

See lesson 1, 3, & 4, of ABANA Controlled Hand Forging for tips.

Material:

3/8 " round x 11" hot rolled steel

Instructor will get you started



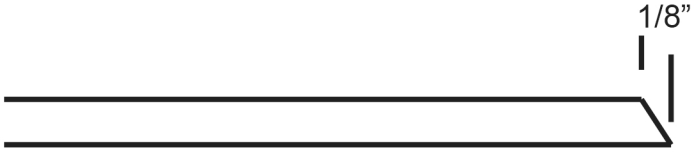
Each end should be drawn to a short square taper
Then taken from four sides to 8, and 16,
and then round.
Show your piece to the instructor between each step
Both ends of the staple should be the same length
One longer would be correct for a staple, but not require as much skill and understanding about moving the metal.

"S" hook

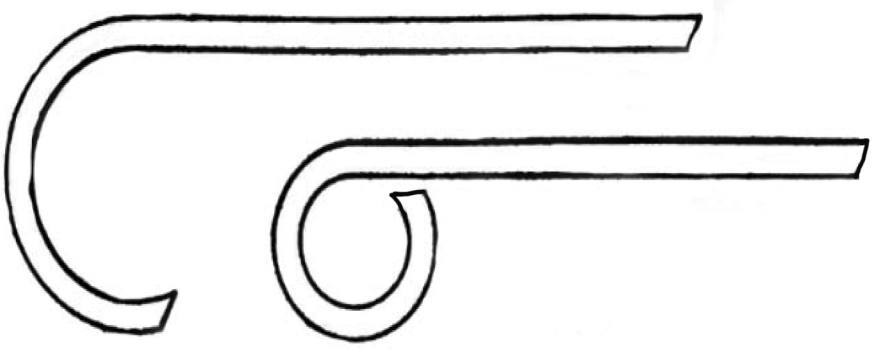
Material:

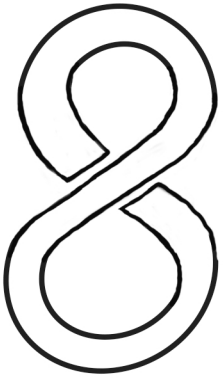
3/8" x 11" hot rolled steel

Bring end to bright orange heat and hot file slight angle on each end of piece about 1/8" in on one side.
Think about how the each end should be made to give you the desired gap when the hook is completed.



ABANA Controled Hand Forging tips lesson 15 will show how to work over the anvil horn





Do NOT close the loop.

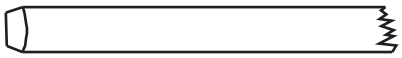
Hot Cut Chisel

Material:
apx 5/8” x 8” of coil spring from car or truck.

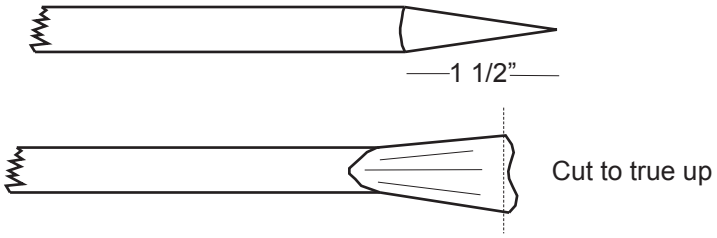
Heat to low yellow and straighten, This is a higher carbon steel, forge between yellow and red to avoid fractures in the metal.

Heat and hot file to remove rag edge, upsetting may help.

Heat and forge a short taper on the striking end.



Heat to low yellow. Forge flat taper on face of anvil.
Forge evenly on both sides.

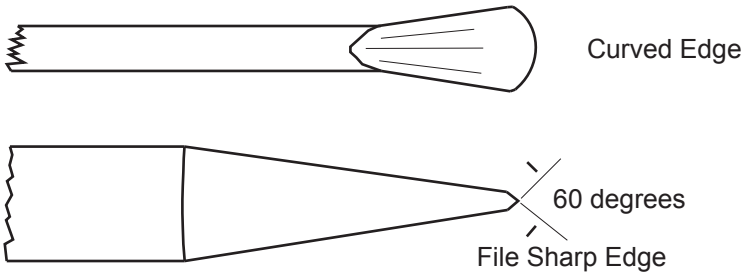


If needed, heat and hot cut to straighten cutting edge.

Heat to low yellow, forge both sides evenly to

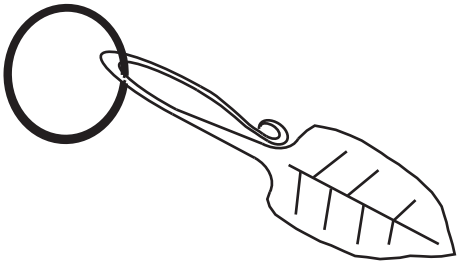
achieve nice shape

Heat and hot file to shape edge and let cool.
Cold file to smooth and shape sharp edge when metal is cool to touch



Follow heat treat info on page 19
Temper to straw color

Leaf Key Ring



Material:

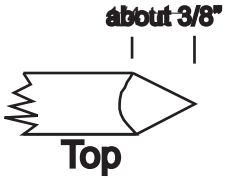
3/8” round hot rolled steel.

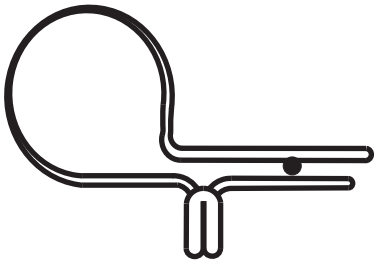
Spring fuller and rounded chisel made in previous lessons.

To make the point, heat to high forging temperature of yellow/white.

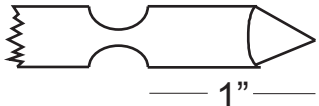
Forge to a very short, sharp point.

Short Shart point



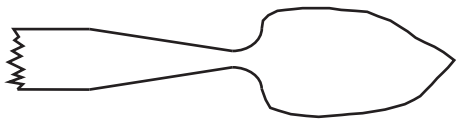


Fuller a 1/4” stem for the leaf, using the spring fuller begin one inch from point.



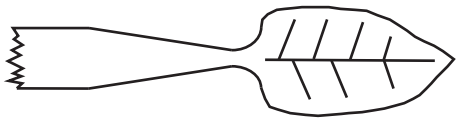
Heat and draw stem away from leaf using far rounded edge of anvil.
This point becomes the week spot, keep it hot when working on the rest of the leaf to avoid craking off.

Heat and forge to form leaf. Hammer at slight angle to leave leaf thicker in the middle. Work to acheive a natural shape. Do not hit tip.



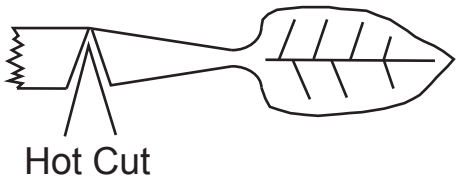
Heat and using your hot cut chisel form veins on one side of the leaf

* Don not do this directly on face of anvil, use metal plate on anvil face and save anvil face from damage. You may need some assistance holding the piece



Heat, with the vein side down, form a natural curved shape by using ball pein to hammer against wood stump or swedge block

Heat and cut at point just where the stem ends using hot cut hardy tool.

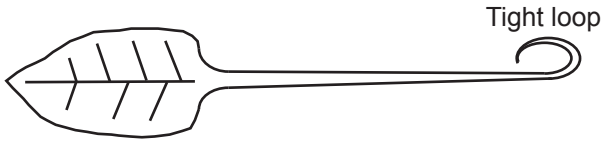


Heat and draw stem to 4 sided 3/16” square, with a small point.

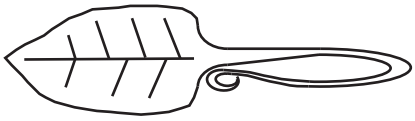
Take 3/16 square to eight sides, then 16 sides, then to round.

This small size will heat quickly, don’t burn it

Heat, with point over the edge of the anvil to hammer a small curve
Turn over and hammer toward you to bring the curve back into a small loop



Heat, and quench tight loop end, before forming larger loop for key ring.



Wire brush and apply hot wax finish, see index for hot wax information.

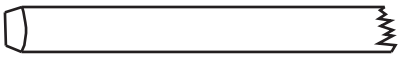
Square Punch

Material:
apx 5/8” x 8” of coil spring from car or truck.

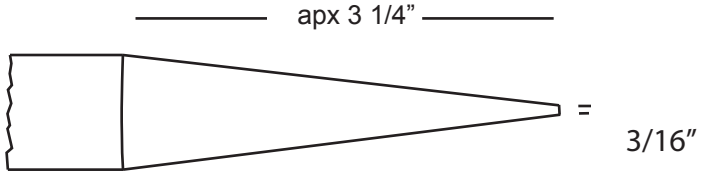
Heat to low yellow and straighten, forge between yellow and red.

Heat and file to remove rag edge, upsetting may help

Heat and forge a short taper on the striking end.



Heat to low yellow. Forge taper on face of anvil.
Keep square drawn out to apx 3/16”
Forge evenly on all sides.



Air cool, cold file end to short point.
Smooth and prepair for heat treat.

Follow heat treat info on page 19
Temper to straw color

3/8” Nail Header

3/8” refers to the size of the round stock used to make nail.

Material:
Apx 5/8” or larger x 8” piece of carbon steel around 1050 carbon content. A piece of coil spring from truck or car will also work well.

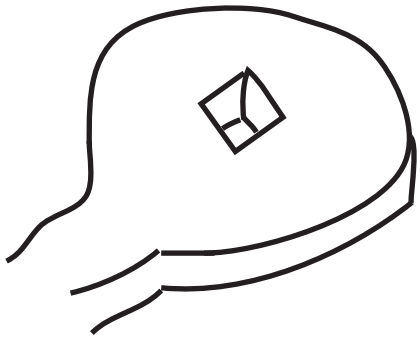
Heat to bright orange and straighten.
Heat and hotfile to clean edges.

Heat and UPSET about 1 1/2” of one end until close to 1”
(see upsetting in ABANA’s Control Hand Forging)

Flatten the upset end to about 3/8”, NO LESS.
Square off the remaining metal to create handle, leave edges slightly rounded.

This should give you an area about 1 1/2” x 3/8“ to be used as the header.
We are using 3/8 round stock for our nails, so the square hole needed to make the head, must be 1/16” smaller, or 5/16“.

Using the square punch made earlier, punch a hole in the center, making sure the larger side is no bigger than 5/16” Take your time. This will take several heats, repeatedly quench punch to keep shape.
You are pushing the metal out from of the center of the piece. Check bottom, and hammer back any high spots, repeat the process. Bottom side of nailer should be flat with header end. Punched hole will be slightly larger on the top of the nailer to allow removal of finished nail.



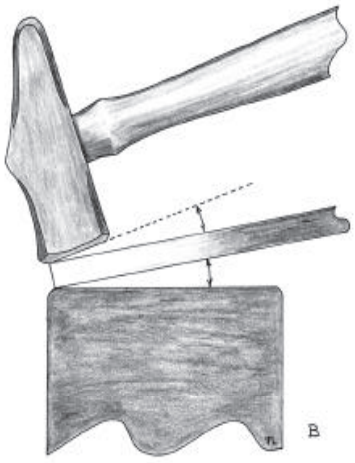
Air cool, cold file to smooth.

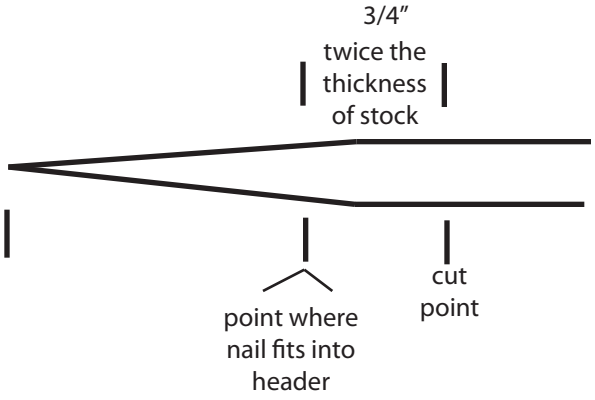
Making a Square Nail

Nail header made in basic one is a 3/8" nail header.
3/8" refers to the size of the round stock used to make nail.
Making nails helps develope hammer control and hand eye co-ordination.

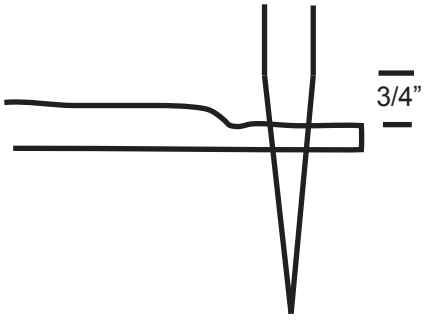
Material:
3/8" round hot rolled mild steel, is used to make nails.
Use any piece of 3/8" round stock 3 or more inches long.
Tools:
Hammer, 3/8" nailer, hot cut that fits hardy hole in anvil.

Start with a taper apx 1/2" from end, pushing metal out to tip as you taper.
This will help to keep the heat in the piece as you work.
See ABANA's Control Hand Forging for tapering help.
Taper to apx 1 1/2".





Fit taper into nail header, and mark or just mentally note 3/4" from the point the taper fits in the nail header. 3/4" is twice the size of the 3/8" stock being used.

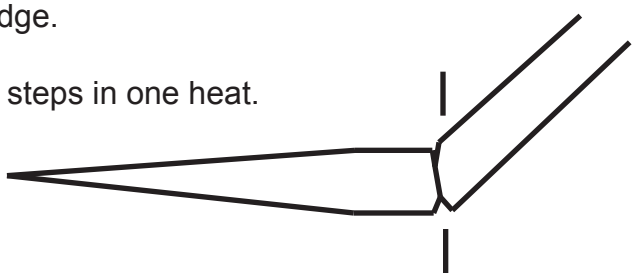


Making a Square Nail

Using the hot cut in the hardy hole, cut all around the piece about one third of the way thru. Rolling the stock along the edge of the hot cut to help stay in line. Be careful not to cut thru.
This may take some practice.
While still hot, put tapered end in pritchel hole, to just above the cut, bend at the cut to about a 45degree.

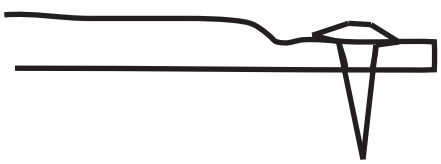
QUENCH hot cut to help keep edge.

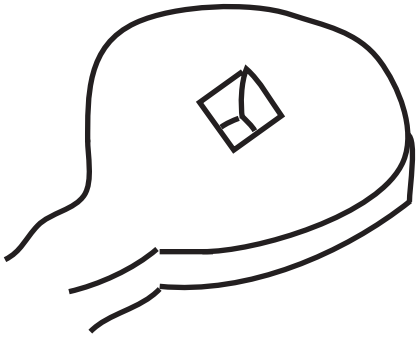
With practice, you can do these steps in one heat.



Heat piece to a bright yellow in fire with bent section in the fire's hot spot and small tip pointing up and away from heat to avoid burning the small nail point.
Next few steps must go quickly to work with the heat and complete the nail.
Pull in nail header and twist to break off at cut.
With nail in header, set header over hardy or pritchel hole and squarely hammer or upset the end to make the nail head.
Your first few hits will determine how well head is centered on nail.
When head is shaped, turn header over on anvil face to cool head slightly.
If done hot, nail head will cool and shrink slightly, turn nailer over and tap nail on anvil, it should be loose and you are finished.
If nail is not hot enough when upset, it will stick in nailer, and if repeated may shorten nailers life.
If this happens, put nail in vice, with header about 1/8" above vice, and tap on header to drive header down and loose of nail.

Make 12 good nails for instructor.



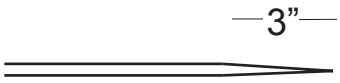


Basic I Projects

Fire Place Poker

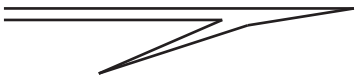
Material:
3/8”round x 36” hot rolled steel
Borax to forge weld

Heat Tip and draw to a sharp 3” square point
Take to 8 sides, then 16 sides, then to round.



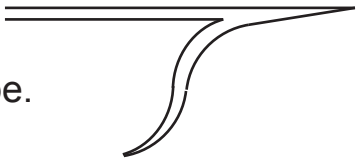
Layout 4”, heat and bend over 180 degrees

Forge weld to form solid tip at bend.
Heat to yellow, wire brush to remove scale.
Apply Borax to melt and coat area to be welded.
Heat to bright yellow welding heat, assure that both pieces are the same color or temperature.
Avoid burning.
Quickly close weldwith rapid “LIGHT” blows. Reapply Borax and repeat welding to assure secure weld.



Heat to yellow high forge heat.
Draw to sharp point, square, 8 sides, 16 sides, and then round.

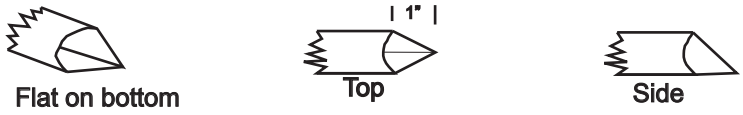
Heat to yellow and bend to a pleasing shape.



Hammer some texture to the shaft to with in aproximately 12” of the unfinished end.

Heat tip of opposite end to make handle

To make the point, heat to high forging temperature of yellow/white.
Forge to a short, sharp point by hammering on THREE sides.



Layout 6 ”mark, heat and bend 180 degrees

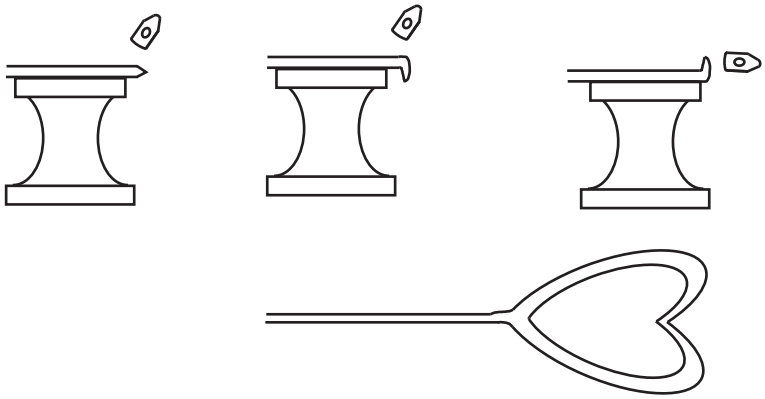
Forge weld closing weld starting at thick end of scarf and working to close tip with quick LIGHT blows.
Heat to yellow and forgeweld to blend to a smooth taper.

Heat tip of loop and forge to a SHORT square point.
Do not loose material thickness.

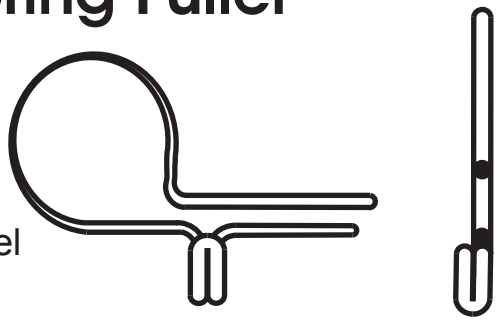
Heat entire loop including weld to a yellow heat.
Spread loop with chisel and anvil horn.
Open to about 2 ”.

Heat entire loop including weld.
Bend tip of loop over anvil and twist into loop to form a heart shape.

Heat and twist to align heart with flat surface.



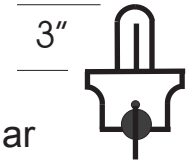
Spring Fuller

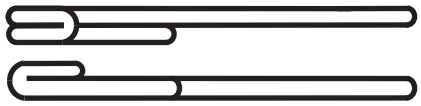


Material:
1/2” round x 30” hot rolled steel
Mark 10” from one end

Heat and bend 180 degrees at 10” mark. Verify fit to hardy hole oriented along the length of the anvil. Take care not to over hammer.

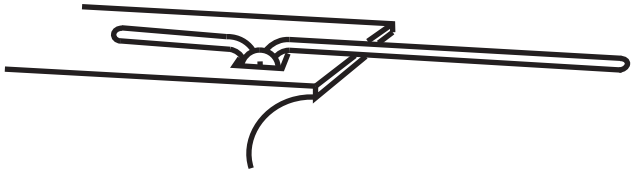
Heat and clamp in post vise with 3” of bend exposed.
Strike and bend exposed metal 90 degrees or more.
Move to anvil and complete 180 degree bend perpendicular to the first bend.
Verify to fit hardy hole.





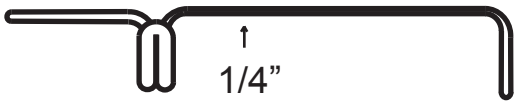
Heat and locate material in hardy hole with top of bend flush with face of anvil. Bend both pieces 90 degrees to lay flat on the anvil and in a straight line, with the shorter end facing the horn, and the longer end hanging off the tail.

Take care to avoid flattening the round shape.

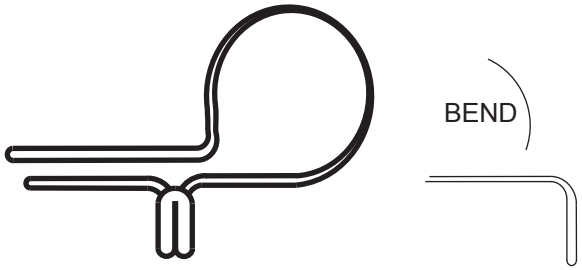


Mark 5-1/2” in, form longer end. Heat and bend down 90 degrees at 5-1/2” mark as shown.

Heat and flatten to 1/4” thickness to reduce stiffness between hardy boss and final bend.



Heat and bend the thin section in a loop to acheive a roughly 3” diameter circle. Leave upper leg projecting 1/2” longer than the lower leg.



Heat and align the legs to be aproximately 1/2” apart and parallel to each other. Work boss to fit securly into the hardy hole.

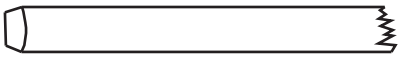
Hole punch

Material:
apx 5/8” x 8” of coil spring from car or truck.

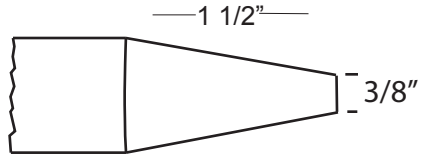
Heat to low yellow and straighten, forge between yellow and red.

Heat and file to remove rag edge, upsetting may help.

Heat and forge a short taper on the striking end.



Heat to low yellow. Forge taper on face of anvil.
Remember 4 sides, 8, 16 and round
Forge evenly on all sides.



Heat and hot file tip to a 3/8 flat end.

Sharp edges of punch are what sheer the metal

Air cool, cold file to smooth and prepair for heat treat.

Follow heat treat info on page 19
Temper to straw color

Heart Wall Hook

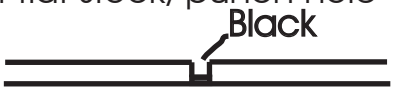
Material:
1/4" x 3/4" x 16" hot roll steel flat stock
Previously made 3/8" hole punch and hot cut chisel

Punches and chisels have been heat treated, repeatedly
quench tips of these tools to keep them so.
Hole punch must have squared corner/edges to cut thru metal

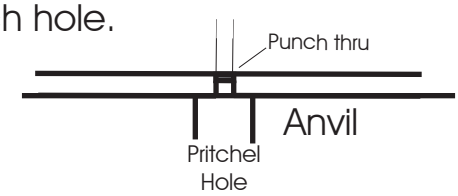
With soapstone, layout 0, 6 and 10 inch marks on anvil face.

This next process should be done quickly, a dry run before heating may help.
You need to quickly find your mark, hold punch firmly on material, and hit it solid.

Heat to yellow heat
Using anvil marks and centering on the 3/4" width of flat stock, punch hole
at the 6' and the 10" mark
Hammer punch into metal until almost through.
The sound of the hit will change when you get to this point.

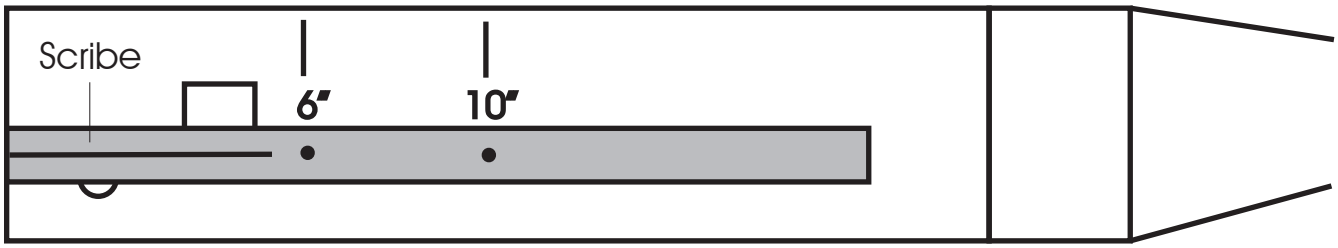


Flip material over, you will see dark spot of punch hole.
Punch thru over pritchel hole on anvil.
Quench punch, watch for mushrooming.



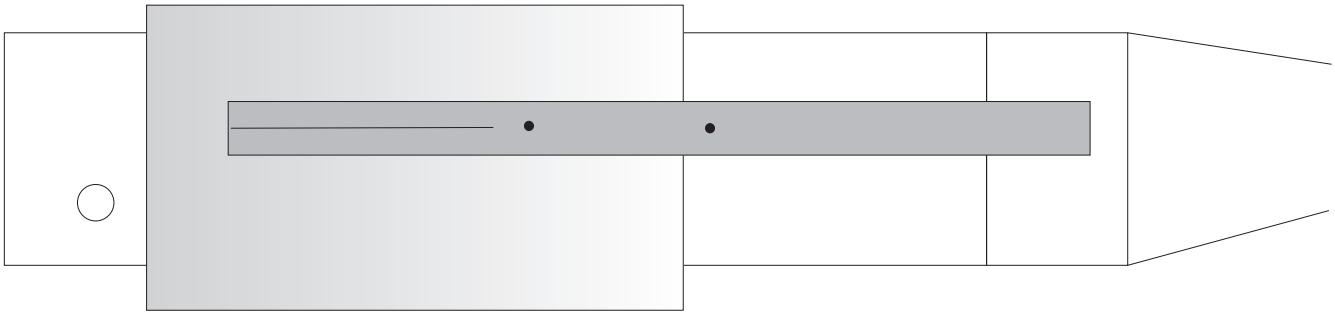
Scribe a line from end, 5" down center of material toward 6"marked hole

Texture edge cold to break machine edges from 6" hole past 10" hole to the end, and 4" up back side.

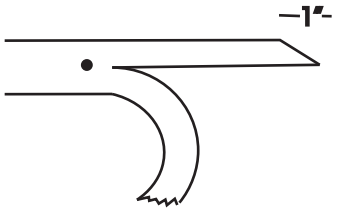


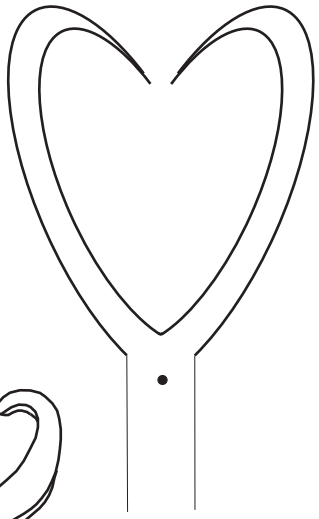
Heat end just marked with scribe to yellow heat.
Use hot cut chisel to cut entire length, but NOT through metal.

The rounded end of the chisel will let you sort of walk the chisel down.
Make a light line down first and follow with heavy blows letting the
chisel follow along mark. DO NOT CUT THROUGH ON THE ANVIL SURFACE.
This may take several heats.
Next, use cutting plate of soft steel to protect anvil.
Cut through, reheat, spread open at cut and file raged edge in vise.
Quench chisel after each use to keep a good edge.

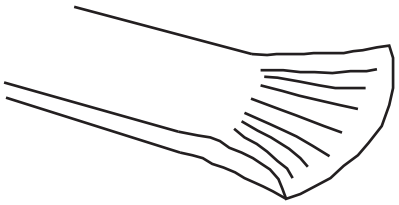


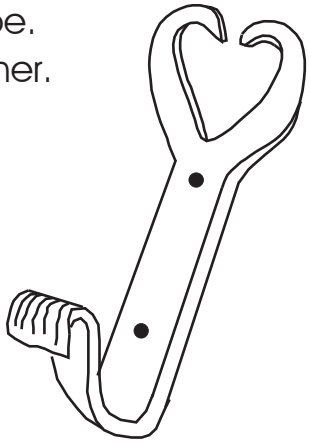
Forge to even up sides to same size.
Form short taper at tip, one side at a time.
Hot file sharp edges.





Work one side at a time to make heart shape.
Forge Fishtail on end using cross pein hammer.



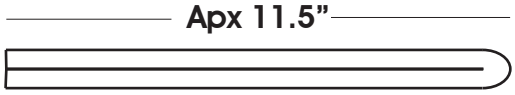


Scroll fish tail end and bend hook

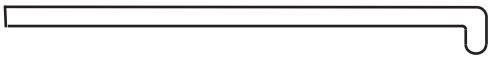
Turning Fork

Material:
1/2"x 24" round hot roll steel

Mark center, heat at center and fold neatly in half.

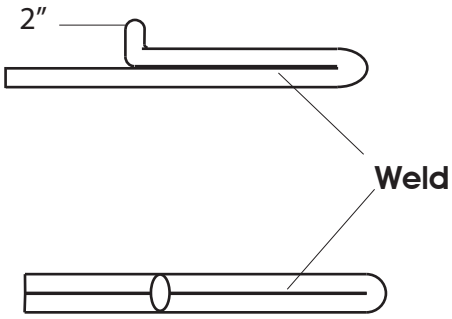


Bend closed end to 90 degree , about 1/2"



Measure 2" from open end and bend over as shown.

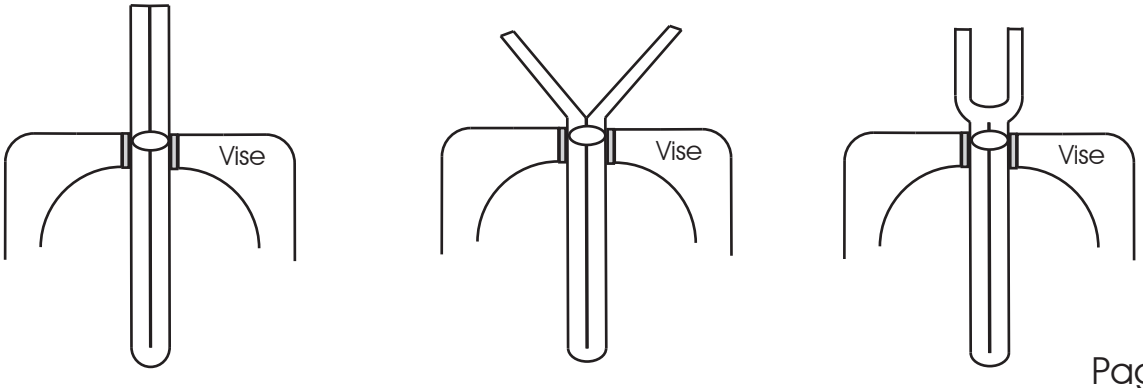
All measruments are approximate



Forge weld all layers.

Forged end may be drawn to fit hardy hole

Heat open end to yellow heat.
Place fork in vice as shown, with only "legs" are above vice.
Pry legs open and shape fork as shown, with apx 1 1/2 "gap.

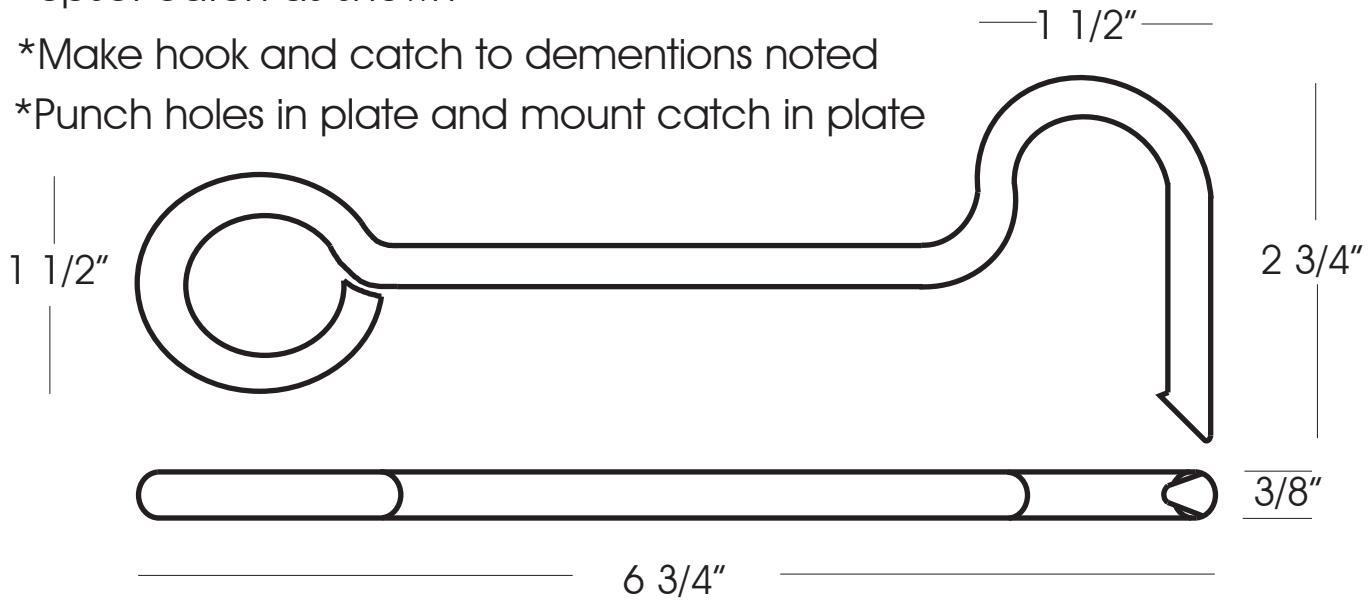


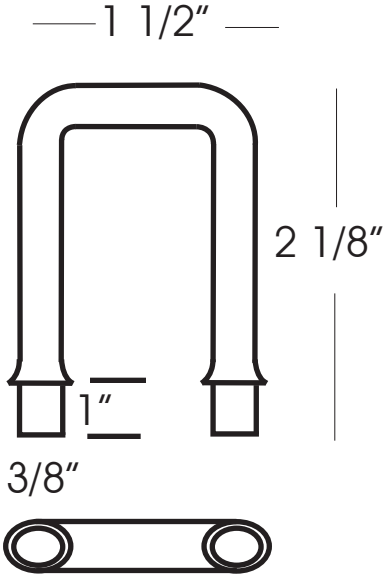
Basic I FINAL TEST Project

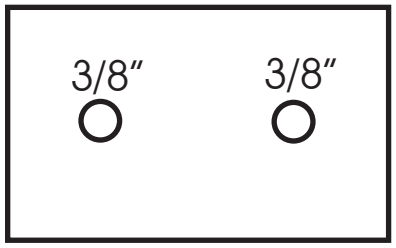
See instructor for suggestions

Farm Gate Hook

*Material needed:
3/8" round mild steel
1/4"x 3"x 1-1/4 "flat stock mild steel
3/8 hole or rivet punch made by student
*Show how to determine length of material needed to make hook and catch.
*Upset catch as shown
*Make hook and catch to dementions noted
*Punch holes in plate and mount catch in plate







1/4 x 3 x 1-1/4" stock

Heat Treating

Normalize
Steel should be annealed or normalized to return it to its natural state.
The section of metal desired, is then hardened and tempered.

Heat to orange heat and then allow to slowly air cool.
Avoid drafts and cold surfaces, if available use vermiculite, or lime.
Allow to cool below 200 degrees.

Harden and tempering
There are a few different methods of heat treating steel. Two are described here.

1.*One is a two stage method taught because it better shows the difference
Between hardening and tempering.
****Harden**
Heat the cutting end to orange and quench in water to cool. Steel is now hardened.
Polish the end with sand paper or steel wool in order to see color changes in next step.
See table to determine desired color. Page 16
****Temper**
Heat the end until you just see a red start to show.
Quench tip of tool in water, allow remaining heat to travel to cutting edge.
Watch color of oxide change, stop color from traveling when it reaches desired
color by quenching tip. Maintain color on edge until heat has left metal, by continuing to quench.

2.*The second single step method works well also.
****Harden**
Heat cutting end to low orange, allow edge and 3" or so to soak in heat.
Quickly wire brush to remove scale.
While still at orange heat quench 1 to 1 fi"of cutting edge into water.
Slightly dip up and down until edge is cool.

See table to determine desired color. Page 16
Temper
Quickly file or sand to expose bright metal
Allow remaining heat to travel to cutting edge.
Watch colors of oxide change from light straw to desired color shown on chart
Quench when desired color appears. Maintain color on edge until heat has left metal, by continuing to quench.

Dressing up
Lightly sand or grind to clean up cutting edge.
Do not allow edge to heat or temper will be lost. Use nearby quench tub.

Tempering Colors

Yellow	420	Engravers, scrapers, razors, burnishers
Pale straw	430	
	440	Stone drills, reamers
Straw or orange	450	Saws for metal cutting
Deep straw	470	Scribes, knives, punches
Brown	480	
	490	Dies
	500	Knives, plane irons, taps
	510	Chisels, twist drills
Bronze	520	Surgical instruments
Light Purple	530	Hammers
	540	Axes, center punches
Purple	550	Cold chisels, stone working tools
Blue	570	Screwdrivers
Dark blue	590	Wood saws, springs
	600	Large saws
	610	Springs
Greenish blue	630	

One of many wax finish formulas

Museum Wax Finish

Materials:

1 cup	boiled linseed oil
1 cup	turpentine
1 teaspoon	Japan driver
2 cakes	beeswax (cake is apx 1"x3"x4")

Caution:
This is a volatile and extremely flammable mixture
Use a hot plate - not an open flame
Mix this outdoors or with adequate ventilation

1) Use a 2 quart sauce pan (not your wives)
2) Add linseed oil, turpentine, and Japan driver to pan, add bees wax.
3) Slowly and carefully heat to melt wax.
   As soon as wax melts - stop heating.
   Pour into small paint can, allow to cool then keep sealed.

How to use wax

Heat piece to 300degrees. Brush wax onto surface
with paint brush or wipe on with cotton rag.
Coating should smoke some.
Allow to soak into surface.
Then wipe away excess.

This linseed and bees wax mixture will cure in 8 hours to form a
hard, long lasting finish suitable for household articles and interior locations.

Material sources:
Home Depot - Japan Dryer, Linseed Oil, Paint Can, Turpentine
Ace Hardware - Bees Wax Cake apx $1.99 (in 2001)