N.J.B.A. Newsletter

NJBA Volume 19, Issue 1 11/05/14
http://njba.abana-chapter.com

Editors Soapbox

News letter is late, so I apologize , I need to get myself back on the old schedule. But its still only by a few weeks this time. Anyone who wants to become more involved in NJBA can, you only need to ask and offer your services, it's our group, the more people that are active the better and stronger we are. If you are interested in helping please contact one of the board members listed on page 2. We would like to welcome Adam Howard back to the board. Adam is now involved with Cold Springs Village in Cape May.

We are working on setting up meets with opportunities to learn, forge or teach others what you know. Come out and chat or get your hands dirty! Let's boost the attendance at the upcoming meets. Larry Brown, Editor

Upcoming events for 2015

We have yet to finalize the events for 2015. We should have this done by the next newsletter and they will be on the web site as soon as we know them, so check occasionally. Below is what we are set up for so far this year.

March 21st - Lightweight anvil stand workshop at Marshall's Farm, Howell, NJ
April 24-26 - A-Day at Delaware Valley College info on page 3
May 3rd - Bevins Day at Peters Valley, Layton, NJ information on page 3
May 17- Walnford Day information on page 4
August first week, Middlesex Co. Fair, Information next newsletter
September 20th - Red Mill at Clinton, NJ information in next newsletter

Anvil Stand Workshop

We've had to change the date for the Anvil Stand Workshop from March 14 to March 21. PLEASE MAKE A NOTE OF THIS NEW DATE. The nominal starting time will be 9 AM, but some of us will be there earlier, perhaps as much as an hour earlier.

The change was to ensure we'd have at least two weldors on-hand, as a fair amount of the work involves welding.

Right now we have commitments from only two weldors. They might be able to handle all the welding -- but they'd probably be grateful to get some rest breaks. If you weld professionally, or have the skill to do so, we'd REALLY like you to participate. If you can bring your own portable welder, even better -- but please coordinate with Marshall if it isn't gas-driven. (If you plan to bring equipment, contact me at least a week in advance coming so I can get the supplies you'll need.)

If you know any other NJBA members who weld, let us know so that I can solicit their participation.

I may bring my little flux-core welder so that I can tack weld parts into place for the professional welders to weld up solid, saving them some time, but I am not competent to do the final welding.

There are many other tasks to do, besides welding, including cutting, grinding, drilling, possibly filing, bending (hot or cold), jigging (for the welding) and assembly work. So if you come, we can keep you busy. I plan to start doing some preliminary work in preparation for these workshops as early as this coming Monday evening (at Marshall's open forge

The NJBA Web Site!

The NJBA Web Site is:
http://njba.abana-chapter.com/

The Newsletter is at:
http://www.lightningforge.com/njba/index.htm

or use the link on the NJBA web site for the newsletter.

Official NJBA Address

NJBA
P.O. Box 224
Farmingdale, NJ
07727-9998

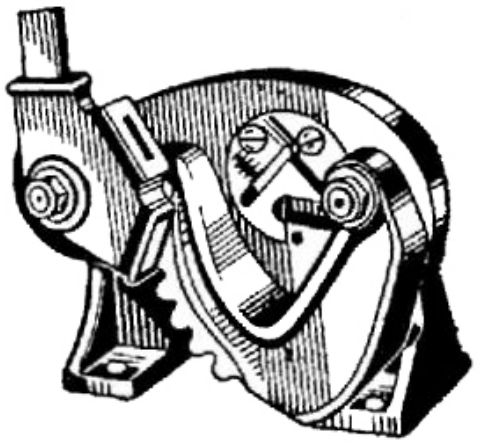
Rather than use room in the newsletter, All correspondence between ABANA and NJBA can be found on the ABANA web site. If you cannot access it there, contact me and I will send you copies.

NJBA Board of Directors

NJBA Directors information
is not available online

meet). This work will probably continue for the next few Monday nights preceding the workshop. If we run shy of work for the Anvil Stands, we'll start in on some of the other equipment we need to build -- so there should be plenty to keep people busy.
Bruce Freeman

More information on this workshop and the others on page 5.



2015 Delaware Valley College A-Day

The 2015 Delaware Valley College A-Day demonstration will be Friday-Sunday 24-26 April 2015, Doylestown, PA, starting noon on Friday, 10:00 the other two days, ending 6:00 Friday and Saturday and 4:00 Sunday.

This is a low impact event and lots of fun working with the students and demoing in a small fair venue (read: lots of small kids, set up close to all the small child activities and rides). The college provides a 20 x 20 tent, access to power, free parking (if I know you are coming) and drive in/out loading/unloading capability. This is an official PA State Fair, so you can enter your work into competition (normally on that Thursday, I can enter your stuff if I have it early) and possibly win money and a pretty ribbon. It would be nice to have ironwork other than mine in the various categories for competition. You can display your work but there is no selling to the public. And it is a good place to recruit for NJBA.

I bring my own tooling and equipment, and you are welcome to bring your own also. If there is sufficient interest the trailer can be brought over, or the demo equipment should that be ready.

I will be there all three days. Members can come for whatever time commitment you are comfortable with.

If you want to participate or you want more information please contact me.

Doug Learn
215.489.1742 (home)
cjfdlearn@verizon.net

Then 'n' Now
Bevans Day

Before there was a Peters Valley in northern New Jersey there was Bevans. That small hamlet was a crossroads along Old Mine Road, an original road traversingthe entire area. The name was changed over a century ago to reflect the area's primary farming family.

Today Peters Valley School of Craft (http://www.petersvalley.org) is located in both the old village and surrounding area, all part of the Delaware Water Gap National Recreation Area.

On Sunday May 3rd Peters Valley will celebrate Bevans Day, highlighting the history and culture of the area as well as inviting the public to visit all the School's studios, which will be open from 10AM to 5PM. It's a great opportunity to visit the area, see all of what Peters Valley is offering this year, get together with friends and generally hang out! Super place for a ride on a nice day too -

The New Jersey Blacksmith Association will be participating again this year. The Blacksmith Studio will be open and forges hot. Members familiar with Peters Valley will be available to talk with visitors, and smiths can demonstrate a variety of techniques appealing to blacksmiths. Surprisingly, many of the general public have never seen hot metal struck!

Peters Valley has extended a unique opportunity over Bevans' Day weekend for blacksmiths - The Blacksmith Studio will be fully available for our use both Saturday and Sunday. Valley Brook, the adjoining residence, will be available Saturday night for those who may wish to use the shop Saturday and stay over. Kitchen facilities are available.

Sunday all tailgaters are encouraged as well as donations for an IITH drawing. If there's enough interest we could have a cookout lunch Sunday.

We do need to get an idea of those who want to tailgate as well as those willing to do a brief demo - which can be making something just for fun or sharing ideas, as well as those interested in attending or spending the night, so . . . Questions? More info? Reserve an overnight or tailgate spot? Demo? Suggestions and Great Ideas ? ? ?

Please contact Dave Ennis at (908) 713-1679 or davidennis@att.net

Meet at Walnford Park

May 17th

We will be demonstrating and holding a membership meeting at Walnford Park on Mau17th. Walnford is also known as Crosswicks Creek Park and is in Upper Freehold, N.J. Hammer in and demo at Walnford Park. Please come out especially with your family to enjoy a day at the hidden jewel of he Monmouth County Park system - Walnford park. NJBA will have the trailer with three forges at the demo. We will be immediately across from the working gristmill. There are many activities for children so this is another great family event.

Historic Walnford is the 36 acre Historic District at the heart of Crosswick Creek Park. This country estate and former mill village provides a window to view more than a century of social, technological, and environmental history in Western Monmouth County.

The site includes a large home built for the Waln Family in 1774, an 1879 Carriage House, and assorted outbuildings and farm structures. Much of the site's interpretation is connected to the newly restored and operating late 19th century Gristmill.

Directions

Directions: Please note: If you choose do an internet search for directions to this address, be aware that the parking lot on site is not accessible from the Walnford Rd/Hill Rd intersection. Directions below.
From the East Via I-195: Take Exit 11 (Imlaystown/Cox's Corner) and turn left onto Rt.43 (Imlaystown/Hightstown Rd). At the first intersection, turn right onto Rt. 526/Red Valley Rd. At the first light, turn left onto Sharon Station Rd and follow approximately 2 miles. Turn right onto Rt. 539 North. Travel a short distance and turn left onto Holmes Mills Rd. Make first right onto Walnford Road which leads directly into the park.. From the West: Follow I-195 to Exit 8 (Allentown), Rt. 524/539. Turn right and follow Rt. 539 through Allentown. Turn right onto Holmes Mills Rd and then right onto Walnford Rd, which leads directly into the park. From the North: Take Rt. 9, 79, or 34S to 537W to Rt. 539 in Upper Freehold. Turn right onto Rt. 539 (Forked River Rd), then left onto Burlington Path Rd. Turn right onto Holmes Mills Rd and then left onto Walnford Rd, which leads directly into the park.

The Lightweight Forge Project

NJBA to Hold Workshops to build Equipment for Demonstrations

by Bruce Freeman

NJBA will be holding workshopsto build six sets of portable blacksmithing equpment, each consisting of forge, firepot, hood, flue, anvil stand, and vise stand. One such set will fit into the trunk of a car, and all six of them will fit into the back of a pickup truck, greatly facilitating getting our equipment to demonstrations.

The following figures illustrate the components (not to scale). Figure 1 shows the folding forge table, the firepot, and the SS hood, plus a length of flexible air duct. (Omitted from the drawing are two 2-ft sections of galvanized flue pipe.) Figure 2 shows an anvil mounted on the anvil stand, which adjusts vertically about eight inches. Figure 3 shows a likely version of the vise stand (still in prototype), including an optional set of wheels below and behind the table. A blower will also be needed, but stands for these can be very simple and lightweight, so we don't plan to hold a workshop to make them.

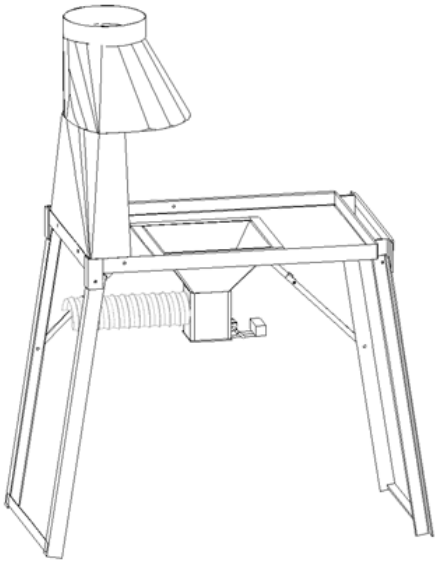


Figure 1.
Forge, Firepot, and Hood

For stowage, the anvil stand is broken down by removing the anvil from the table, and lifting the table and trammel out of the base. The table may also be separated from the trammel if desired. The flue sections lift off the flue and are nested together. The hood lifts off and the firepot lifts out of the forge table. The firepot may then be stowed within the base of the anvil stand, which in turn fits within the hood. The table folds flat. The post of the vise stand (along with the vise) unscrews from the flat base. The optional wheels then may be clamped in the vise jaws and the vise inverted and rolled like a hand truck. The nut and bolt visible in the table are removed and used to protect the threads that join the post to the base.

All the equipment assembles without the use of tools, and there are few separate loose pieces to get misplaced.

We will need the help of NJBA members for to fabricate all this equipment, and invite your participation. The first workshop, to build anvil stands, will be held on **Saturday, March 14, beginning at 9 AM.** The work will be typical fabrication tasks, including cutting, grinding, drilling

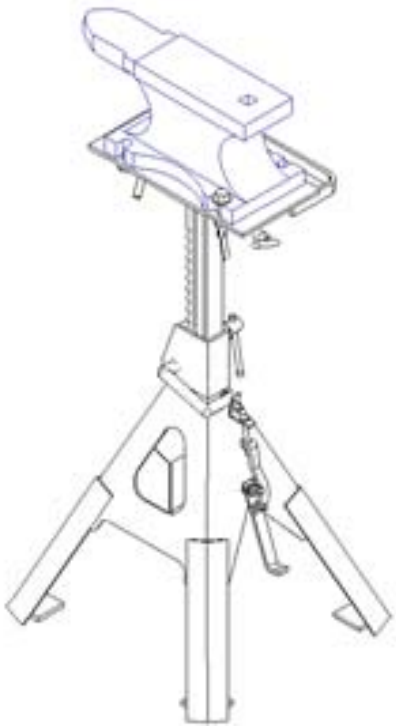


Figure 2.
Anvil Stand
(anvil not included)

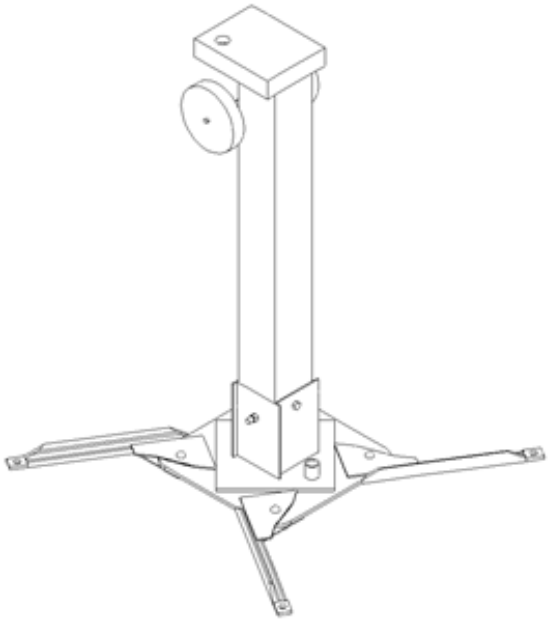


Figure 3.
Vise Stand

and welding. Please bring your own work gloves and safety glasses as we have only a limited supply in the shop. Questions may be directed to me.

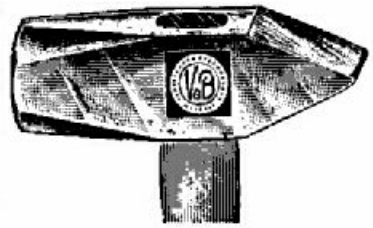
This equipment is primarily intended for light use and portability, rather than for permanent installation in a shop. However, the Board of Directors has opted to open these workshops to NJBA members who wish to go home with equipment of their own. If this is you, contact me at the email or phone number given in the director's list. Final workshop fees are not set yet, pending completion of the materials list, but will probably be $100 or less for each piece of equipment. A nonrefundable $50 registration fee will be applicable to this workshop fee.

NJBA Holiday Party

NJBA closed the year on December 7th with our traditional Holiday Party. Once again Marshall and Jan graciously hosted the party. There was a very good turn out and the food and the selection was great. Many thanks to Marshall for opening their home to us and making this a great party.

Northeast Blacksmiths Meet At Ashokan NY

http://www.northeastblacksmiths.org/
This Springs demonstrator is
Seth Gould, April 24, 25, 26



Blacksmithing Workshops and Classes:

Peters Valley Craft Education Center
19 Kuhn Rd., Layton, NJ 07851 (973)948-5200
pv@warwick.net www.pvcrafts.org

Academy of Traditional Arts
Carrol County Farm Museum
500 South Center St. Westminster, MD 21157
(410)848-7775 (410)876-2667

Touchstone Center for Crafts
R.D.#1, Box 60, Farmington, PA 15437
(724)329-1370 Fax: (724)329-1371

John C Campbell Folk School
One Folk School Rd.
Brasstown, NC 28902
1-800-365-5724 www.folkschool.com

Adirondack Folk School.
P.O. Box 2 Lake Luzerne, NY 12846
518-696-2400
info@AdirondackFolkSchool.org
http://www.adirondackfolkschool.org/

Holcombe Jimison Farm

by Ben Suhaka

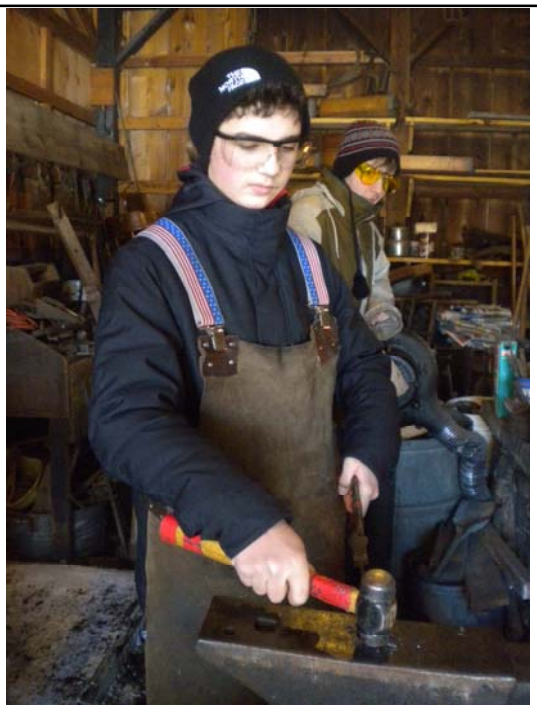
The Holcombe-Jimison Farmstead Museum located just north of Lambertville on Route 29 (1605 Daniel Bray Highway) is dedicated to the preservation of Hunterdon County's agricultural heritage from the 18th into the 20th centuries. The blacksmith shop at the Holcombe Jimison Farm is open every Wednesday morning, from 8:00 AM to 12:00PM, and on Sunday afternoon May through October from 1:00 PM to 4:00 PM.

At this time the blacksmith shop consists of three members, myself, Wayne (retired, formerly with the electric division of PSE&G) and Duffy (still working as a small airplane pilot). We also have two home schooled students who show up on Wednesdays, (hopefully on Sunday in the summer). It is proving a little difficult find projects simple enough for them to practice on.

As the weather warms up, we hope to get the shop cleaned up make it more like working display blacksmith shop. We want the visitors, especially the younger generation (the ones that never saw a phone booth or would not know how to work a rotary phone) to get an idea of life in the past. I would like to give them a taste of the work involved to make something as simple as a nail. Let them use the hand crank blower, then the overhead bellows and the hand crank drill press.

Looking forward to this summer when the power hammer, made by one of our member will be installed. We also hope to have two small portable forges set up in front of the shop and bring them back into the shop at the end of the day.

Zack Majorossy 14 years old

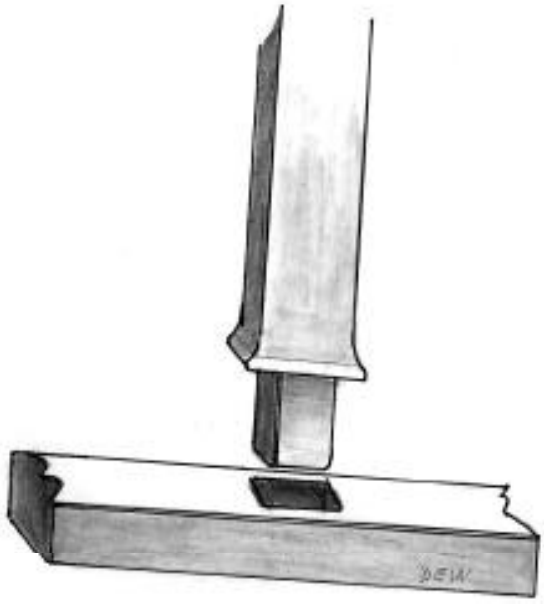


Max Renieris 15 years old is learning Blacksmithing from Ben Suhaka, our resident blacksmith

Controlled Hand Forging Lessons 9 & 10

Mortise and Tenon Joinery

Text and Illustrations by Doug Wilson



#1. Example of technique

Lesson Number Nine–
Mortise and tenon joinery
Definition: Making a mechanical joint with two or more pieces
Intent: The smith will learn to forge a tenon and assemble a mortise and tenon joint.
Tools Side set – top and bottom (drawing #2) Note that the cutting edges aren't sharp. The cutting edges are slightly radiused. Set hammer Monkey tool or bolster plate with 1/4" x 3/4" hole (drawing #3) (This is a tool block with a 1/4" x 3/4" hole in center.)
Materials: 1/2" x 1" x 18" mild steel bar.
Method: Step One: Upset end of bar and forge to 1 1/8" x 5/8", 3/4" from end. End tapers down to 3/8" x 3/4". (drawing #4) Mark bar on hot cut 3/4" from end.
Step Two: Take a full yellow heat. Place the bar over the bottom side set. Hit a light blow. The bottom surface of the bar will be cut. Turn the bar up on its corner. Strike another light blow.

Turn bar onto uncut next surface. Strike again. This marks the second side of the bar. (drawing #5) Repeat and cut the remaining two corners and sides with light blows.

#2. A top and bottom side set

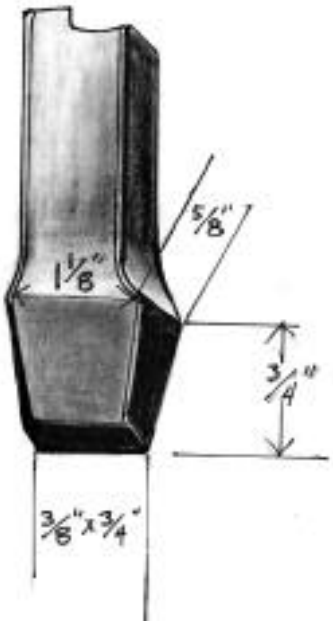
#3. A bolster plate

Notes: The light blows on the corners help to insure proper tool alignment.

Misaligned cuts or double cuts cause hot shuts, then cracks. Proper tool alignment is critical here. Any mis-cuts should be filed out immediately.

Once marked, the bar can be supported on a stand or your hip. Use top tool to continue. (See previous lesson for bar support.)

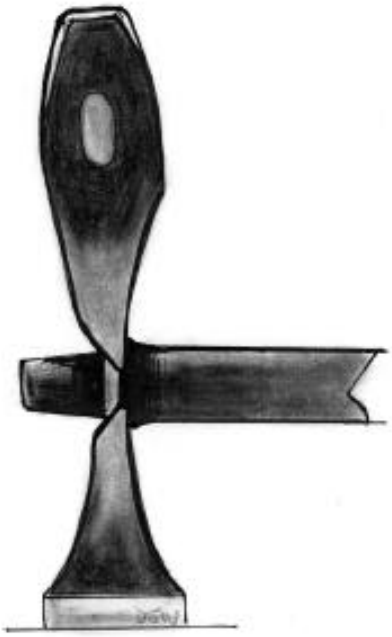
Reheat bar if necessary. Continue cutting until the core of the bar is just a bit oversize, in this case about 5/16" x 13/16".



#4. Upsetting and forging dimensions

Notes: If the tenon is a bit too fat that's ok. Too thin won't do. A striker's assistance helps with drawing down the tenon.

Step Three: Reheat bar to full yellow. Place bar over sharp edge of anvil face. Place set hammer directly over it. (drawing #6)
Strike a heavy blow. Turn the bar 1/4 turn. Strike again. Turn again in the same rotation. Strike again. You are drawing out the tenon.



#5. Marking the second side of the bar

Continue until you have drawn down the tenon to 1/4" x 3/4"; length as far as it goes. Finally, lightly forge down the corners.

Note: As you forge down the tenon, the set hammer and the anvil must be parallel. Check size of tenon by inserting end of tenon into bolster.

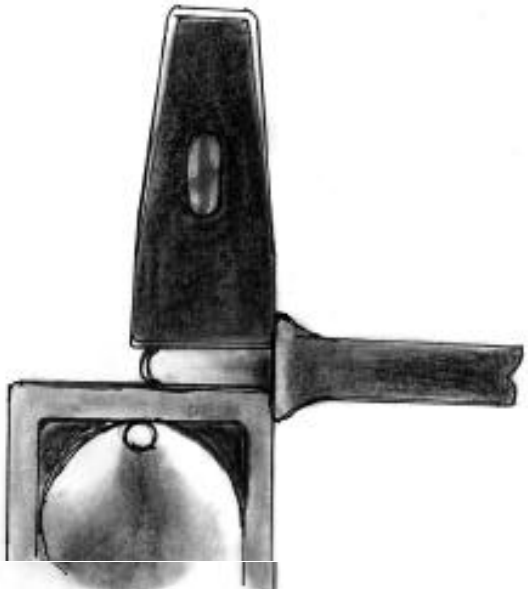
Step Four: Upset square shoulders. Reheat to full yellow. Heat should extend about an inch up from tenon shoulder.

Note: Quench the tenon to prevent burning if necessary. Pull the bar from the fire. Set bolster over the hardie hole. Insert tenon. Upset and square by hitting hard on top end of bar. (drawing #7)

Straighten bar as necessary. Square shoulders to bar with light hits on anvil face.

Note: Tenon should be centered on the bar.

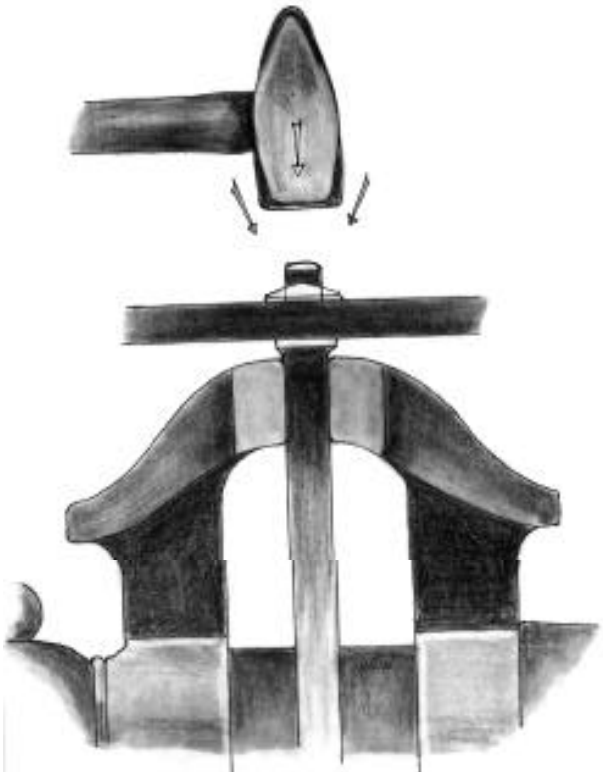
Centerlines of bar should be straight. Shoulders should be straight and square.



#6. Using the set hammer

Step Five: Cut tenon to length on cutoff hardy. In this case, length should be 1 1/4" from shoulder.
Note: Beveled edges on the end of the tenon help prevent thin, sharp or cracked edges on the finished tenon head.

#7. Using the bolster plate



8. Upsetting the tenon

Step Six: Finishing the joint. Heat tenon and about 1" above shoulder to full yellow.

Quickly set bar in vise. Set mortise onto it. Tap it down so it sits firmly on tenon shoulders. With rapid hammer blows, upset the tenon. (drawing #8) First hammer blows are straight down. Finish with angled blows.
Note: The entire tenon and a bit of the shoulder must be at a bright heat to insure a tight joint.

Forge the head of the tenon into a symmetrical shape with smooth edges. It should be centered on the face of the bar it has joined.
Note: If you run out of heat, you can use a torch to reheat the tenon head. It is best to finish this operation in one heat. A second heat should only heat the tenon, not the bar with the mortise. (drawing #9)
Troubleshooting: If the tenon has cracks at the shoulder, this was caused by (1) cutting too

deep in step two, (2) misaligned or double cuts, or (3) forging tenon at black heat. Note: File out hot shuts before and during forging of the tenon. If the tenon head is not centered on the bar it joins, your upsetting blows may not have been straight down or the mortise was not centered in the bar the tenon joins.

#9. The lesson completed

Targets, Time: Upsetting bar, one heat. Cutting shoulder and drawing out tenon, two to three heats. Trimming end of tenon, one heat. Assembling pieces and heading tenon, one heat.
Targets, Dimensional: Tenon head should be symmetrical, without sharp edges and centered on the bar it joins. Tenon shoulder should be the same dimension

Forge Welding

By Dan Nauman Illustrations by Tom Latané
Photos by Dan Nauman
Lesson Number 10– Forge Welding
Definition: Fusing two or more bars together by bringing them to a high heat in a forge, and applying pressure to the area being fused by hammer blows.
Lesson: Upsetting, scarfing (see Definitions, right), and forge welding the ends of two bars of equal size together to make one bar. Intent: The smith will learn the technique of welding two bars of equal size together, accurately maintaining the original stock size and shape after welding.
Materials: Two 15" bars of 1/2" square mild steel. Tools needed: Basic tools include standard cross peen hammer and anvil. Flux (see Definitions, right), either borax or EZ Weld. Calipers and a square can be used to evaluate your work.
Method: Forge welding is used in several circumstances: to produce a smooth transition of adjoining elements; to secure several elements into a bundle (i.e., leaves, grapes, acorns, bas-

A forge-welded sample from Cyril Colnik

ket twist); to join a bundle to another element; to close the ends of a single bar shaped in a ring, oval, or rectangular shape (as in a frame); to join mild steel to high carbon steel (as in an ax bit); or to laminate several bars together to form a billet (as in Damascus laminate).

Definitions:

1.) Scarf (scarfing): Preparation or preparing a portion, often the end of a bar for welding, by tapering to a thin edge which can be blended into the mating material.

2.) Flux: The product applied to the areas to be fused to reduce oxidation, and lower the melting temperature of the scale. (Examples: borax, EZ weld, etc.)

3.) Clinker: The hard, gritty, often glassy mass that congeals in the bottom of the firepit.

4.) Coke: Soft coal that has had the bulk of its impurities burned out. Coke's appearance is puffy. As good-quality soft coal burns, it expands and congeals to the neighboring coal nugget, forming a larger mass. Almost entirely carbon in its makeup.

Note: Just as there are different approaches to other aspects of forging, the same is true for forge welding. It cannot be said that any one way is best, as there are many experienced smiths who produce consistently sound welds in a different manner than explained here. Different scarf forms, different fluxes, and several other aspects of forge welding can be learned and utilized. To introduce these differences in this lesson would prove confusing to the student. Thus, this lesson will concentrate on the method taught to me in the 1970s. Differences aside, the fundamentals usually prove to be similar or identical.

In all cases, a high heat is needed at the point of fusion to successfully weld the bars together. The color of the bars should be yellow to yellow/white when removed from the fire. The only exception to this would be when welding high carbon steel to mild steel. A lower heat of orange/yellow should be the highest heat applied so as not to burn the carbon out of the carbon steel.

The gray scale that forms on a bar when heated is the enemy of the forge weld. The bars will not fuse properly when scale is present. Scale forms on the outside of the bar in the presence of oxygen. Flux forms a barrier around the areas to be fused, protecting it from oxidation. It is applied to the bars at an orange heat. Flux is not glue, or a bonding agent, rather it lowers the melting temperature of this scale, and prevents more scale from forming while heating in the fire. Some smiths theorize that to some degree flux also raises the burning temperature of the metal.

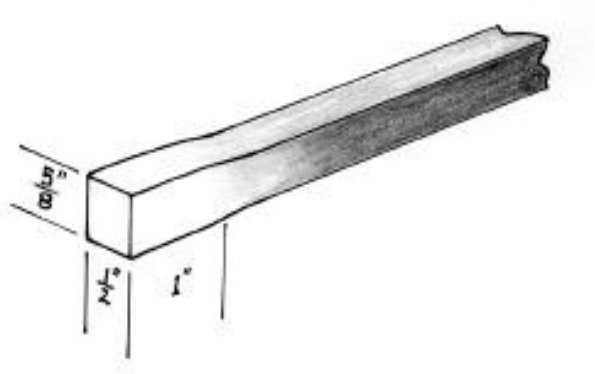


Figure 1: Upset end preparation

Another important aspect of welding is to be absolutely sure you have a "clean," domed fire. A clean fire is free of a clinker in the firepit, and has no fresh coal burning in the center of the fire. A good welding fire also has an abundance of coke domed and banked in the firepit. Should the fire "hollow out" while heating the bars, only coke should be added to the fire to replenish the fuel. Fresh coal cools the fire, and also introduces impurities naturally found in coal. These impurities are largely burned out as the coal becomes coke.

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Another important aspect of welding is to be absolutely sure you have a "clean," domed fire. A clean fire is free of a clinker in the fire-pit, and has no fresh coal burning in the center of the fire. A good welding fire also has an abundance of coke domed and banked in the firepit. Should the fire "hollow out" while heating the bars, only coke should be added to the fire to replenish the fuel. Fresh coal cools the fire, and also introduces impurities naturally found in coal. These impurities are largely burned out as the coal becomes coke.

When taking a welding heat, a good deep fire with the bar in the center of the fire under a good two or so inches of coke will reduce (but not eliminate) the amount of scale which forms on the bar during heating.

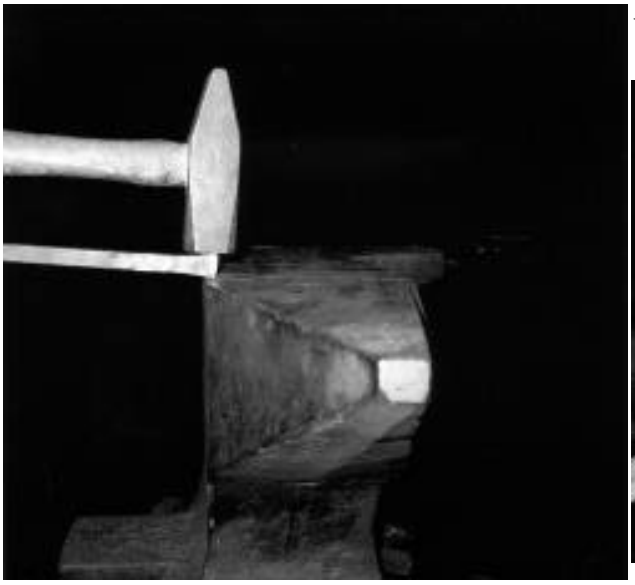


Figure 2: A half-face blow.

Step One–Preparing the scarf:
Taking a short high (yellow) heat on the last 1" of the bar. Then upset about 1" of the end of the bar so that the bar measures at least 9/16" square. (See previous lesson Number 7) Next, forge one dimension back to 1/2", producing a cross section measuring 1/2" x 5/8".

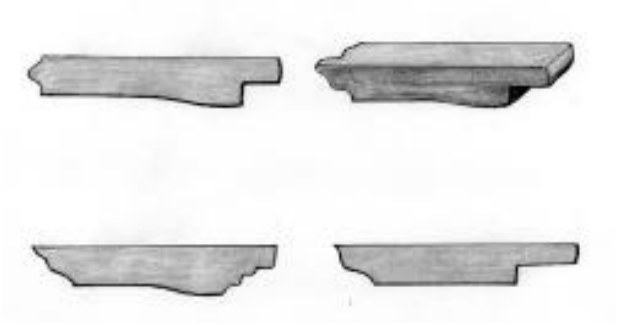


Figure 3: Above, correct. Below, incorrect. Left– initial shoulder backed off anvil too soon. Right– no upset remains for scarf to be laid upon during weld.

Step Two: Take another yellow heat on the end of the bar, again on the last 1" of the bar, place the end of the bar (with the 5/8" sides vertical) squarely on the anvil's face with the end of the bar 1/4" from the inside edge of the anvil. The edge of the anvil should be somewhat sharp for this step. Hitting straight down with the hammer's face halfway above the an-

Figure 4

vil face and halfway beyond the anvil face (Figure 2, photo), reduce the cross section to about 1/2 the thickness of the material, in this case to 5/16".

Tip: In order to create a clean shoulder in this operation, put a slight downward pressure on the bar so the bar stays where you put it. Then after the first or second blow add a slight forward pressure to keep the bar from "stepping" off the anvil.

Step Three: The forging dynamics of the material will cause the area of the bar on top of the anvil to slightly spread wider than desired. In the same heat from step two, turn the bar 90 degrees, and forge this area back down to 1/2" in thickness.

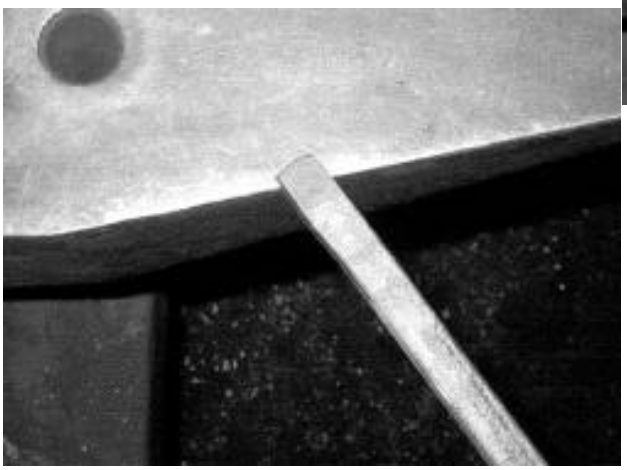


Figure 5

Step Four: Take another yellow heat on the last inch of the bar. Place the shoulder produced on a sharp edge of the anvil, pressing the shoulder squarely against the side of the anvil. The hand the bar is holding should be lowered slightly so the face of the scarf is off the anvil face. (Figure 4, photo). Move the hand holding the bar to the left of square, and take a blow. Moving the bar back and forth at a 90-degree angle (right to left), and using each step produced by the previous blow to brace against the side of the anvil, slowly step the bar off the anvil. (Figure 5, photo). In this same process, the profile of the bar should be drawn out to a flat point. (Figure 6, photo). If done correctly, the face of the scarf should have steps as shown in Figure 7. When the scarf is drawn out, forge a slight curve at the end of the scarf. You should be able to do all of step four in one heat.

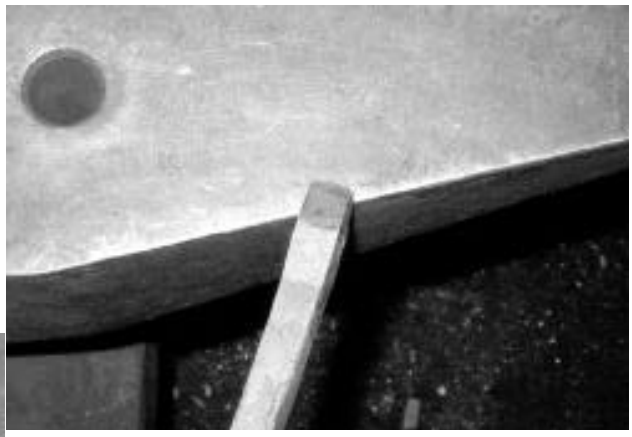


Figure 6

Notes on scarves: The reason for the curve at the end of the scarf is simple. The anvil acts as a heat sink when hot metal is applied to it. If the end of the scarf is not off the anvil when welding, it might cool too rapidly, and the weld will not be properly fused in this area. The curve keeps the thin edge of the scarf off the anvil before the first blow, retaining the heat longer to produce a sound weld. The thin tapered edge of the scarf is formed to produce a smooth weld joint. A scarf with a thick edge will produce a weld with a very visible seam (Drawing, figure 8).

Step Five: Repeat steps one through four on the second bar.

Step Six: Fluxing the scarves.

SAFETY! - Some fluxes may emit noxious fumes when heated. Make sure your forge and building are vented properly.

Reduce the air blast in the fire if you have an electric blower. If you are manually applying the air blast, reduce the force of the blast to

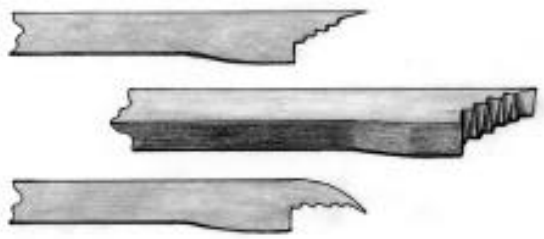


Figure 7: Top– shouldered and stepped scarf. Bottom– Curved tip. Shoulder prevents scarf from overlapping beyond upset area when scarves are quickly placed together.

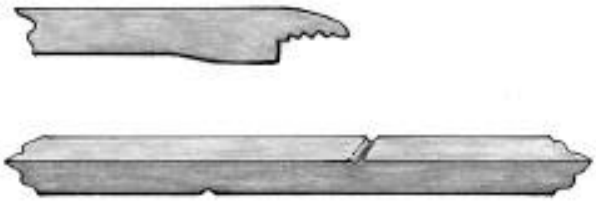


Figure 8: Blunt scarf makes seam difficult to blend.

more of a whisper. This will reduce the chances of burning the scarves while fluxing by reducing the available oxygen in the fire.

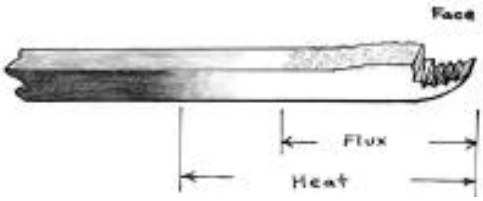


Figure 9: Fluxed face heated from below.

Making sure you have a clean and deep fire, place the scarves into the center of the fire, face up. If the bars are not covered with coke, cover them. When the bars reach a bright orange, with the bars remaining in the fire, take your fire rake make a hole in the fire over the scarves so flux may be sprinkled on the face of the scarves. With a small spoon with a long handle (so you do not burn your hand), apply enough flux to cover the scarf, as well as beyond the scarf where the other scarf will join. (Figure 9, drawing). Cover the bars once again with coke. When you are finished fluxing the scarves, position them so they are facing down in the fire.

Notes: One of the biggest mistakes beginners make in welding is not applying the flux back far enough on the bar where the bars will be fused.

Some smiths prefer to flux all sides of the scarves, while others simply apply flux to the scarf faces. The theory behind fluxing all sides of the bar is to insure that all surfaces are free from scale, as well as to increase the burning temperature of the bar. The bar can and will burn if allowed to get to a full sparkling white heat, at which point the flux will also burn off. The bars likely will not weld at this high temperature. Also, the molecular structure of the material will break down, creating a weaker joint, and often an unsightly weld.

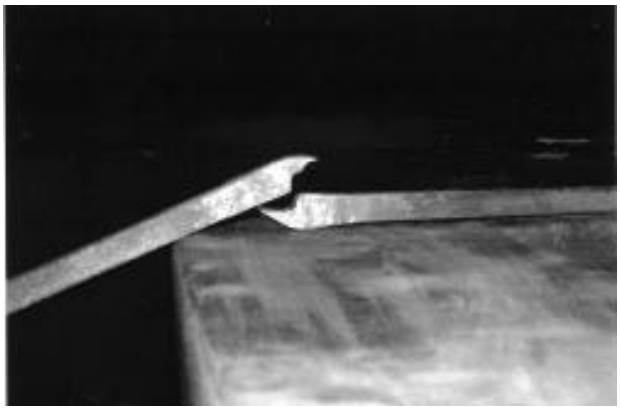
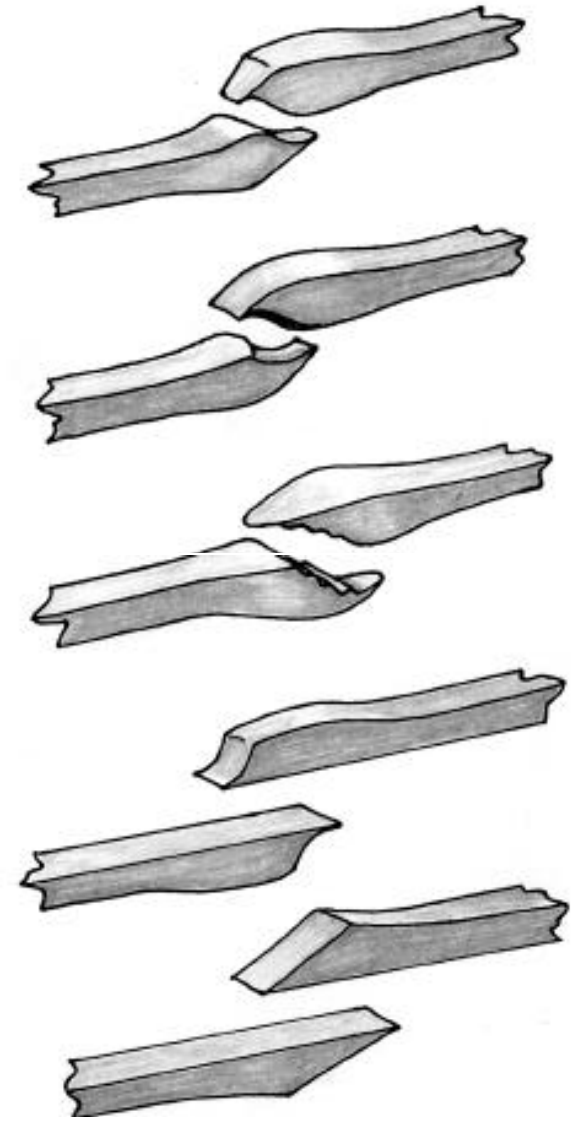


Figure 10

If you choose to flux all sides of the scarves, turn the bar 90 degrees only after you are certain the flux has adhered to the scarf surface. You will know when this happens, as the flux will be the same color as the bar. If one bar gets hotter than the other, move it to the side of the fire where the fire is cooler, or reduce the air blast further.



Some other forms of bar end scarfs. The 90º shoulder on the scarf described in the text will aid in quick alignment of bars to be welded, preventing overlap beyond upset material

Fluxing the scarves in the fire keeps them hot, and reduces the amount of scale formed, therefore shortening the time it takes to produce the weld. Removing the bars from the fire to flux the scarves is not necessarily wrong, as many smiths prefer this procedure, and do so successfully. Sometimes, fluxing in the fire is virtually impossible (i.e., welding a wagon wheel tire.) In these cases, removing the bar from the fire is necessary.

Always keep coke on top of the bars when not in the act of fluxing.

Tip: Rub soapstone or chalk on the face side of the bar to indicate direction of the scarf face when pulling the bars from the fire.

Figure 11

Step Seven: Welding the bars

Have your hammer at the anvil in a position to grab it quickly. The scarves are at a welding heat when they are at a yellow-white appearance in color (often referred to as a "welding heat"). Make sure the scarves are heated well beyond the shoulder where the mating bar will join. Some smiths wait to see just a few sparks coming from the fire, indicating the piece is just starting to burn. This is not necessary, and can lead to burning the tips off of the scarves.

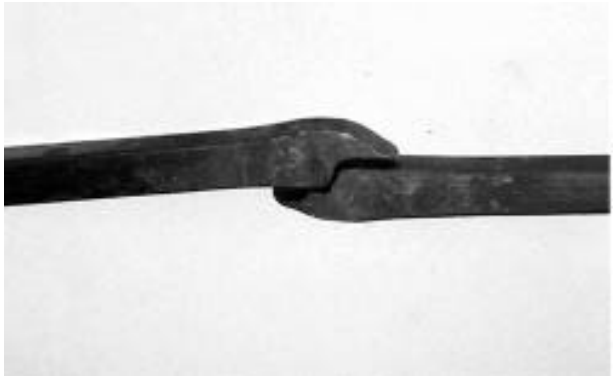


Figure 12

Tip: If you are not sure if the pieces are at a welding heat, gently touch the pieces together in the fire. If they want to stick, almost like a magnet, they are probably ready to weld. With experience, this touching in the fire will not be necessary.

SAFETY: *When welding, molten sparks fly from the bars which can burn others, as well as you. Alert others in the area when performing a weld, and make sure other items in the shop that are flammable are protected from the sparks. Some smiths wear a protective leather apron when welding to prevent their clothes from burning. You and anyone else present should be wearing eye protection with side shields at all times. After welding, be aware of the possibility of fire caused from stray sparks in the surrounding area, i.e., shop rags, charcoal, dry wood, etc. These items and others ignite easily from molten metal and flux spattered from the forge-welding process.*

Bring the pieces out of the fire, rotating one piece 180 degrees so that the scarf is facing up. Place the bar with the face up on the center of the face of the anvil, coming in from the far side of the anvil. (This bar should be in your hammer hand.) Place the other bar on the near edge of the anvil, with the scarf off the face, pointing up at about a 45-degree angle. (Figure 10, photo). In a hinging fashion, lower the scarf down onto the opposing scarf, keeping contact with the edge of the anvil to control the accuracy of the placement of the scarf (Figure 11, photo) and press down on the opposing scarf. The heels of the scarves should be placed together as shown. (Figure 12, photo). Press down hard enough so you can release the bar in your hammer hand.

Release the bar in your hammer hand, grab the hammer, and strike firmly in the center of the joint. Forge the entire joint rapidly with six or seven blows. Make sure you forge the thin tip of the scarf as it will cool rapidly. Next, flip the now-welded bar 180 degrees to forge the opposite side. Hit six or seven blows on the entire joint and then turn the bar 90 degrees and repeat five or six more blows on the joint. Flip the bar 180 degrees and hit the joint once again five or six blows. Repeat as necessary, never forging colder than a medium orange heat.

Figure 13: Bars for practice weld– no alignment of scarves.

Note: Dark spots on the joint indicate cooling of the material and will not weld there. This may be caused by too low a heat, or inadequate fluxing. These areas must be fluxed again, returned to a welding heat, and forged to fuse the joint.

While welding, keep in mind that you do not want to forge the cross section of the joint down beyond the parent stock size. Also, be careful not to forge beyond the joint as this will also reduce the cross section of the bar beyond the parent stock size.

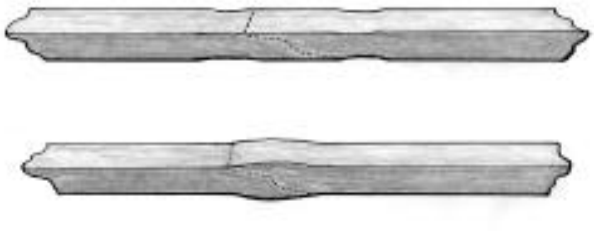


Figure 14: Top– thin areas due to loss of material from burning, too little upset, or over-hammering, must be upset. Bottom– remaining bulge must be drawn down to dimension.

With a properly executed weld there will not be any "dark spots" or evidence of a scarf. If there is evidence that the weld is not complete, flux the open seams of the joint, and take another welding heat. Remove the bar from the fire, and forge down carefully, so as not to greatly reduce the cross section of the bar beyond the parent stock size.

Note: Timing is important. If you take too much time getting the pieces from the fire to the anvil, you may lose too much heat to weld the bars together. To increase your proficiency, you may want to take a few "practice runs" by removing the bars while cold from the firepit, positioning them on the anvil as described in step seven. Do this until you are comfortable with the procedure. You will then be able to release the bar from your hammer hand and grasp the hammer without the bar falling to the ground.

Tips: -Some fluxes, such as EZ Weld brand, are very aggressive and may adhere to the metal after the weld has been completed. To remove it, take another welding heat, remove the bar from the fire, and scrub vigorously with a stiff wire brush. Flux is harder than a file, so do not try to file the flux off, as it can ruin your file.

-A lighter hammer of 1 1/2 to 2 pounds may work better than a larger hammer. With a lighter hammer, the hammer can be swung faster and more accurately. Also, the chance of forging down beyond parent stock size is reduced with a smaller hammer, as you will not have the heavier force of the larger hammer.

-You may want to first practice a more simple weld to get used to the properties of forge welding. The faggot weld is a simple, crude weld which has no end preparation (no scarves.) Try bending a 3/16" x 3/4" piece in half and weld the last 3/4" of the end of the bars together. (Figure 13, drawing). Be extra careful when performing this type of weld, because the larger surface area causes more molten flux and sparks to fly from the joint.

Step Eight: Refining the weld (If necessary) If the cross section of the joint is still larger than the parent stock size, place the bar back in the fire and bring the joint to a welding heat. Remove the bar from the fire, and carefully forge the joint back down to the parent stock size.

Potential problems and solutions: If the weld is properly executed, the joint is invisible, the bar has no bulges or "necked-in" spots, and has sharp 90-degree corners. (Figure 14, see drawing of bulge and necked-in spots). To refine the bulge, proceed as described in step eight.

If the bar is necked in, it will be more difficult to fix. The portion of the bar where it is necked in is taken to a welding heat, and then upset (refer to Lesson Seven, Hammer's Blow, volume 12, #1, Winter 2004) back to the parent stock size. A poorly executed weld will begin to come apart or fail entirely in the upsetting process.

If a parallelogram was formed at the joint, first upset the joint, then take another heat and forge down the acute angles slightly. (As explained in Lesson One, Hammer's Blow, volume 11, #1, Winter 2003.) Then carefully reduce to the parent stock size.

Targets: -The scarf is produced in one heat. -The weld is completed in one to two heats, and the joint returned to the parent stock size.

-The joint is to be square in section with sharp corners, no necked-in areas, and no bulges. You can check your accuracy with a pair of calipers. Check for squareness with a steel square.

-The welded bar is to be straight, have no twist, be free of flux residue and the bar should have no visual evidence of a seam.

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