N.J.B.A. Newsletter

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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.

We would like to welcome Billy Barrett to the NJBA Board, and would like to see other new faces. We look forward to working with Billy in NJBA.

David Macauley our Chairman, treasurer and events coordinator passed away from a heart attack on January 1st. David took on a lot of responsibility's in NJBA and we have some large shoes to fill.

We have covered some of what David did but we can still use help. David used to run events at Cold Spring Village and we could use help setting these up again from someone in Southern NJ.

We need to repaint the trailer, probably in April. We may do it on a Monday night or weekend, If you want to help call a board member, in particular, Bruce Hay

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. If you are interested in helping please contact one of the board members listed on page 2.

Larry Brown, Editor

Upcoming events for 2014

Get you calendars out and mark these events down. Please bookmark our web site and check for updated meet information. Remember most of our meets have an "Iron in the Hat" drawing, so be sure to bring something. Meet information starts on this page and continues on page 3.

June 7th Eric Cuper Studios in Easton, PA more info below and on page 3.
June 21st Blade forging demonstration by Mark Morrow at Marshalls
August 4-10 Middlesex County Fair
September 14th Red Mill in Clinton NJ
December 7th—Annual Holiday Party, Marshall and Jan's house.
Please check the web site for updates and changes.

Blacksmithing Demonstration Jason Roberts, Daniel O'Sullivan and Eric Cuper at Cuper Studios Saturday, June 7, starting at 9am.

Jason Roberts and Cuper Studios are teaming up to demonstrate some fine metalworking techniques for PABA, NJBA, and NOMMA members. All are welcome! As always, there will be an Iron In The Hat (please bring items to donate to help raise money for meetings), tailgating is welcome (try to leave parking spaces in front of the garage doors for tailgater and feel free to bring stuff to sell). Coffee and donuts and lunch will be provided. Please bring a chair if so desired but we will also have bleachers.

The Demonstrators

Jason Roberts is a Philadelphia based metalsmith. He is a native Pennsyvanian who received his BFA from Kutztown University. After college he traveled throughout the US to work for an assortment of craft schools and artist blacksmith shops before

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.

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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.

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returning to start his own business. In 2008 he founded J. Roberts Metalworks; a company specializing in art and high end architecturals. www.jrmworks.com

Daniel O'Sullivan received a BFA from Parsons School of Design, completed a traditional Ornamental Ironworker Apprenticeship followed by Stage Forge at the International School of French Wrought Ironwork in Muizon, France. He taught blacksmithing in County Mayo, Ireland, and worked for an exclusive European metalworking company. Daniel is now proud to be a Local 483 Union Ironworker and is on the Board of the NJBA.

Eric Cuper, an NJBA Board member, began blacksmithing at Peters Valley Craft Center in 1996 (which is where he first heard of NJBA). From there he attended Southern Illinois University at Carbondale to receive his BFA and MFA degrees specializing in blacksmithing. While at SIUC, Eric's forged sculptures were shown nationally and won several prestigious awards. His work can also be found in several books on forge work. Since 2004, Eric has been operating Cuper Studios LLC in Easton, PA. Cuper Studios is an architectural metalsmithing company.

To help facilitate lunch, it would be great to have a general head count. Please give me a ring or an e-mail to let me know if you will be coming. I look forward to seeing you here.

Thank you,
Eric Cuper
908-642-6420
ericuper@hotmail.com

Knife Making Demo with Mark Morrow
June 21st at Marshalls Farm

Knife blade forging, how to forge the blades
Covering hunting knives
fighting knives , bowies and larger blades
Forging Damascus
After the billet is done
Welding on tangs , hidden tangs and full tangs , Grinding and filing blades , and heat treating blades in the forge and oven

So if you have interest in making your own blades this will give you a lot of information on the how to and the not to do of making knife blades ,

I will be forging several different styles and sizes of blades, normalizing and heat treating the blades, covering final grinding and polishing with a 2 X 72 belt grinder and also sanding block .
Also covering fittings and mounting handles

Demo to start at 9 am and go most of the day

Middlesex County Fair
August 4 –10

4H grounds East Brunswick
Description: Public paid demo – good money maker for NJBA we provide 3 paid demos and then have the facility open for blacksmiths while the fair runs.
Wonderful family activity.
The fair hours are 5 -11 PM Monday through Friday, 11 AM - 11PM on Saturday and 11AM - 7PM on Sunday.
We will have the NJBA trailer at the site for the entire time and we will probably have addi-

tional forging stations. We will be under a tent with other crafters. The site has easy access to water and power and we will have tables to display our forged items.
All smiths are encouraged to attend. This is a wonderful fair to attend and is great opportunity for the entire family.

Driving instructions:
The Middlesex County Fair is located on Cranbury Rd. where it intersects Fern Roads in East Brunswick. Take Route 18 into East Brunswick, follow the directions for Cranbury onto Cranbury Road (Rt. 535 South), pass East Brunswick High School on the left, keep left at the fork, and continue on Cranbury Road for about three miles to the fair. 655 Cranbury Road.
FROM OLD BRIDGE-Take Route 18 north toward New Brunswick, pass the Colonial Diner and head toward Cranbury over the Route 18 overpass and proceed past the high school and bear left at the fork, as above.
Route from north county (this is the least congested route), take Exit 8A on the New Jersey Turnpike. Turn right on Route 535 North directly to fairgrounds (5 miles). For information please contact Marshall Bienstock, Cell 732-221-3015 jlfmib@optonline.net

Canal Day Wharton NJ

August 23st

Billy Barrett will be doing a demo at Canal Day in Wharton NJ 10Am - 5PM. Here is the URL: http://www.canalday.org. All NJBA smiths are welcomed. This was a great festival in in the past. Some good bands, food and vendors. Great family event. Contact Billy Barrett, 973-234-8701
anvilman67@yahoo.com

Hammer In
Red Mill Museum Village

Sunday, September 14th from 10am-4pm
Red Mill Museum Village 56 Main Street, Clinton, New Jersey 08809
www.theredmill.org

The Red Mill Museum Village will host the annual Hammer-In on Sunday, September 15th from 10am-4pm.

The Red Mill Museum Village resident blacksmiths Robert Bozzay and Dave Ennis will host the event.

The day's activities will center at the Museum's Blacksmith Shop where local blacksmiths and the New Jersey Blacksmiths Association (NJBA), dedicated to the promotion of the art and craft of blacksmithing, will have members on hand to demonstrate and sell their work. Tool dealers and collectors are invited to tailgate, sell and swap their smithing tools and accessories. Among the items to be found will be anvils, blowers, forges, vises, hammers, and tongs.

Visitors who have "what is it?" objects cluttering up the garage can bring them along and members of NJBA will be glad to identify them.

Admission for the day's activities is $9 for adults, $7 for seniors, active military and veterans, and $5 for children (6-12). Free for children under 6, Museum members and for NJBA members. Included in the price is admission to the Museum's historic buildings and exhibits.

For more information, or to register contact, Amy Boyce, Curator of Public Programming, at (908) 735-4101 x 102 or email programs@theredmill.org. NJBA contact is David Ennis, 908-713-1679 davidennis@att.net

Report on Walnford Day, 2014

by Bruce Freeman

Sunday, 18 May, 2014 was Walnford Day, an annual event at Historic Walnford Park, in the southwest corner of Monmouth County.

NJBA has been demonstrating at Walnford Day for several years, and it's usually quite a good event. In past years, this event was in the autumn, but the Park Service moved it to spring, this year, apparently to reduce conflicts with other events. The Park goes to some trouble to get in several craftsmen and women, as well as enlist their own volunteers to demonstrate -- woodworking, spinning, quill-pen calligraphy and other things.

The big change for NJBA was the absence of both David (who died) and Marshall (who had to go out of state for a funeral). Another big change was that Marshall would, in any event, have been unable to haul the NJBA equipment trailer to the park because his smaller truck was in need of repairs. Fortunately, Tom Majewski, stepped up to haul the trailer, despite the fact that he works nights and couldn't stay for the event. Without that tow, I would have had to transfer a forging station from the trailer to my pickup truck, a considerable extra burden. (Tom is one of our more active board members. He helps a lot in many small ways, often just by helping out or taking photographs for our newsletter. This was one more example of that.)

I met Tom at Marshall's around 8:30 AM. We briefly considered pulling some unnecessary boxes of stuff out of the trailer, but decided against it due to the time it would have taken. We hitched the trailer to his truck and caravanned to the park, pulled into the place always reserved for us and started unloading, only discovering as we did so that we had only three small buckets of coal! This was completely contrary to expectations. In years past, we had always kept at least one bag of coal on the trailer and I was not prepared for its lack.

About this time, another NJBA member, Bob Crowder, showed up and we set up the site to help. I made the "executive decision" to set up only one forge. This was partly due to insufficient coal for more than one, partly because I did not expect a lot of demonstrators, partly because of my incipient sinus headache (I really did feel up to be hammering steel!) and partly because I feared that there might not be enough folks around at the end of the day to load. (I distinctly remember the LAST Walnford Day at which three or four of us took over an hour to set up and break down the worksite. One or two of us might be able to pack up the one forging station alone, but there was no chance we could do much more without our usual crew of three to five to take the load.

As it happened, we got more help than I'd expected. Although Tom had to leave after we set up, Jay, an 18-year-old park volunteer who'd helped us last year, showed up almost the same time. Later Sue Dunsmoor, who works at the Johnson Atelier, and who demonstrated forging aluminum at our September meet at the Red Mill, showed up for a few hours, but had to leave before break-down. She showed up around noon, and with two experienced blacksmiths to hold the fort, I decided to make a run back to Marshall's Farm for more coal, leaving Bob and Sue in charge in my absence.

The trip took me about an hour. Despite the additional coal, however, the consensus was NOT to set up a second forge, since it was already about 1:30 when I got back and we had to close up around 4:30. Since Jay was a novice, Bob, Sue and I took turns giving him some

instruction. We didn't really do a lot of forging on only one forge, but we did hit hot iron and talk to the visitors, and the Park staff seemed very satisfied by our presence.

At the end of the day, I still had two helpers, Bob and Jay, to break down the site and load the trailer, so it went fairly smoothly. The trailer came out something of a mess because David Macauley had always had us unload it completely before reloading it, but I had no intention of doing all that extra work.

As I'd previously arranged, we left the trailer at the Park overnight. One of the rangers came by with a pickup truck to haul it to a different location, out of sight from the road, and park it there. Tom picked it up then next morning and hauled it back to Marshall's Farm -- on his way home from work. (Fortunately, it actually IS on his way home, so he didn't have to drive far out his way after a long shift.)

Thanks go to all who participated and especially to Tom, who facilitated immensely by towing the trailer.

The Shop of the Late David Macauley

by Bruce Freeman

Thursday, 22 May, I spent some time on the phone dealing with the issue of the blacksmithing equipment of the late David Macauley. The owners of the property his shop is at needed the space cleaned out and the equipment stored elsewhere. Bill Ker (our main contact with the Macauley family), Marshall Bienstock and a few others had visited the shop a couple weeks ago, and assessed the situation and made a decision. However, the original intention to sort the equipment and prepare for the move at a leisurely pace over some weeks went by the wayside when we learned that the owners of the property David's shop was located needed it cleaned out much sooner.

After some preliminary discussion, Craig Macauley, David's brother and executor of his estate, phoned me directly to work out some of the details, and I and hashed it over with Marshall. Ultimately, the decision was made to move the stuff on Saturday, 24 May, and somehow it devolved upon me to get a crew together for this task. Marshall wanted to do this in the morning, but getting volunteers out early is NOT easy, so I nominally set it for "mid-morning" -- about 10 AM. I phoned several members who were fairly local and had shown some interest in helping, then sent out a general announcement and request for help to those members in New Jersey. All in all we got eight folks to agree to come and two "maybes." A couple folks had to beg off simply because the notice was too short for them to change plans in time to come.

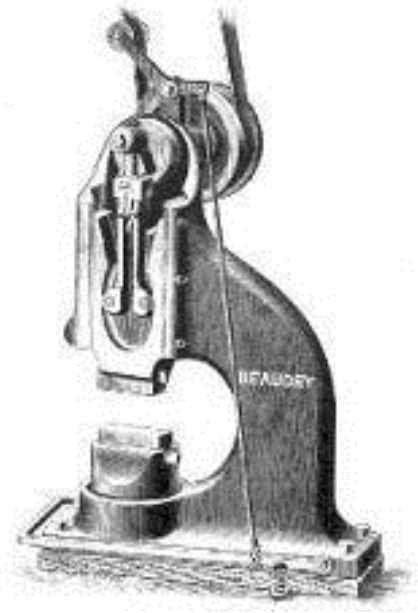
The crew started gathering before 10 AM at Marshall's farm, and were ready to roll by about 10:15. We caravanned to David's shop in four or five vehicles, including Marshall's large farm truck. As we loaded stuff out of the shop, Marshall stayed mostly on the truck and organized things as they were handed up. I helped direct the crew on the ground. This was a bit involved as there was a LOT of stuff to move, to box up, and even some stuff to disassemble before moving. We loaded the truck with much of the stuff that was not blacksmithing-related, while most of the blacksmithing-related tools we moved to the area nearest the truck, ready for a second load. By maybe around 1:30 PM, the truck was jammed full. Craig had ordered food for everybody, which arrived about then, so we took a lunch break.

After lunch we headed out in our several

vehicles, back to Marshall's Farm. There we had a pleasant surprise: The trailer bed being about the same height as the truck we were filling it from, it proved quite easy to move stuff from the truck to the trailer, and unloading the truck went quite fast with so many working. Nonetheless it was about 3:30 by the time we headed back to David's shop.

Before we made the second trip, we loaded on the truck a ramp and a crane that fit on the back of the truck. When we got there, these proved to be very useful in saving backs from lifting heavy things like anvils and buckets or boxes of tools and supplies. The former we could just hook to the crane winch and haul up to the truck deck; the latter we could slide up the inclined plane of the ramp. That, and the fact that much of the blacksmithing equipment was ready to load, made the second load go much faster. One thing that took some additional work was the steel stock, of which David had had at least a half-ton, maybe more. Several of us carried many small loads of that to the truck, where one of us arranged it along the side of the truck bed. Unfortunately, we hadn't completely emptied the shop by the time the truck was loaded.

Once again, we caravanned to the farm and unloading went fairly quickly, despite the heavy weight of some of the objects to be moved from truck to trailer. Most of the equipment, like anvils and swage blocks, was quite dense and easily loaded onto a hand truck or dolly and rolled on ramps from truck to trailer. David's cast-iron forge (which had been even bigger before disassembling into table, pot, blower, hood, and flue) was one notable exception, but even that proved amenable to being rolled across on a dolly, many hands keeping it from getting away from us. The stock we were able simply to slide from truck to trailer, with minimal lifting.



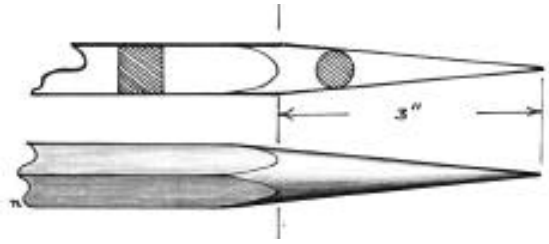
It was getting late by this time, around 5 PM I believe, and it had been drizzly or rainy since about 2 PM. So we called it a day, but will have to probably go back next weekend for a last load. I only hope we can get a good-sized crew out again for this work, as it simply cannot be done by only a few.

The list of today's participants from NJBA was Matt Yucht, Eric Von Arx, David Woodward, Jose Torres, Bill Ker, Jon Herbst, Bob Crowder, Marshall Bienstock, and myself. Craig and his daughter, who came down the night before from Massachusetts, worked alongside us. (Kathy Macauley and her daughter Molly were present as well.) All these participants donated an entire day and lots of effort to this move. Several brought hand trucks. Bob brought lots of large, sturdy boxes that proved very useful in packing smaller stuff for the move. I brought plastic tarps, thus guaranteeing that the worst of the rain would only fall on an empty truck. (We never used the tarps.) And Marshall contributed the use of his large farm truck as well as the loan of an 80-ft storage trailer, without which none of this would have even been possible.

CONTROLLED HAND FORGING part 2

Drawing a Round Taper, Lesson 3

By Jay Close
Illustrations by Tom Latané
Lesson Number Three– Drawing a Round Taper
Definition: "Drawing," "drawing out," or "drawing down" means to reduce the cross-sectional area of a bar.
Drawing a round straight taper to a point 3 inches long on the end of a square sectioned bar.



1. The final forged shape.

Intent: The student will learn to forge a round taper of a specified length on the end of a square bar and to control for the material stretch that results from converting square to round sections.

Tools Needed: Basic tools only, these to include a rule, straightedge, dividers and outside calipers.

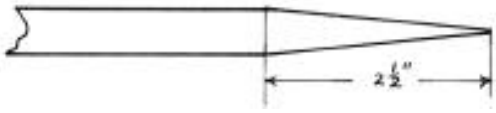
Materials: 24 inches of 1/2 inch square mild steel.

Method: When forging a round sectioned taper, first create an accurate square sectioned taper. The square taper is hammered to an accurate octagonal taper and sometimes to a 16-sided or 32-sided taper before final rounding.
As the square taper is forged progressively toward round, the length of the taper will grow about 20%. Knowing this, the square taper you begin with should be 5/6 the desired length of the round taper you need.

Step One: Review the previous lesson on drawing a straight square sectioned taper on the end of a square bar.
Starting at a yellow or light welding heat, forge a square taper on the end of the 1/2 inch square bar. This taper should be 2 1/2 inches long and hammered to a sharp point.

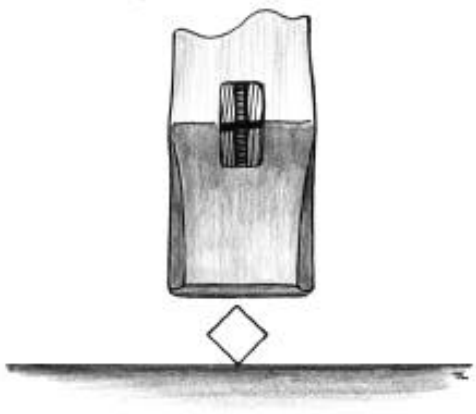
Review also the Targets section of the previous lesson on drawing out a straight taper. (Lesson One: Drawing Out, The Hammer's Blow, Vol. 11, #1, Winter 2003)
Make sure the sides of your taper are straight and the point on center. It is hard to make a round taper significantly better than the straight taper you start with.

Step Two: Place a chalk or soap stone mark 3 inches in from the front edge of the anvil. This will be a reference for drawing your taper to finished length.



2. Needed straight taper and dimensions.

Alternatively, set the points of dividers 3 inches apart and keep them handy for comparison to your work.
Note in the technical sketch shown above the "fingernail" transition between the square and round, and where on the bar we measure to judge the needed length.
Carefully reheat the bar with the point pushed through to the far side of the fire so that it does not burn before heavier sections of the bar are at a working temperature.



3. Corner up position.

4. Forge a neat flat all the way down to the point.

At a yellow or light welding heat, bring the bar to the anvil and place it "corner up."
Raise the hand holding the workpiece until you can feel good contact along the downside corner of the square taper.
Starting where the bar is thickest, match your hammer blows to the slope of the upper corner and forge a neat flat or facet all the way down the corner.
As the taper narrows, so too must the facet. Lighten your hammer blows progressively as you approach the point. You want to create a clean facet. This facet will end up with an elongated, asymmetrical diamond shape.
The diamond will be widest at the base of the original square taper. It will taper gradually toward the point. Above the base of the square taper, the diamond will come to a quicker point centered on the corner of the bar. This is where the hammer overlaps on the corner into the parent bar — the diagonal dimension of the bar is greater than the diameter of the needed round taper.
Roll the bar 90 degrees left or right (remember which) and work another flat on the next corner.
Roll the bar 90 degrees in the same direction and now the bottom flat of the first forged facet will come on top.
The anvil has already begun the facet for you. It is not as broad as the hammered facet, but the smooth anvil face has probably made a neater flat than you could hammer.
Forge this facet to match the one originally hammered. Roll the bar another 90 degrees in the same rotation and refine the other facet started by the anvil face.
At this point you should have four long diamond-shaped facets centered on the corners down the length of the taper. On the original flats of the square taper you will see long triangular facets. Your goal is to create an equal-sided octagonal section down the entire point length.

5. The forging should look like this.

Step Three: At another light orange to yellow heat, work down each of the corners of the taper to create a 16-sided taper. This is especially important where the taper is heaviest and the most material needs to be reshaped.

Step Four: This can often be done at the end of the heat of Step Three. Keeping the taper evenly on the anvil surface, slowly roll the bar beneath the hammer to create an even texture of hammer marks approximating a smooth, round, even taper.

6. The goal is to create an even-sided octagon

Troubleshooting and Corrections
Shape And Dimension Problems: Check that the sides of the taper are straight and that the point is centered. Review the lesson on making a straight taper with a square section for hints on correcting these problems. If you have approached the work in the organized fashion described, and if you have managed to keep the taper well supported on the anvil as you work, there should be little correction needed.

If the taper is too short, and you began with a proper square section taper, the material must be "hiding" somewhere. Are the sides of the taper straight? Check against a straightedge. Any bulge is material that could be forged into length.
Perhaps you did not forge an accurate or complete even-sided octagonal taper before rounding. The result is a taper that is still "square-ish" in section with rounded corners.

7. Cross sections of a "square-ish octagonal" bar and desired round

Go back and hammer down these rounded corners as facets once more. Then forge down the new corners before rolling and rounding.
Sometimes the taper will be a bit short simply because the hammered texture isn't refined enough. Make sure there are no obvious flats or facets left on the work that are more than about 1/16 inch wide.
If your taper is too long, determine why. For example, you may have worked into the square-sectioned bar beyond the start of the initial square taper. You must do this on the corners but not on the flats of the square. Using your hot cut hardie, trim the tip back to prepare for drawing and rounding the taper once more.

Important: you must trim back more than the needed shape change. If the taper is 1/2 inch too long, trim off 1/2 plus a bit more. You still must draw out the now-blunt tip. How much to trim is a matter of experiment and experience, but you've lost the element of control that working from a specific square taper gave you. As a "guesstimate" to get you started, try trimming back an extra 50% of your original error. For example, if the taper is 1/2 inch too long, cut back 3/4 inch.
Having trimmed the tip, re-draw the point starting again with facets down the length of the taper that are then blended into a smooth round. When changing the dimensions of a round, always work from facets first.
If the taper is too long, maybe you have over-forged some portion of the round, creating concave sides. On a thin point like this do not attempt to upset the bar to shorten it and fill out the concavity. Rather, trim as recommended above and redraw the point, square first, then round.

Surface Texture Problems: Small concavities or dimples are a common problem with the surface, especially near the thicker part of the taper where the corners of the bar are first forged. These dimples result from not having the bar hot enough or from not hitting hard enough or a combination. If not severe, they can be forged out and blended into the surrounding surface. Remember to keep your anvil surface clean and work the bar down to a black-red finishing heat. Hit hard to make the shape change, but lighten up with finish work. Hit light, sharp, smoothing blows. Keep the taper well supported on the anvil. Create an even-textured surface where no individual hammer mark predominates.

Targets
Time Targets: See the earlier lesson on drawing a square sectioned taper for goals for the first step of this lesson.
Once the square section taper is established, try to convert it into an even sided octagonal taper in one heat.
Take a second heat to make the upper part of the taper 16 sided and round the whole length. (A larger diameter taper may require the whole length worked 16 sided or even 32 sided. A smaller diameter taper may be able to skip the 16 sided step.)
A third heat working down to a dull red may be used to refine and smooth the surface.

Dimension Targets: Strive to create a taper that is 3 inches long plus or minus 1/16 inch.
Draw the point as fine as you can, but no more than 1/16 flat on the end.
No section of the taper is to be greater than 1/2 inch diameter. Except on the corners above the taper the original 1/2 inch square bar should remain unchanged.

Shape Targets: The point must be on center, and the sides of the taper must be straight. (The previous lesson on the square section taper will give guidance on judging this.) The section of the taper must be round, not "rounded square-ish."

Except for the corners, the dimensions of the parent bar must remain unchanged above the taper. Strive for a clearly defined "fingernail" transition between the square and round sections.

Forging Dynamics

(1) There are three reasons to work the round-sectioned taper as a square, then a series of progressively smaller facets before achieving a round:

a. When using wrought iron, the traditional and historical material of the blacksmith, this was the way to retain the fibrous integrity of the material. Premature rounding causes the individual iron strands to shear past one another and create internal cracks and other flaws in the bar.

b. With any material, this method allows the greatest control of dimension and repeatability of results.

c. A hammer blow that travels across a surface in motion or a hammer blow that makes a sweeping motion itself is less effective.

Working the bar as opposed stationary facets for as long as possible makes most effective use of the hammer blow.

(2) Comparing the cross-sectional area of bars helps predict material requirements for different forging operations. For example, a one-inch square bar has a cross-sectional area of one square inch. On the other hand, the cross-sectional area of a round bar one inch in diameter is only about 80% of the square:

area of a circle equals pi times the radius squared, OR area of a 1-inch circle equals 3.14 times (.5 X .5), OR .785 inches

When the square becomes round, the material in the corners of the square gets forged in, causing the bar to stretch.

It is actually quite easy to make a round greater than one inch in diameter from a one-inch square bar. Do this by not retaining the one-inch dimension as the corners are first forged to create an octagon. The bar will swell to greater than one inch across the flats.

If you want a one-inch diameter round from a one-inch square, first hammer the square slightly under size, then octagon and then round. This anticipates the swelling that results from forging in the corners of the square.

3) When you forge the first facet on the top corner of the square taper, the anvil is beginning a facet directly underneath on the bottom corner. The hotter (softer) the bar and the harder you hit, the more closely will the bottom facet made by the anvil approximate the dimensions of the top one made by the hammer. However, even with the hardest blow on the hottest metal, the iron itself absorbs some of the impact of the hammer so the bottom shape change will never exactly equal that of the top. This is why we work all surfaces of a bar if a uniform product is desired. (

4) If the hammer blows are light and/or the bar is cool, the shape change brought about by the hammer is increasingly concentrated on the surface directly beneath the hammer. If you don't forge the corners of your taper forcefully enough or hot enough the corner alone will spread. As the adjacent corners spread you create a small pocket or concavity in the surface. Look for these as they are an indication of working the bar too cold.

Bending Bar Stock

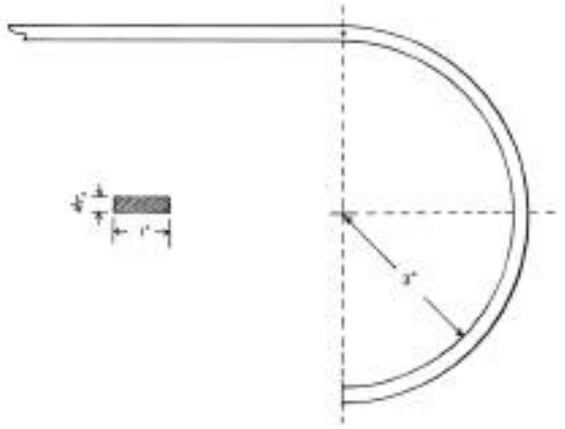
By Jay Close
Illustrations by Tom Latané
Lesson Number Four– Bending

Definition:

For bar stock, bending creates a change in the longitudinal axis of the bar. This change can occur in a single plane as in bending a classic scroll, or the change can occur in multiple planes as in a corkscrew.

Straightening is a special form of bending, as are sinking and raising when dealing with sheet stock. Bending a semicircular curve with a three-inch inside radius on the end of a flat bar.

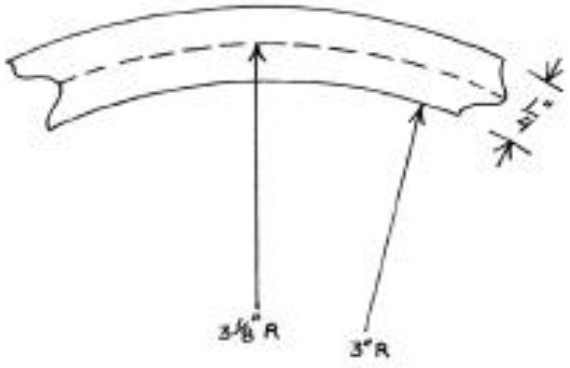
Intent: The student will practice calculating the bar stock needed to produce a bend of specified radius and learn to use the horn of the anvil to create a controlled semicircular bend of required dimensions.



1. Dimensions of the finished forging.

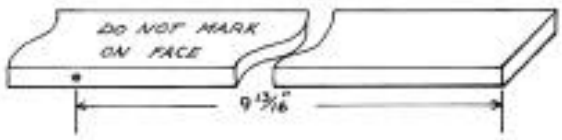
Tools Needed: Basic tools only, these to include a rule and a square.
Material: 24 to 30 inches as convenient of 1/4 inch by 1 inch mild steel bar.
Method: After calculating the needed material to make the bend, the curve is produced by using the horn as a bending point or fulcrum. Shifting the location of the bar on the horn and changing where and how hard the bar is struck controls the needed curve.

Step One: In the technical sketch, above, the radius of the bend is constant, i.e., you are asked to make a semicircle or a half circle with a radius of 3 inches measured to the inside of the bend.
However, the actual needed bar stock is determined by an imaginary line down the middle of the bar thickness. Therefore, as the bar is 1/4 inch thick, calculate the material needed for a 3 1/8 inch radius bend.



2. Material needed.

There are many ways to determine the needed material. These methods vary in accuracy and convenience. If you lack a fullsized drawing and are working from a scaled drawing or just a set of dimensions, simple geometry yields an accurate result.
In the same way that pi times the diameter of a circle equals its circumference, pi times the radius will give the linear dimension of a semicircle or half circle.
bar length needed = pi times radius
bar length needed = 3.14 times 3.125 inches or 3 and 1/8 inches
bar length needed = 9.8125 inches or 9 and 13/16 inches
Measure 9 and 13/16 inches from the end of the bar and center punch a distinct mark on the edge of the bar (not on the face).
This arithmetical method of determining the needed length of bar will only work with curves that have an even, unchanging radius, but it is very accurate.
Many smiths feel it necessary to work from a fullsized drawing.

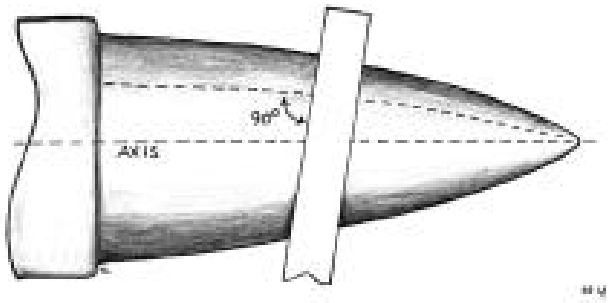


3. Material layout.

If this is not available, other methods for determining the needed bar stock are possible. Some smiths lay a piece of string or wire on the drawing along the needed curve and then straighten the string or wire to take a measurement. Others will step off the needed material using a set of dividers or a compass. A useful tool called a “traveler” can also be employed and yields a very accurate result. These methods, while of varying degrees of accuracy, have the advantage of being useful for scrolls and irregular curves as well as semicircles and full circles. Where appropriate, we will cover these other methods in subsequent lessons.
Whatever method you choose, remember to take your measurement down the middle of the bar thickness.

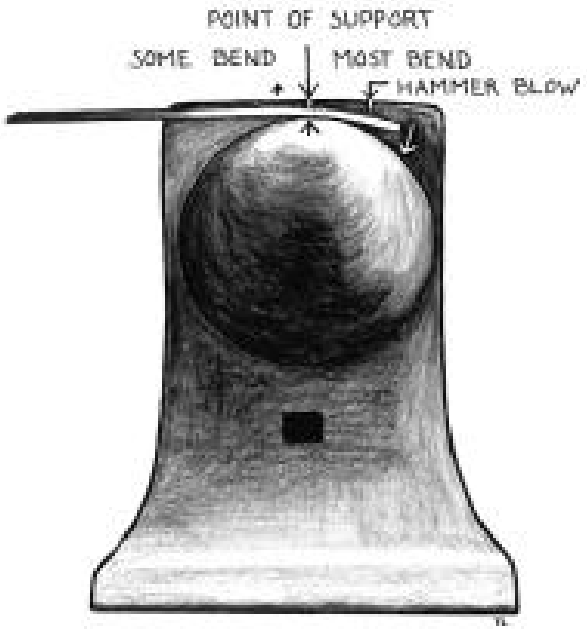
You may feel it useful to make a full-sized sketch of the needed shape, not just to determine stock requirements, but as a guide to the desired final form. If so, use the drawing (fig.#1) as a guide. For such simple shapes as this, ultimately you will come to find this drawing unnecessary and you will learn to hold an image in your mind of the completed form to guide you.

Step Two: Take an even, light orange to yellow heat on the end of the bar. Try to heat at least 4 or 5 inches, but evenness of the heat is important.
When hot, place the bar across the horn of the anvil at a slight angle to the axis of the horn, approaching perpendicular to the taper of the horn. This helps avoid the curve taking on a corkscrew spiral as it is forged. The exact angle to hold the bar depends on the geometry of the horn and is a matter of experimentation, observation and correction as you work.
With the bar held horizontally, the point of contact with the horn is directly on top. Extend the end of the bar no more than a half an inch beyond that point of support so that the end is unsupported and free to bend.



4. Holding the bar at an angle.

Hit the end of the bar straight down and the work will deflect. Most of the deflection will be on the end of the bar you hit, but the metal will “kick up” a little on the near side of the point of support too. The hotter the bar and the harder the blow the less it kicks up.
The amount the bar moves depends on (1) how hot/soft it is, (2) how hard you hit it, (3) where you hit it, and (4) how much of the bar is unsupported by the anvil. These are also areas for experimentation. Get this first part of the curve well bent. It is often easier to straighten it later than introduce more curve. After the first hit, advance the bar another half inch or so and hit it again. Do this a third time and check the progress. If you have made a sketch, compare the beginning curve to that. Otherwise, look at your curve and imagine it continuing at the same rate. Does it look like it will create the desired curve?

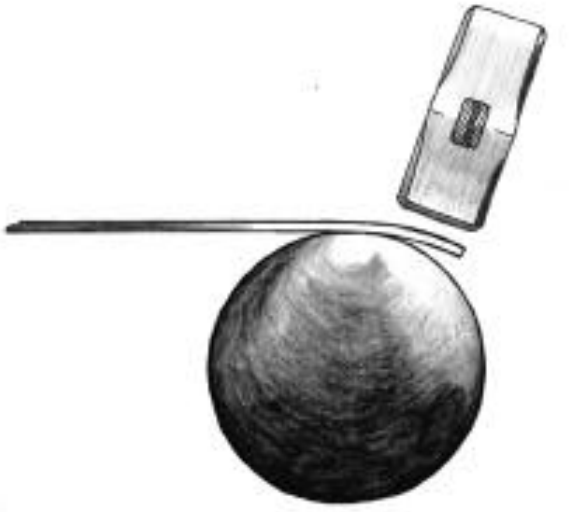


5. Forging dynamics of bending on the horn.

If you need a tighter bend, return to the approximate location of your first hammer blow and hit the bar again.
If you have clearly bent too much, place the end of the bar on the horn and hit on the near side of the point of support.
Drawing #8 in the "Trouble Shooting and Corrections" section shows the idea.

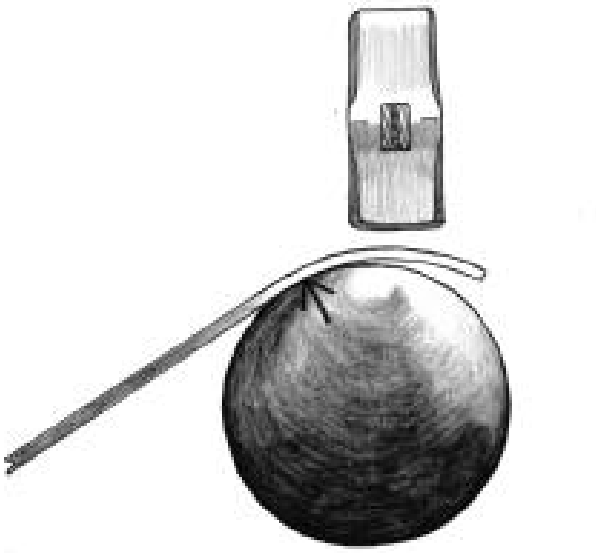
HINTS: Hitting on the near side of the point of support will open a bend. Hitting on the far side of the point of support will close a bend.
As much as possible, try to hit vertical blows straight down on the work. This is just good ergonomic practice.
In all cases, try to have the hammer face contact the bar squarely, even if the point of impact is at an angle. You can accomplish this by (1) swinging into the bar (that is, not hitting vertically), or (2)

angling the hammer face and continuing to hit straight down. The drawing gives the idea. As the bar bends and you need to rework an already bent section, feel free to lower the bar-holding hand in order to keep hitting straight down. Do not bend at the waist, but flexing the knees can help. At a certain point this becomes awkward, so angle your hammer blow as necessary. Raising and lowering the bar-holding hand will also alter the point of contact of the bar on the anvil and the nature of the bend.



6. The hammer face should strike the face of the bar squarely, whether the blow is straight down or swung at the angle necessary to match the surface of the bar.

In no case bend the bar against the curve of the angle. The horn is not a forming jig. It is only a variable fulcrum point for bending.
Much of the ease of bending a smooth curve comes from even and anticipated resistance to the hammer blow.
Any blow that pinches the bar between the hammer and the anvil is a drawing blow that thins the work and makes controlling the bend more difficult.
Likewise hot and cold spots in the bar present the same challenges.
A hard blow at a high heat close to the anvil horn with a small amount of the bar unsupported will result in the tightest bend.
Hit lighter and bend less.
Work colder and bend less.
Push more of the bar across the horn, hit farther away and the curve will be gentler.
Work the curve, never hitting twice in a row on the same spot. Keep the hammer blows moving and the bar advancing across the horn.



7. Lowering the bar to alter the point of contact.

Bending will develop its own cadence: Hit. Advance the work. Hit. Advance the work. Hit. Advance the work…etc.
Check your work.
Make corrections.
Check your work again.
Do not mindlessly hit the work. Observe the shape. Decide on a course of action. Then hit with confidence.

Step Three: When satisfied with the first part of the bend, put the bar back in the fire to heat the next section.
At a light orange to yellow heat repeat the sequence of Step Two to continue the bend. Keep track of your punch mark and visualize the complete curve as you work.

Step Four: After you are satisfied with the curve, allow the bar to cool slowly in the air and then check the needed dimensions (see the Targets section, page 18). A cold bar will allow a more accurate assessment of the required specifications. At this point small corrections in the curve and dimen-

sions can be made cold, employing the same approaches you used while the iron was hot.

Troubleshooting and Corrections:
Identifying and correcting problems are the keys to this lesson. It will take much experience before a semicircular curve can be made with no fuss.

8. Bending sequentially by moving the bar across the horn.

Basically, problems are of two types: over bending and under bending. Both present their own challenges.
To correct a bend, you can vary (1) where the bar is supported on the horn, (2) the deviation from horizontal of the straight section of the bar , (3) whether the bar is held with the bend up or down, and (4) whether you hit on the far side or the near side of the point of bar support. How you manipulate these options to correct a problem often depends on how far along the bend is before the problem is addressed.
The earlier a problem is corrected, the easier the correction will be and the correction will have less of an effect on the subsequent work.

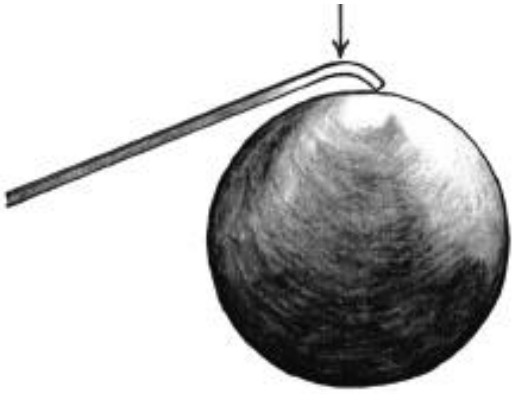
Here are some problems and potential solutions:

a) An over-bent end of the bar that is caught early is corrected by setting the tip of the bar on the horn and hitting on the near side of the point of support. Remember the prior hint: Hitting on the near side of the point of support will tend to open or straighten a curve; hitting on the far side of the point of support will tend to close or tighten a curve. If, on the other hand, the over bend is not noticed until most of the curve is already completed, then the bar is best flipped so the curve reaches under the horn and the end comes on top. Support the end and hit to the far side of the point of support.

b) b) An under-bent end of the bar, if caught soon, can be corrected by placing the end of the bar on top of the horn, lowering the holding hand down and hitting down to tighten the bend. (See drawing #7) If not caught soon enough, an under-bent end of the bar can be corrected by flipping the curve to run under the anvil. Support the end on the horn and hit as needed on the near side of the point of support to tighten the bend.

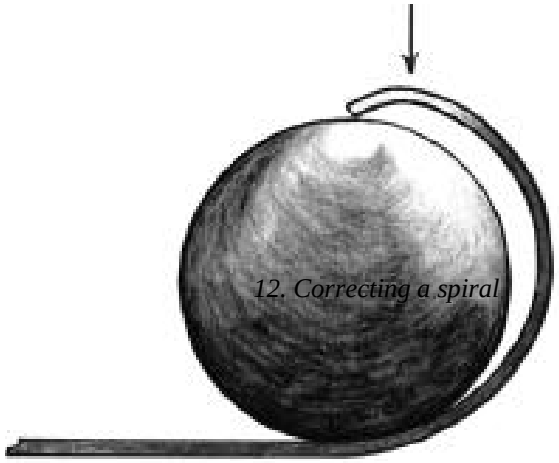
c) c) Sometimes the bend will begin to twist like a corkscrew. This results from holding the bar perpendicular to the axis of the anvil, not the curvature of the horn. Try to flatten this corkscrew on the anvil face as you work, but alter the angle of the bar on the horn to keep the twist from developing in the first place.

Using the horn, you can also bring the twist into alignment by tilting the bar with one edge off the horn and striking down on that unsupported edge to swing the bar back into a single plane. You may have to do this sequentially along a broad section of the bend, depending on how extensive the spiral has become. Remember, avoid thinning the bar against the anvil. You want to hit only the unsupported edge of the bar.



9. Straightening an overbent bar.

Targets:
Try to get the bend done in two or three heats.
The distance between the end of the bar and the beginning of the straight section should be 6 inches plus or minus a 1/16.
If you slide a square along the straight section, where it meets the punched layout, it should also hit the end of the bend.
The straight section should remain straight.
The curve should be even– no flat, straight areas or sharper bends than the needed curve.

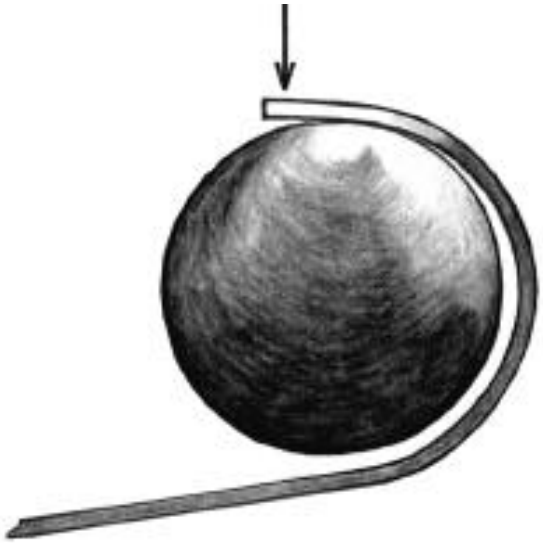


12. Correcting a spiral

10. Another way

Forging Dynamics:

The hotter the bar, the softer it is. Therefore, the more shape change that will result when a given hammer blow is applied. In bending we apply a force to change the axis of a bar. By supporting the bar at a given point on the horn we concentrate the effect of our hammer blow to a certain length of

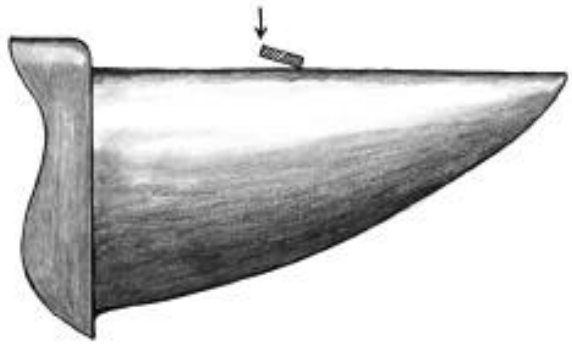


11. Correcting an underbent end

that bar axis.

On the far side of the horn where the bar is unsupported and free to bend, the hammer will have the most effect. On the worker's side or near side of the point of support the effect of the blow is "dampened" by the anvil horn and the support given the bar by the worker's arm and body. The effects of a bending blow will, to some degree, transfer past the point of support on the anvil, but will be less than on the unsupported side. The softer/hotter the bar, the more effective the dampening effect of the horn and worker's body.

Hitting on the end of a long, unsupported section spreads the energy of the hammer blow over a longer area so the effect on any one point is less– hence, a gentler bend.



12. Correcting a spiral

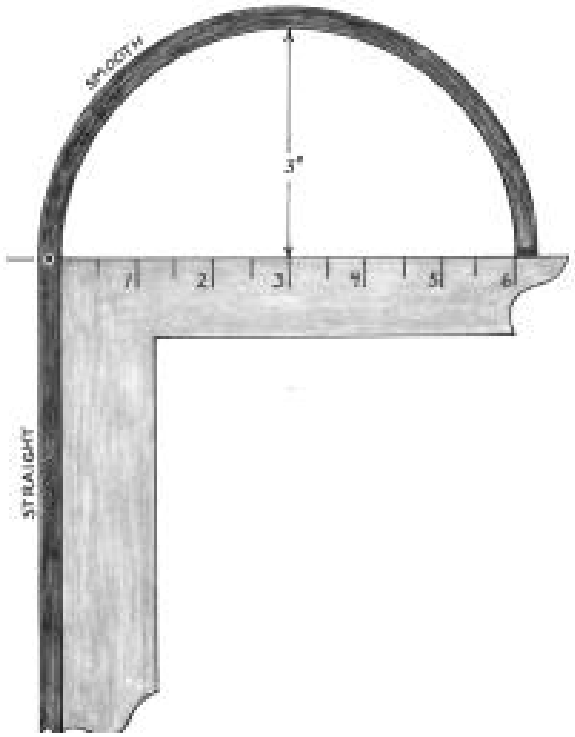
Hitting in the middle of a long unsupported section will result in an 'S-curve'. The part supported by the horn won't bend; the free end has its own inertia and resists bending from a force place far from it; the middle bends down and the ends tend to stay where they are.

A hotter section or a thinner section will respond to a hammer blow the same way, by deflecting more than the cooler or thicker areas to either side.

(2) Every bent bar has an inside and an outside radius different by the bar thickness.

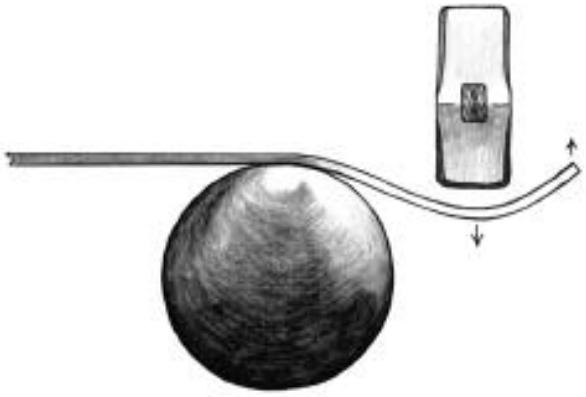
When calculating material needs for a bend of a specified radius, if you figure the lineal requirements using the outside radius, you will have too much material. If you use the inside radius you will end up short. The central axis of the bar will remain unchanged in a bend or twist; therefore, do your calculations from that dimension whether or not it is specified on the dimensioned drawing.

(3) As you bend a bar of iron, the bar upsets on the inside of the bend and stretches on the outside. The stresses of stretch and upsetting combined with



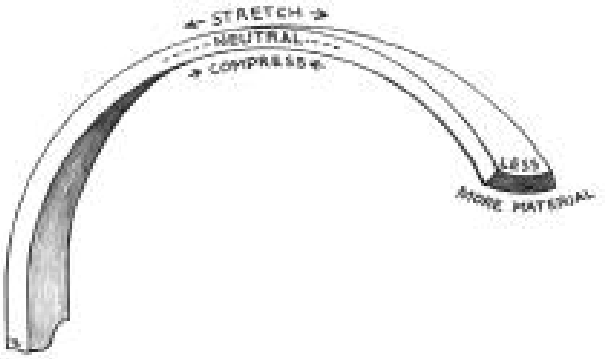
13. Checking your work.

differential resistance to the stress of bending will make a bar cup in cross section as it is bent.
The upset bar inside the bend is offered the least resistance by growing sideways. The bar actually gets wider. The stretched bar on the outside of the bend is forced longer but the material for the stretch must come from somewhere. The bar grows narrow as a result. The combined widening of the inside of the bend with the narrowing of the outside makes the bar cup.
(4)When marking out for a bend, use only a round centerpunch mark, not a chisel cut or something similar. This will minimize the potential for concentration of stress in the bar that could lead to a crack or split. In no case should you mark the face of the bar either inside or outside of a bend. Both situations, by disrupting the unbroken bar surface, will result in the concentration of stresses at that point. These considerations are particularly critical when forging wrought iron and when the bend is acute.
(5)Assessing final dimensions when the bar is cold has two advantages. First, it is more convenient



14. Forging dynamics– forging an "S" curve.

and safer to look closely at the work when the bar is at room temperature. Second, like most materials, iron expands when hot. When working to high levels of accuracy, final dimension should only be assessed at room temperature.



15. Forging dynamics– "cupping" of the metal within the curve.

(6) Even quenching ferrous materials with low-carbon contents can leave them with internal stresses and slightly stiffer. As a general principle, allow your work to cool slowly in the air when finished forging. If there is any slight adjustment need to be done while the bar is cold, the bar will resist less.

This is from ABANA's Hammers Blow Spring 2003 Pages 12—19

New Jersey Blacksmiths Association
Attn: Larry Brown, Editor
90 William Avenue
Staten Island, New York 10308

Northeast Blacksmiths Association

Northeast Blacksmiths holds its meets twice a year at the Ashokan Center in New York State.. The Ashokan Center is located in Olivebridge, N.Y., several miles west of Kingston, N.Y. The meets are held the first weekend in May and in the first weekend in October every year. The main demonstration is in the blacksmith shop and there is a "Hands On" workshop for beginners. A main demonstrator is brought in for each meet, food and bunkhouse style lodging are provided as part of the cost of the weekend long meet.

Contact :
Jonathan Nedbor for more information
Phone:(845) 687-7130 jonned@hvc.rr.com
For more info and to register for meets, check out the web site; http://www.northeastblacksmiths.org/

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Do you have any particular skills (welder, accountant, carpenter, doctor) that may be helpful to the group or membership?

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O Beginner O Intermediate O Advanced O Professional

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Send your completed application with $ 25 (one year dues) to;
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Membership is from *Jan. 1 — Dec. 31*

NJBA Ballot and Renewal

Renewal

Name_____

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[ ] My check is enclosed for **$20** (membership) or **$40** (business membership).

Ballot

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You should vote on all nominees.

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Larry Brown	[ ]	[ ]	Tom Majewski	[ ]	[ ]
Eric Cuper	[ ]	[ ]	Mark Morrow	[ ]	[ ]
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Bruce Freeman	[ ]	[ ]	Bruce Ringier	[ ]	[ ]
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TEAR THIS PAGE OFF!!!

NJBA Board of Directors Election and Membership Renewal Page

The NJBA bylaws were recently amended to provide for a mail-in ballot for electing NJBA directors. On the other side of this page, you will find your ballot and renewal notice. Please fill out your ballot and return it with your 2014-2015 membership dues. (Note that NJBA elections are not, nor ever have been, by secret vote. Your name is on your ballot so the board can confirm you are a member in good standing and that your vote should be counted – which you can insure by returning your ballot with your dues.) Ballots will be counted 30 days after this newsletter is mailed, so please be prompt in your response.

The NJBA Renewal and Board of Directors Ballot is on the next page. Please fill this out and send in as soon as you can.

The date of your last renewal is on the mailing label!!!

If your date is **2013** or older this is your last newsletter!!!