



October 2015

Volume 21

Issue 4 (Fourth Quarter)



# WRABA

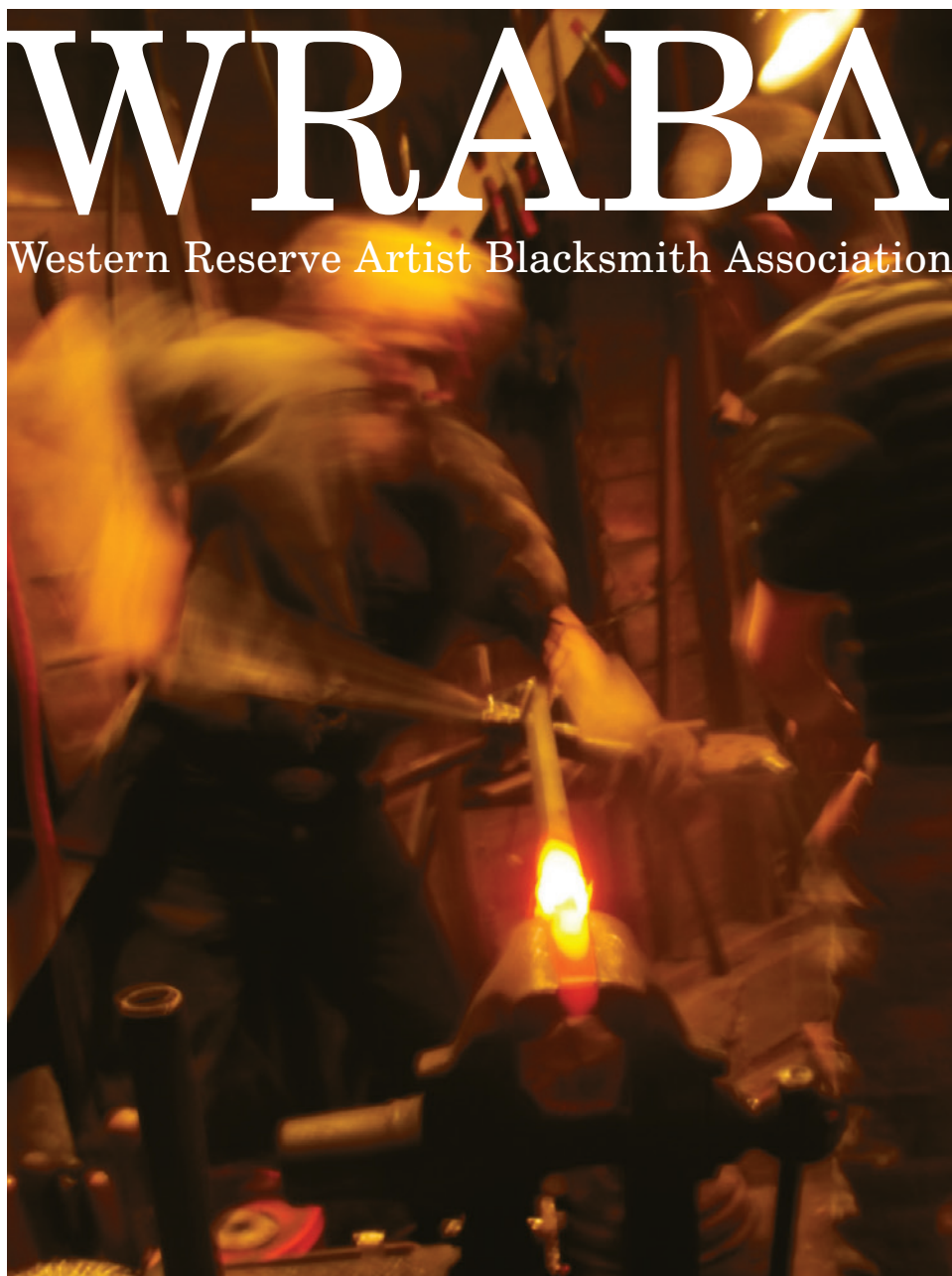
Western Reserve Artist Blacksmith Association

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## UPCOMING EVENTS:

December 12  
Christmas Party  
January 9  
Chuck Hughes  
February 13  
Ken Roby  
March 12  
Bob Parks



Jason Nass above with a friend applying some torque to twist a hot bar of one-inch square stock. Jason hosts Monday night hammer-in at his Jotunheim Forge in Cleveland.

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The Western Reserve Artist Blacksmith Association (WRABA) is a non-profit, educational organization, an affiliate of the Artist Blacksmith Association Of North America (ABANA).

We are dedicated to preserving and promoting the art and craft of hand forging iron. WRABA, our group of blacksmiths meet monthly to share information and techniques at the smithy of one of its' members or at Century Village in Burton, Ohio.

***www.wraba.com***

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Deadline for articles to be put in the newsletter: March 15, June 15, Sept. 15, Dec. 15th (these dates are in the month prior to the issue that is supposed to come out on the 1st)

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Ralph Neumeister

## Fundraising

Bob Temple  
Art Wolfe

## Special Events

Bob Temple  
Roy Troutman

## Hammer-Ins

Don Pfaff

## Tips & Tricks

Ralph Neumeister



## President's Letter:

A word from our "fearless leader".

August 8th Picnic, we had a great time forging friendships and eating good food. We put the new forge area to good use as a food staging area and sat in the shade of the trees enjoying the day.

Raccoon County Music Festival August 15th, Factoid: Geauga is a an Indian word for raccoon. We were again short handed for this event, so think about it for next year. It is a great event, lots of good music and it's only on Saturday.

SOFA, Well no Quadstate for me this year, I heard that it was a record crowd. Have not heard much about the new format this year so maybe it was ok. Of course we all know it is the place to go and buy gear. We also raffled off the wine table there, so great job to all who help with that project! I guess I will just wait till next year just like the toys on the island of misfit toys.

Apple butter festival October 10th, great event, tons of help, we always draw a big crowd at this event so thanks to those who hammered and work the tables.

This is a reminder that we are a voluntary organization, no one gets paid to do the work needed to make it through a year. We all have jobs outside of WRABA, things are sometimes overlooked. So please send us a friendly reminder if we miss something.

So ya want to be a blacksmith? Four years ago just after conference, I joined WRABA. I had been asking for blacksmith lessons for a Christmas present to no avail. Then during my annual search for blacksmith schools, a web search hit on the open forge program. The following February, Ken Roby must have decided he needed more aggravation in his life and offered a job to an Engineer. Most people you meet are amazed that there are any blacksmiths still around, unless of course you mean horse shoeing. So I find it enjoyable to share my occupation now, and even more the awesome works of art that Ken has allow me to be part of. Maybe that's why I feel the importance of passing on the knowledge, help someone else find the happy place. Do not let your tombstone read, "Died with a wealth of knowledge and skills, that only he knew of." We definitely need help at our open forge nights, more instructors needed!

Upcoming events:

December 12, 11 am to 3 pm WRABA Christmas party at ASM International Headquarters. Eight miles west of Burton, Ohio on Route 87 (next to Geauga Parks Westwood park) Meat and drink provided, please bring a dish or dessert to share. We will have our VIP raffle and our annual auction which will include items from our conference demonstrator and of course donations from you, so clean out the shop!

January 9th Hammer-in at Chuck Hughes',

February 13th Hammer-in at Ken Roby's,

March 12 at Bob Parks'.

We try to schedule our events on the second Saturday of the month. The best way to check on dates is through our website or on Facebook. This also the medium for us to inform you on changes and cancelation.

There is no try, just do! Wise words from our friend Yoda.

Gary Barnhart

President, WRABA



# WRABA Events

## Open Forge Winter— Every Monday, Tuesday or Thursday from 5 to 9 PM

These are informal forge sessions intended to introduce people to blacksmithing, give new members and those without a permanent shop a regular place and time to spend at the anvil, and also an opportunity to socialize.

You don't have to be a member to attend an open forge but you will want to join soon after! We highly recommend you wear all cotton clothing, and leather shoes. Synthetic tends to melt if something hot hits it, and this could in turn stick to your skin. Bring safety glasses if you have them. A leather glove for your non-dominant hand would be good also. You want to be able to remove it quickly and easily if necessary.

### Monday Open Forge

At Jotunheim Forge, Jason Nass hosting.  
4101 Brooklyn Ave.,  
Cleveland, OH 44109.

Go to the garage in back. Contact Jason at 216-609-9250 for more information.

### Tuesday Open Forge

At Maple Leaf Forge, Ralph Neumeister hosting.  
17231 Messenger Road,  
Burton, OH 44021.

Contact Ralph at 440-552-9560 for more information.

### Thursday Open Forge

Steel Tree Workshop, Gary Barnhart hosting.  
1961 State Route 534,  
Southington, OH 44470.

Contact Gary at 330-898-8171 for more information.

## Hammer-in Schedule

Check [www.wraba.com](http://www.wraba.com) for details.

**January 9..... Chuck Hughes**

**February 13... Ken Roby**

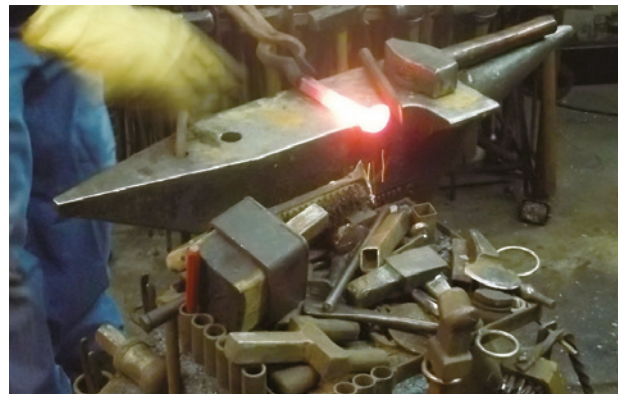
**March 12..... Bob Parks**

## Christmas party

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*Jason Nass' primary anvil. He hosts Monday night in Cleveland.*



*Ralph Neumeister's primary anvil. He hosts Tuesday night west of Burton and has ALL KINDS of tools.*



*Gary Barnhart's primary anvil—it's so shi-i-i-ney! He hosts Thursday night open forge in Southington, Ohio.*

# A Brief History of Iron and Steel Production

by Professor Joseph S. Spoerl

Saint Anselm College

The production of iron by humans began probably sometime after 2000 BCE in south-west or south-central Asia, perhaps in the Caucasus region. Thus began the Iron Age, when iron replaced bronze in implements and weapons. This shift occurred because iron, when alloyed with a bit of carbon, is harder, more durable, and holds a sharper edge than bronze. For over three thousand years, until replaced by steel after CE 1870, iron formed the material basis of human civilization in Europe, Asia, and Africa.

Iron is the fourth most abundant element and makes up more than five percent of the earth's crust. Iron exists naturally in iron ore (sometimes called ironstone). Since iron has a strong affinity for oxygen, iron ore is an oxide of iron; it also contains varying quantities of other elements such as silicon, sulfur, manganese, and phosphorus. Smelting is the process by which iron is extracted from iron ore. When iron ore is heated in a charcoal fire, the iron ore begins to release some of its oxygen, which combines with carbon monoxide to form carbon dioxide. In this way, a spongy, porous mass of relatively pure iron is formed, intermixed with bits of charcoal and extraneous matter liberated from the ore, known as slag. (The separation of slag from the iron is facilitated by the addition of flux, that is, crushed seashells or limestone.) The formation of this bloom of iron was as far as the primitive blacksmith got: he would remove this pasty mass from the furnace and hammer it on an anvil to drive out the cinders and slag and to compact the metallic particles. This was wrought iron ("wrought" means "worked," that is, hammered) and contained generally from .02 to .08 percent of carbon (absorbed from the charcoal), just enough to make the metal both tough and malleable. Wrought iron was the most commonly produced metal through most of the Iron Age.

At very high temperatures (rare except in a blast furnace -- see below), a radical change takes place: the iron begins to absorb carbon rapidly, and the iron starts to melt, since the higher carbon content lowers the melting point of the iron. The result is cast iron, which contains from 3 to 4.5 percent carbon. This high proportion of carbon makes cast iron hard and brittle; it is liable to crack or shatter under a heavy blow, and it cannot be forged (that is, heated and shaped by hammer blows) at any temperature. By the late Middle Ages, European ironmakers had developed the blast furnace, a tall chimney-like structure in which combustion was intensified by a blast of air pumped through alternating layers of charcoal, flux, and iron ore. (Medieval ironworkers also learned to harness water wheels

to power bellows to pump the air through blast furnaces and to power massive forge hammers; after 1777, James Watt's new steam engine was also used for these purposes.) Molten cast iron would run directly from the base of the blast furnace into a sand trough which fed a number of smaller lateral troughs; this configuration resembled a sow suckling a litter of piglets, and cast iron produced in this way thus came to be called pig iron. Iron could be cast directly into molds at the blast furnace base or remelted from pig iron to make cast iron stoves, pots, pans, firebacks, cannon, cannonballs, or bells ("to cast" means to pour into a mold, hence the name "cast iron"). Casting is also called founding and is done in a foundry.

Ironmakers of the late Middle Ages also learned how to transform cast pig iron into the more useful wrought iron by oxidizing excess carbon out of the pig iron in a charcoal furnace called a finery. After 1784, pig iron was refined in a puddling furnace (developed by the Englishman Henry Cort). The puddling furnace required the stirring of the molten metal, kept separate from the charcoal fire, through an aperture by a highly skilled craftsman called a puddler; this exposed the metal evenly to the heat and combustion gases in the furnace so that the carbon could be oxidized out. As the carbon content decreases, the melting point rises, causing semi-solid bits of iron to appear in the liquid mass. The puddler would gather these in a single mass and work them under a forge hammer, and then the hot wrought iron would be run through rollers (in rolling mills) to form flat iron sheets or rails; slitting mills cut wrought iron sheets into narrow strips for making nails.

While blast furnaces produced cast iron with great efficiency, the process of refining cast iron into wrought iron remained comparatively inefficient into the mid-1800s. Historian David Landes writes: "The puddling furnace remained the bottleneck of the industry. Only men of remarkable strength and endurance could stand up to the heat for hours, turn and stir the thick porridge of liquescent metal, and draw off the blobs of pasty wrought iron. The puddlers were the aristocracy of the proletariat, proud, clannish, set apart by sweat and blood. Few of them lived past forty. Numerous efforts were made to mechanize the puddling furnace -- in vain. Machines could be made to stir the bath, but only the human eye and touch could separate out the solidifying decarburized metal. The size of the furnace and productivity gains were limited accordingly" (The Cambridge Economic History of Europe, Vol. VI, Part I, 1966, p. 447).

Another important discovery in the 1700s (by the Englishman Abraham Darby) was that coke (a contraction of "coal-cake"), or coal baked to remove impurities such as sulfur, could be substituted for charcoal in smelting. This was an important advance since charcoal production had



led to severe deforestation across western Europe and Great Britain.

Steel has a carbon content ranging from .2 to 1.5 percent, enough carbon to make it harder than wrought iron, but not so much as to make it as brittle as cast iron. Its hardness combined with its flexibility and tensile strength make steel far more useful than either type of iron: it is more durable and holds a sharp edge better than the softer wrought iron, but it resists shock and tension better than the more brittle cast iron. However, until the mid 1800s, steel was difficult to manufacture and expensive. Prior to the invention of the Bessemer converter (described below), steel was made mainly by the so-called cementation process. Bars of wrought iron would be packed in powdered charcoal, layer upon layer, in tightly covered stone boxes and heated. After several days of heating, the wrought iron bars would absorb carbon; to distribute the carbon more evenly, the metal would be broken up, rebundled with charcoal powder, and reheated. The resulting blister steel would then be heated again and brought under a forge hammer to give it a more consistent texture. In the 1740s, the English clockmaker Benjamin Huntsman, searching for a higher-quality steel for making clock springs, discovered that blister steel could be melted in clay crucibles and further refined by the addition of a special flux that removed fine particles of slag that the cementation process could not remove. This was called crucible steel; it was of a high quality, but expensive.

To sum up so far: wrought iron has a little carbon (.02 to .08 percent), just enough to make it hard without losing its malleability. Cast iron, in contrast, has a lot of carbon (3 to 4.5 percent), which makes it hard but brittle and nonmalleable. In between these is steel, with .2 to 1.5 percent carbon, making it harder than wrought iron, yet malleable and flexible, unlike cast iron. These properties make steel more useful than either wrought or cast iron, yet prior to 1856, there was no easy way to control the carbon level in iron so as to manufacture steel cheaply and efficiently. Yet the growth of railroads in the 1800s created a huge market for steel. The first railroads ran on wrought iron rails which were too soft to be durable. On some busy stretches, and on the outer edges of curves, the wrought iron rails had to be replaced every six to eight weeks. Steel rails would be far more durable, yet the labor- and energy-intensive process of cementation made steel prohibitively expensive for such large-scale uses.

The mass-production of cheap steel only became possible after the introduction of the Bessemer process, named after its brilliant inventor, the British metallurgist Sir Henry Bessemer (1813-1898). Bessemer reasoned that carbon in molten pig iron unites readily with oxygen, so a strong blast of air through molten pig iron should convert the pig iron into steel by reducing its carbon content. In 1856 Bessemer designed what he called a converter, a large, pear-shaped receptacle with holes at the bottom to allow the injection of compressed air. Bessemer filled it with molten pig iron, blew compressed air through

the molten metal, and found that the pig iron was indeed emptied of carbon and silicon in just a few minutes; moreover, instead of freezing up from the blast of cold air, the metal became even hotter and so remained molten. Subsequent experimentation by another British inventor, Robert Mushet, showed that the air blast actually removed too much carbon and left too much oxygen behind in the molten metal. This made necessary the addition of a compound of iron, carbon, and manganese called *spiegel-eisen* (or *spiegel* for short): the manganese removes the oxygen in the form of manganese oxide, which passes into the slag, and the carbon remains behind, converting the molten iron into steel. (Ferromanganese serves a similar purpose.) The blast of air through the molten pig iron, followed by the addition of a small quantity of molten *spiegel*, thus converts the whole large mass of molten pig iron into steel in just minutes, without the need for any additional fuel (as contrasted with the days, and tons of extra fuel and labor, required for puddling and cementation).

One shortcoming of the initial Bessemer process, however, was that it did not remove phosphorus from the pig iron. Phosphorus makes steel excessively brittle. Initially, therefore, the Bessemer process could only be used on pig iron made from phosphorus-free ores. Such ores are relatively scarce and expensive, as they are found in only a few places (e.g. Wales and Sweden, where Bessemer got his iron ore, and upper Michigan). In 1876, the Welshman Sidney Gilchrist Thomas discovered that adding a chemically basic material such as limestone to the converter draws the phosphorus from the pig iron into the slag, which floats to the top of the converter where it can be skimmed off, resulting in phosphorus-free steel. (This is called the basic Bessemer process, or the Thomas basic process.) This crucial discovery meant that vast stores of iron ore from many regions of the world could be used to make pig iron for Bessemer converters, which in turn led to skyrocketing production of cheap steel in Europe and the U.S. In the U.S., for example, in 1867, 460,000 tons of wrought iron rails were made and sold for \$83 per ton; only 2550 tons of Bessemer steel rails were made, fetching a price of up to \$170 per ton. By 1884, in contrast, iron rails had virtually ceased to be made at all; steel rails had replaced them at an annual production of 1,500,000 tons selling at a price of \$32 per ton. Andrew Carnegie's genius for lowering production costs would drive prices as low as \$14 per ton before the end of the century. (This drop in cost was accompanied by an equally dramatic increase in quality as steel replaced iron rails: from 1865 to 1905, the average life of a rail increased from two years to ten and the car weight a rail could bear increased from eight tons to seventy.)

The Bessemer process did not have the field to itself for long as inventors sought ways around the patents (over 100 of them) held by Henry Bessemer. In the 1860s, a rival appeared on the scene: the open-hearth process, developed primarily by the German engineer Karl Wil-

helm Siemens. This process converts iron into steel in a broad, shallow, open-hearth furnace (also called a Siemens gas furnace since it was fueled first by coal gas, later by natural gas) by adding wrought iron or iron oxide to molten pig iron until the carbon content is reduced by dilution and oxidation. Using exhaust gases to preheat air and gas prior to combustion, the Siemens furnace could achieve very high temperatures. As with Bessemer converters, the use of basic materials such as limestone in open-hearth furnaces helps to remove phosphorus from the molten metal (a modification called the basic open-hearth process). Unlike the Bessemer converter, which makes steel in one volcanic rush, the open-hearth process takes hours and allows for periodic laboratory testing of the molten steel so that steel can be made to the precise specifications of the customer as to chemical composition and mechanical properties. The open hearth process also allows for the production of larger batches of steel than the Bessemer process and the recycling of scrap metal. Because of these advantages, by 1900 the open hearth process had largely replaced the Bessemer process. (After 1960, it was in turn replaced by the basic oxygen process, a modification of the Bessemer process, in the production of steel from iron ore, and by the electric-arc furnace in the production of steel from scrap.)

Unlike many of his competitors, Andrew Carnegie was quick to recognize the importance of the Bessemer, Thomas basic, and open-hearth processes. He was also among the first steelmakers to grasp the vital importance of chemistry in steelmaking. These became keys to his success as a steel manufacturer.

The mass production of cheap steel, made possible by the discoveries described above (and many others not mentioned), has revolutionized our world. Consider a brief and incomplete list of the products made possible (or better or more affordable) by cheap, abundant steel: railroads, oil and gas pipelines, refineries, power plants, power lines, assembly lines, skyscrapers, elevators, subways, bridges, reinforced concrete, automobiles, trucks, buses, trolleys, refrigerators, washing machines, clothes dryers, dishwashers, nails, screws, bolts, nuts, needles, wire, watches, clocks, canned food, battleships, aircraft carriers, oil tankers, ocean freighters, shipping containers, cranes, bulldozers, tractors, farm implements, fences, knives, forks, spoons, scissors, razors, surgical instruments, ball-bearings, turbines, drill bits, saws, and tools of every sort.

In view of his moral failings, can we really consider Carnegie a “portrait of human greatness?” The case for an affirmative answer is this. We are heirs to thousands of years of technological progress, and we benefit every day from the ingenuity and hard work of many thousands of blacksmiths, ironworkers, steelworkers, engineers, inventors, chemists, metallurgists, and entrepreneurs, long since deceased, one of whom was Carnegie and few of whom were saints. Our standard of living today owes much to Carnegie’s entrepreneurial drive, self-education,

and genius for efficiency. Whatever his flaws – and who among us has none? – Carnegie embodied a type of human greatness that deserves our appreciation and gratitude. Without forgetting the contributions of others (especially his workers), we should make the same judgment about Carnegie that Stephen Ambrose makes about the men who built the first transcontinental railroad: “Things happened as they happened. It is possible to imagine all kinds of different routes across the continent, or a better way for the government to help private industry, or maybe to have the government build and own it. But those things didn’t happen, and what did take place is grand. So we admire those who did it – even if they were far from perfect – for what they were and what they accomplished and how much each of us owes them.” (Nothing Like It In the World [New York: Simon and Schuster: 2000], p. 382)

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- \*\*\*\*\*
- A good way to learn about the iron manufacturing process prior to its transformation in the Industrial Revolution is to visit the Saugus Iron Works, an authentic recreation of the first integrated iron works in North America (1646-1668), run by the National Park Service in Saugus, MA. <http://www.nps.gov/sair> AND <http://www.cr.nps.gov/nr/twhp/wwwtpls/lessons/30saugus/30facts1.htm>
- For more information on Carnegie, see the PBS/American Experience website: <http://www.pbs.org/wgbh/amex/carnegie/index.html>
- For an index of sites on iron, steel, and Carnegie: <http://42explore.com/ironsteel.htm>

# Christmas Ornaments

*Editor's note: I dug this up from the Projects 2008 "WRABA Tips and Techniques" pdf available on our website. The photos are very low resolution, but adequate enough to illustrate the text.*

Story by Tim Mann, Murphys, California \* Photos & Illustrations by Eden Sanders

Several years ago, I was looking for a simple project to introduce artsy iron to the students of the welding class at Columbia College, Remembering a demo by Dorothy Stiegler of Elizabeth Brim's blow-up technique, I found the perfect project. It uses little material and few tools, easily made. It requires some welding and has the thrill of doing something unexpected with really hot steel. Why not steel Christmas ornaments?

## Materials:

6-1/2" x 5" w gauge mild, ungalvanized steel and a 12" length of 1/4" steel brake line.

## Tools:

4-1/2" angle grinder, swivel pad Vise-Grip®, oxyacetylene outfit or TIG welder, soft jaws for vise, simple repousse tools, opener (long round taper with a chisel tip), pitch or lead. Make half pattern on folder paper to ensure both sides are the same. I use a 3" diameter circle with the bottom drawn out to a point and the top curving up to an 11/16" flat where the blow up tube fits and the ornament cap and hook will go.

**Math note.** Yes, I know, for a 3/8" diameter hole, I only need 1-3/16" total material, but when you edge weld, you use the extra 3/16".

Unfold your pattern and trace onto metal. If you like the pattern and plan to use it again, trace it onto 26-28 gauge galvanized sheet metal and cut out with tin snips. Rough cut to a little beyond the line with whatever you use to cut 22 gauge stock.

Mark one side of each piece in so that the rest of the steps will be done with the two pieces in the same orientation. Put in to in. Align as best you can, paying close attention to the top flats. Grip in the center with the swivel pad Vise-Grip. Grind both pieces simultaneously down to the line. Split apart, and clean up the burr left from grinding. On the in sides draw what you wish for the design. Keep the design V4" to 3/8" away from the edge to make the weld easier. Fast and easy is a snowflake, but I have also done logos as gifts for suppliers. Technically, this makes it repousse, but I consider this more of stamped from the inside.

Follow your design with repousse tools into an appropriate backing medium. I use two layers of sheet lead cut to fit like a saddle over an anvil that works well for simple designs and is available from roofing suppliers and sheet metal shops. For a more elaborate design, I would use pitch ([www.northwestpitchworks.com](http://www.northwestpitchworks.com)), but that would increase cost and time for what is supposed to be a simple project. Safety note: Don't lick or eat lead.

Realign the two pieces in to in. The stamping process has undoubtedly bulged out the middle, but that is OK. What you need to look for is how tight the edges come together. Flatten by putting the in side on the face of the anvil and pressing on the center with the palm of your hand, or give it a few whacks with your fist.

When you have a reasonably good fit, clamp lightly in the Vise-Grip. Fine tune the edges by tapping any gaps closed with a hammer.





**The Weld.** If you know how to TIG weld, I don't need to tell you how to weld this up. For the rest of us, an oxyacetylene torch works just fine. A 000 tip in a regular torch or a half-tip in a Henrob will do the job. Set the acetylene and oxygen pressure at 4 psi for both types. An edge weld without rod is one of the easier welds to make, but if you have never done one, practice on some scrap 22 gauge first.

**Tip 1.** Always work from thin to thick — thin being the corners or points, thick being the middle of piece.

**Tip 2.** Keep the bead moving. Increase your speed as you push more heat ahead of the weld. Try to keep a consistent bead size and weld depth.

**Tip 3.** Watch ahead of the weld pool for a developing gap. If you see a gap, stop the weld! With material this thin, if the sides separate, you will have a very hard time making a good weld and will most likely burn off one side or the other. Take this time to tap the edges together before continuing to weld. (This is a tip I need tattooed on my forehead. I get cocky and figure I can make it work. Boom! Two hours of prep work lost to save one minute.) Do not weld across the top of the flat.

Lightly grind any inconsistencies off the weld to smooth the edge and fair the curves.

Place the ornament between soft jaws in a vise, taking care not to mash the design. Heat the area at the top flat to a red heat and work the chisel tip of the opener between the sides. Then drive it down to create the opening for the brake tube.

Weld the brake tube in place. This weld requires welding rod. Heat the parent metal to just where it starts to sweat and add a drop of rod. What you are trying to do is plug holes, not weld for strength. The weld does not need to be pretty but must be air tight. Check to see if it is adequate by putting air pressure into the ornament. The sides should move a little as you squirt the air.

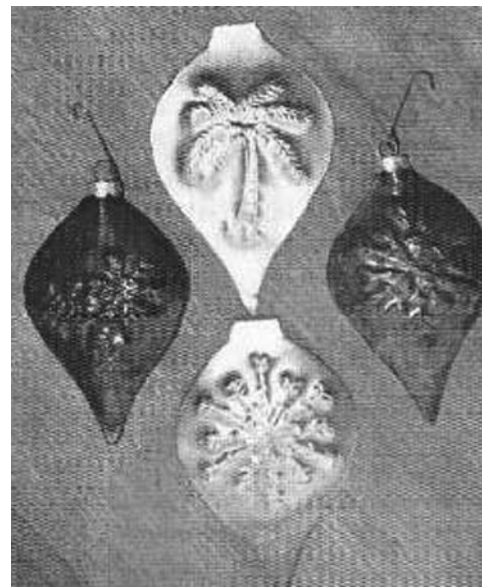
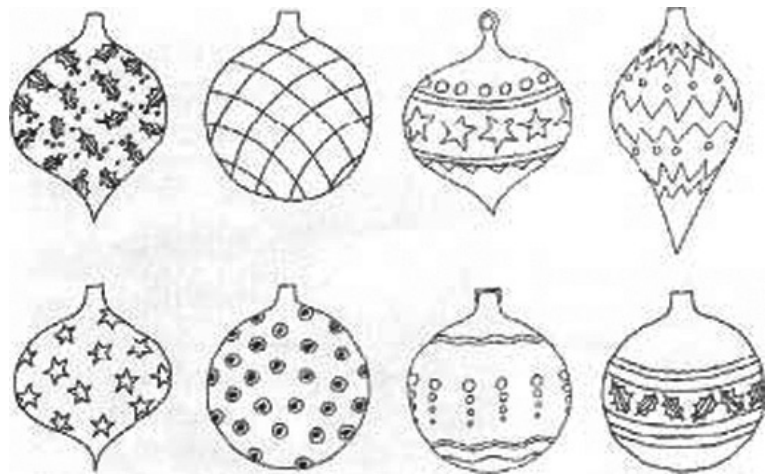
**Safety Note.** Because the brake tube appears to be coated, take care not to breath fumes.

**Fun Part.** Heat the entire ornament to a red heat and inflate.

Setting the compressor at low pressure gives me more control of this process and keeps me from over inflating the shape.

Lightly wire brush off the scale.

**Finish.** Leave the tube on for the next couple of steps as a handy handle. With a wire wheel in the grinder, take off the rest of the scale. I normally reheat to a red heat and let cool to get a consistent coat of scale. As it cools you can highlight the design by lightly brushing with a brass brush. Finish with a couple of coats of clear gloss finish. Now remove the tube. If you made a crummy weld (desirable), you can rock the tube out. If not, place the tube end in a vise and cut it off with a hacksaw. Insert the ornament cap with a book and enjoy.



**Jason Pfaff***Sales/Technical Service*

Alliance Abrasives  
23649 St Rt 62  
Alliance, Oh 44004

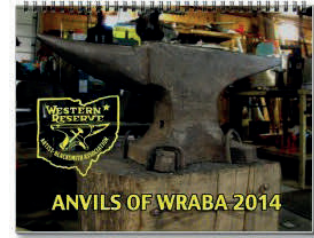
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WRABA now has an online shop at Zazzle.com/wrabashop, also linked on the website. It currently has WRABA shirts, ball-caps, mugs, and calendars of many various styles and colors so you can get exactly what you want with the WRABA logo.

Pictured: a WRABA calendar starting at \$20.95, full-color images featuring the anvils of our members.




# BLUE MOON PRESS

Was at WRABA 2014 Conference  
& donated books for our auction  
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## WRABA 2015 Membership Form

☐ New Membership    ☐ Renewal – Please fill in all sections so your information may be updated

Name \_\_\_\_\_ **Best way to contact me**  
 Spouse/Family Names \_\_\_\_\_ (check one or two)  
 Occupation \_\_\_\_\_ ☐ Email  
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Forge Name \_\_\_\_\_ **May we list your forge**  
 Specialty \_\_\_\_\_ **in a directory on the**  
 Forge Address \_\_\_\_\_ **WRABA website?**  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ ☐ Yes  
 Forge Phone \_\_\_\_\_ Web site \_\_\_\_\_ ☐ No

**Smithing Experience:** I wish to receive my newsletters

- ☐ Beginner  
☐ Hobbyist  
☐ Advanced  
☐ Professional

**via (choose one)**

- ☐ USPS Mail  
☐ E-mail (as a PDF file)

**Comments:**

**Participation:**

- ☐ I am willing to hosting a Hammer-In  
☐ I am willing to demonstrate at a Hammer-In  
☐ I am willing to demonstrate at Century Village events  
☐ I am willing to host an Open Forge  
☐ I am willing to assist with the newsletter  
☐ I am willing to serve as an officer or board member

Date \_\_\_\_\_

*Membership year starts March 1st.*

*Dues are prorated as follows:*

Join Date	Single	Family
<input type="checkbox"/> March-May	\$25.00	\$30.00
<input type="checkbox"/> June-August	\$18.75	\$22.50
<input type="checkbox"/> Sept. - Nov.	\$12.50	\$15.00
<input type="checkbox"/> Dec. - Feb.	\$6.25	\$7.50

**Print form and mail or Email to:**

WRABA c/o Dave Aubuchon  
 9634 Brixton Ave NW  
 Uniontown OH 44685  
[dnl21@sbcglobal.net](mailto:dnl21@sbcglobal.net)

*Membership valid once dues are received.*

**Payment**

*I'm using the following method for payment:*

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Tips & Tricks

## It's Your Pick!

*Updated from a 2008 PAABA Newsletter by one Dave Lint.*

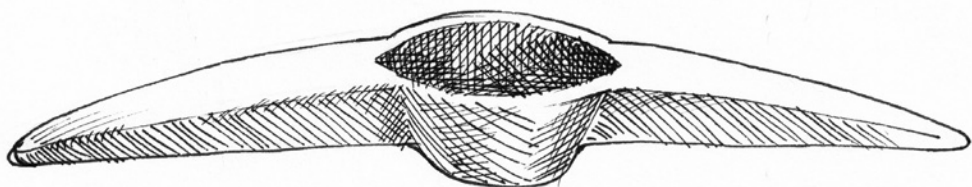
Find a pick-axe head no longer in use. (These things show up at scrap-yards all the time.) You can use these to make your own customized anvil stake.

1. Drive each end into hardy hole of your anvil and mark accordingly. Cut off the ends, or if you prefer, leave them on. Just be sure to leave enough to fit into the hardy hole (4 or 5 inches from the eye of the tool).

2. Cut the head in two. It occurs to me that you could create equal halves, or unequal if you have a specific need in mind.

3 Apply heat and work to required shape.

Great idea to use for an old garden tool. Keep one and have one to give away!



*Pick-axe garden tool without the wooden handle.*

