



April 2008

The Florida

Clinker Breaker

Florida Artist Blacksmith Association - Established May 18, 1985

President's Corner

Rex Anderson

Rex has generously offered to let me fill this space (OK, he didn't have anything to say this month).



Editorial Musings

There will be a Board meeting coming up, so if you want something handled/discussed, please talk to a Board member (a list of those folks are on the last page of the issue). One of those issues is what to do about the archives of the *Clinker Breaker* and possible alternative ways of making it available to the membership.

We currently have seven complete years (1997-2000, 2005-2007) and a couple of partial years (2001 @ 1; 2003 @9) in pdf formats. Eventually, I'll try to scan the missing issues (but don't hold your breath). Our website is currently costing us nothing (thanks to anvilfire.com) but we are space limited and the control over access is essentially non-existent. I've archived some of the issues on my own website (ironflower.com) but I'm running out of space. We could rent space at approximately \$84/annually, buy another domain (~\$15/year), and link from our current site to the archive or just move the website over to a new space (which doesn't change the address unless you are using IP numbers rather than "Blacksmithing.org"). Currently, we are receiving copies of other groups newsletters but not sending ours -- the electronic archive solves this and that's why the current issues are available on line. It is possible that if we rented a site, we could handle membership renewals through the site using PayPal or such rather than everyone writing checks and we would have lots more space for displaying your work and setting up picture galleries.

What I need to know, is does anyone out there think it's worth spending maybe \$100 a year to make our newsletter available on line beyond what we are already doing?

Another suggestion has surfaced that we could save some money by posting the issue on line and distributing the password to paying members. From your viewpoint, you would pony up your dues and an e-mail address. What you would get back via e-mail is the location and password to gain access to the current archive (say the last 3 to 6 months of issues). Then every month, when the issue was uploaded, you would get an e-mail telling you that it was ready to download. After a set time (that's the 3 to 6 months mentioned above), the issue would be moved to the open archive and anyone could access it. Since we would be saving a significant portion of your dues on not printing and mailing the issue, either your dues might drop or the folks who want a paper copy might have to pony up some more money. As an example, I'm a member of the Ecological Society of America and I pay nominal annual dues just to be a member. If I want to receive the journal *Ecology*, I would have to pay considerably more. We can apply this model to FABA if you want to.

Talk to your Board members and tell us what you want. If you don't speak up, we can't hear you!

While I'm waiting on the official go-ahead from our Program Chairman, I wanted to take opportunity to ask if you -- that's right - YOU - might be willing to demonstrate something for about an hour at the '08 conference. The idea is that there will be four time blocks (one per region) and each region can have members (probably 4 or so) who will show up at a set time and share something with the rest of us. If you don't want to demo, maybe you want to run a contest? We ought to be able to come up with something more interesting than walking through the tool sales for umph time, no? I'll make sure we have gear, the cost will be nada to the conference, and we might all learn something. I'm volunteering to do either non-ferric dishing and planishing and/or some aspect of knife fit-and-finish (depending on what folks tell me they want). What I need you to do is talk to your coordinator and tell them that you can be counted on. I would also be interested in knowing if you would be interested in coming by and seeing what was going on. After all, if no one is interested in seeing the demos, maybe we ought to just drop the whole idea.

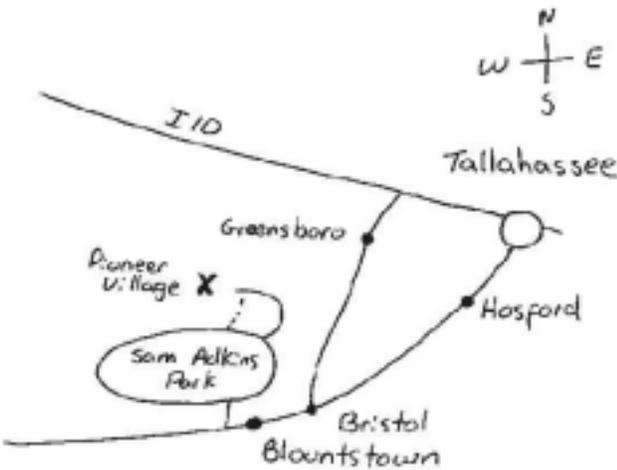
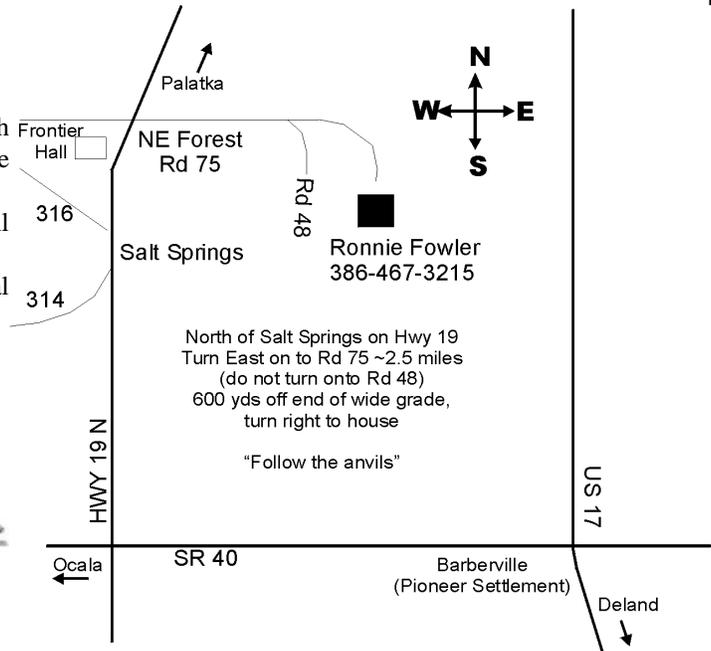
Upcoming Events

The calendar includes events of interest to the blacksmithing community. The regions have no boundaries - everyone is welcome everywhere. Come to more than one if you can. We hold regular meetings in each region on the following Saturdays of each month: NE-1st, NW-2nd, SE-3rd, SW-4th except for quarterly Statewide meetings. The actual dates vary so check the schedule below. Our meetings are informal gatherings around the forge. Prospective members are always welcome. Come for all or any part of a meeting, bring your tools or just watch. Most meetings run from 9AM to 4PM and you'll need to bring lunch if not otherwise noted. If you have any questions about meetings, please contact the Regional Coordinators:

Northeast Region	Ken Knight	352-339-0629	Ironken@AOL.com
Northwest Region	Billy Christie	850-421-1386	chriswoodforge@embarqmail.com
Southeast Region	Ed Aaron	561-748-9824	edaaron9824@bellsouth.net
Southwest Region	Jerry Wolfe	941-355-5615	wolfeforge@juno.com

April 2008

- NE 05** Ronnie Fowler's (Salt Springs)-See NE report
- NW 12** Panhandle Pioneer Settlement, Blountstown, FL with Jesse Frank making an iron bloom using a Kodai furnace (type used by Vikings, Romans, and Japanese)
- SE 19** Artwork with demonstrators Susan Dunsmoor, Phil Herrmance and Art Ballard plus a shop tour;
- SW 22** Zolfo Springs Pioneer Park - Mike McIntyre - local farrier demonstrating-See SW report for details

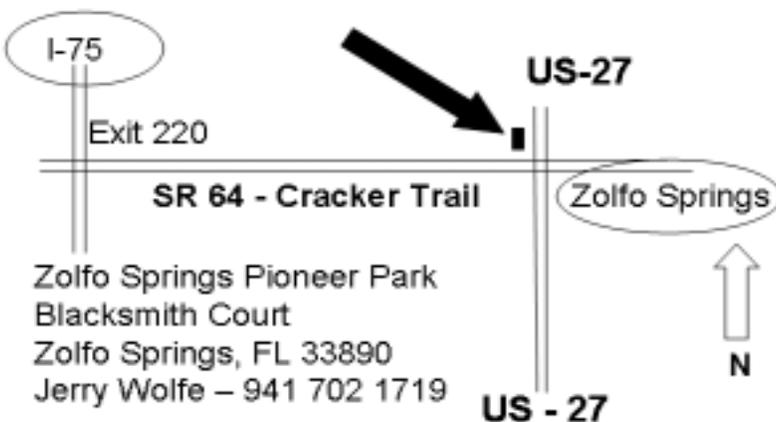


NW Region - Apr 12

SE-Apr 19 -Directions to ArtsWork:

Take the Florida's Turnpike Extension south to Exit 12, turn right onto Caribbean Blvd, go to US1/Dixie Hwy, turn left (south), drive 1.2 miles to SW 216th St. (Hainlin Mill Dr.), turn right, drive 3.7 miles to SW 154th Ave, turn left, drive .3 miles and look on the right for the American Flag and FABA sign.

From the West, take 75 (Alligator Alley) to 27, drive south on 27 to 997 (Krome Ave), head south to SW 216 St., turn left, drive to SW 154 Ave, turn right and look for the American flag and FABA sign on your right.



SW Region - Mar 22

Future Events

- NE - May 03 - Steve Bloom's shop, near Archer FL
 NW - May 10 - Rex & Mary Ellen Anderson, Monticello, FL
 NE- June 07- Barberville - Ben Rogers (different types of chain)
 NW - June 14 – Jim and Ann Hartman, Perry, FL
 NW - July 12 – Rick and Joyce Jay, Fountain, FL

Report from the Northeast

Ken Knight

Our March 1st meeting had a slight change in the itinerary. Juan Holbrook had to cancel due to health issues. We miss seeing Juan and Linda and want them to know that they are in our thoughts and prayers.

Bob Mancuso filled in as demonstrator with the Spanish Mission Cross. The fowling competition netted some very nice pieces and was won by a visiting blacksmith from Pennsylvania. Thanks to all who participated. The 44 member turnout was greater than I had anticipated, and the critiques on my culinary expertise in grilling hamburgers and hot dog's was impressive. Although I did notice that they were all eaten. (I still say that people don't have enough carbon in there diets!) .

Now don't think that all that criticism went unnoticed. Ronnie Fowler was so impressed that on April 5th when we meet at his place everyone will cook there own hot dog over an open fire. This is going to be a big picnic so bring a covered dish and enjoy the demonstration of a throwing Tomahawk.

Report from the Northwest

Billy Christie

It was a beautiful day at Juan and Linda Holbrook's Forge in Gainesville, Florida. We had 49 people sign in to see our new President, Rex Anderson demonstrating. Rex & Mary Ellen are building a new house, so for the demonstration Rex built a free standing toilet paper holder for it. The base was 8 1/2 "sq. x 3/8" thick with 4 small legs riveted on the bottom. For the pedestal he used 7/8" x 23" high. It took the whole meeting to complete, but Rex and his helper Jordan Thomas finished it and it looked great.

The "Iron In The Hat" was a big success bringing in \$180 plus Linda had made another one of her fabulous mosaic stepping stones with an anvil & flower on it. This was auctioned off and brought in \$60. Nice Work! Lunch was delicious with several types of chili, covered dishes, and deserts. Thanks to Rex, Juan & Linda for another great meeting.

Don't forget to make plans to attend the April 12th State Wide Meeting at the Panhandle Pioneer Settlement in

Blountstown. Jesse Frank will be demonstrating using a Kodai Furnace to forge out an iron bloom into a knife. Should be very interesting, hope to see you there.

Report from the Southeast

Susan Dunsmoor & Ed Aarons

April 19, Saturday at ArtsWork Unlimited, 22150 SW 154th Ave, Miami, 305-247-9257. There will be a shop tour, demonstrations of aluminum forging and plate forming, a patina demonstration and much more. Also, they have a large selection of tools and a welder for sale. Sale items: tongs, hammers, and a 25 lb. Little Giant hammer. Please bring an item for Iron in the Hat, a covered dish for lunch, anything new you have made lately, and any item you want to sell or trade. Please call if you have any questions about the directions to the shop. It's worth the drive!

Report from the Southwest

Jerry Wolfe

Our February 23rd meeting was a demonstration at Wolfe Forge on making a Belt Buckle. Jerry Wolfe used tooling for the fly press to make tear drop shaped impressions around the edge of the 2 1/2" by 2 3/4" plate of 1/8" thick steel. The copper loop was fastened to the buckle with copper rivets and the pin was held in place by "swedging" the steel around the copper rivet with a special "punch". Details are given in "Blacksmith Belt Buckle By Gene Chapman" (Google the stuff in quotes to get the URL - the actual URL is full of encoded characters that don't work here! - Ed.). Everyone who wanted to make a belt buckle used their creative mind to design their own buckle, some examples shown.

Mike McIntyre will be demonstrating making a number of items including a horse shoe, leaves, twists and handles for utensils. Mike is a farrier from Ona FL and has a life time of experiences to share with us. We will meet in the Museum Blacksmith shop and have an additional forge set up for "YOU forge it" activities.



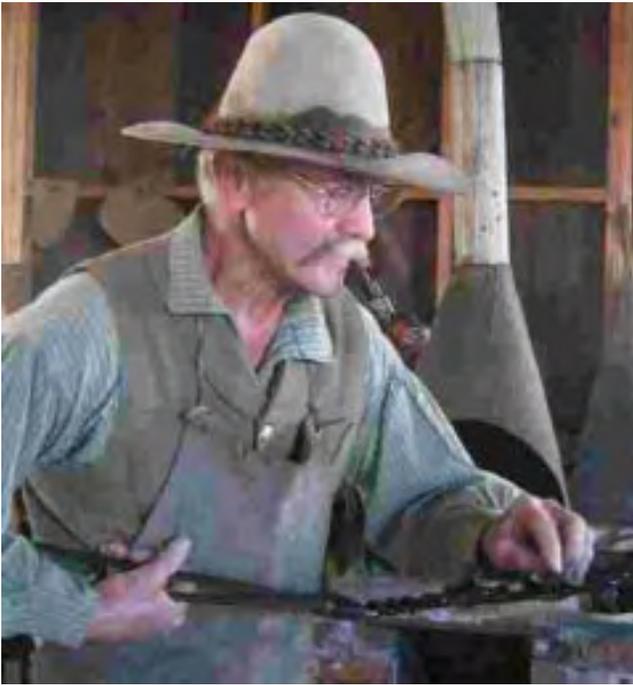
by Eric Collens



by Trez Cole



by Mark Ross



Mike McIntyre

Bring a dish or item to share for the lunch and bring an item for the Iron in the Hat raffle to raise funds for FABA.

Demonstration starting at 9AM.

"How To" videos

Bill Roberts

bill@customdesignmetalarts.com

This one's on large scaled Fold Forming:

<http://www.youtube.com/watch?v=Cwhxc1d14fQ>

And this one's on making 2 different types of Steel Bamboo:

<http://www.youtube.com/watch?v=-4MF7HO-0kY>

And.....Making an Acanthus Leaf:

http://www.youtube.com/watch?v=YpYMwj8F_OA

there are a few others on my YouTube channel.....all anyone has to do is use the More from: ornametalsmith link.

OR

the link to the channel is:

<http://www.youtube.com/profile?user=ornametalsmith>

Notices, For Sales & Want-Ads

BLACKSMITH COAL NOW AVAILABLE!

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Two Very Interesting Steels for Blacksmithing Tools

Dave Smucker

In a past issue of our newsletter, I have talked about proprietary steel that some blacksmiths like for tools. It is called "Flutagon or Atlantic 33". I have been able to obtain data and some history on this steel and it surprised me somewhat in that it is not one of the S series tool steels as I supposed. The other very interesting steel is Timken Latrobe Steel's Hy-Tuf Vac-Arc that has found its way into race car axles and from there into some great blacksmithing tools.

First, let's take a look at: **Hy-Tuf Vac-Arc**

This is an ultra high quality steel originally developed by Crucible Steel (1948) and today made by Timken Latrobe Steel for the production of aircraft landing gear. Based on my past industrial experience I think that Timken is the number one company in both bearings and special steels. Unless you are prepared to pay a whole lot of money don't expect to go the Timken Latrobe Steel and buy this product. It is a very expensive steel to make to meet the aircraft requirements.

But what does aircraft landing gear have to do with blacksmithing tools? Well, it is kind of an interesting story. Race car builders are always looking for something a little better for use in their cars - and a manufacture of race car drive axles found that Hy-Tuf was an outstanding material for use in NASCAR axles. Interesting, but how does that help me? Paul Garrett, resident blacksmith at the John C. Campbell Folk School who just happens to have a background in NASCAR still has a few connections. Because of this he is from time to time able to get some of these used race car axles and sells them for around \$ 10 a piece. (This alone is reason enough to make the joint North Carolina, AACB meeting at the Folk School so you can purchase some of these from Paul.)

Just what is this "Hy-Tuf", what tools is it good for and how do I work with it? "Hy-Tuf" steel is a high strength low alloy steel. It typically is used in the 220,000 to 240,000 psi (pounds per square inch) tensile strength range for both aircraft and race car applications. This steel has good ductility, fracture toughness and impact strength in this kind of strength range and its hardness will typically be in the mid 50's Rockwell C.

In other words, this steel makes great punches, hot cuts, hot or cold hardies, cold chisels, pry bars, bending forks, etc. If we had the material in large sizes it would also more than likely make great hammers. In the size we can get from Paul, I would sure try it for small repoussé hammers. Experience with punches that Paul has made shows that this material has rather good hot strength. (It seems to be in a class with S7 and H13).

Forging: You should forge this steel in the range between 1950 F (orange red) to 2250 F (almost yellow-white) and not forge below 1700 F (cherry red) based on Timken Latrobe's data sheet. (As it gets below orange, you will find you might as

well be hitting your anvil.)

Heat Treating?: In my opinion, you should always heat treat this steel. For narrow sections (punches, hot cuts etc.), you can air quench, for thicker sections use an oil quench. Then temper at 400 to 600 F in an oven. To heat treat heat above 1700 F (cherry red) but NOT to a Lemon and then quench. Right away temper as noted above. Can you get by without the heat treat - Yes, can you get by without the temper, Yes, but just hope that they didn't do this on your aircraft's landing gear.

This is one hell of a tough steel, so it will do a great job for many applications by just normalizing it when you have finished forging. Heat to 1700 F (orange) and let it cool in still air.

What in this stuff anyway and how do they make it? Hy-Tuf Vac-Arc has the following typical analysis:

- Carbon 0.25
- Silicon 1.50
- Chrome 0.30
- Manganese 1.35
- Nickel 1.80
- Molybdenum 0.40

With this steel's low carbon content it seems remarkable that it gets to hardness in the mid 50's Rockwell C but this is a result of the high Manganese along with the other alloying elements. Also, the combination of the Manganese and Silicon work together to give a shock resistance similar to S5 tool steel. This steel is made to very strict cleanliness standards through the vacuum arc remelt process. It would then proceed through forming operations (rolling or forging) and complete inspection and testing procedure before being sold. Sold as an aerospace product every piece could be traced back to manufacturing ultrasonic inspection and testing data. That's what makes it so expensive and blacksmiths so lucky if we can buy used from Paul Garrett. Buy a chuck from Paul and try it. You will like it.

Welding? Can I weld Hy-Tuf? The simple answer is yes and it is not too hard to do for our use. Since welding on aircraft landing gear leads the list of really really big NO NO's I could not find any industrial data on welding. However, Paul has had no problems welding on blacksmithing tools. I simply suggest a good preheat, 400 to 500F, the same way I would handle 4140 or 4340.

Flutagon or Atlantic 33

What is this tool steel? Some blacksmith swear by Flutagon at the best ever tool steel. Well, I have been surprised to find out more data - but I still don't think it is that special. In my opinion, it is a hard-to-find, obsolete, steel with equal or better material today available from many sources.

It is a steel developed early in World War II for field use and very simple heat-treating requirements. It was made by the Atlantic Steel Company and maybe by others during the war.

I can't (internet searches) find Atlantic Steel in business today. They went into bankruptcy in 2003 as did their parent company Ivaco, Inc. Parts have been sold, which may include the former Atlantic Steel Company and they may be operating today under a different name. It you know anymore about this I would like to know.

What is Flutagon? Why this name? What makes it special or not? First the name, and shape. Instead of being a square bar, it is a square bar with rounded corners and flutes down the face of the bar on all four sides. Why? So that under field conditions during WWII, whether on shipboard, or in the army the tool user / maker could tell that it was tool steel and not just some other steel.

WWII also explains the other "great feature". This "great feature" is that the steel does not need to be tempered after heat-treating. As I learned from talking with Jim Battson the reason for this desired feature was the lack of tempering ovens under field or shipboard conditions and the desire to not have to train those making their own tools how to temper using colors. Some blacksmith today still think this is a great feature. I guess because they are "untrainable". Well, that is being a little hard on them but tempering using an oven is very very easy, if a bit slow, (you have to take an hour or two). But tempering using color or a file test is very quick and easy to learn too. If you have noticed, I find it very hard to understand some blacksmiths' reluctance to do the tempering step when heat-treating.

In other words, I would not go out of my way to buy a special steel just because I don't need to temper it. I think this is especially true when today we have S7 and H13 two really great steels that are not hard to find, nor hard to heat treat for smithing tools. In fact, I find that I can make just as good of tools out of 4140 or 4340 as I can Flutagon for most uses. 4140, by the way, is my steel of choice for hammers and power hammer dies. If you have Flutagon, great, it is a very good steel. If you know where to purchase Flutagon today let me know and I will pass it on through the newsletter.

What is this stuff, anyway and why does it not require a temper? The manufacturer published the following composition data back in 1962. In percent.

Carbon	0.30 to 0.40	Manganese	0.35 to 0.40
Chrome	0.65 to 0.85	Nickel	0.35 to 0.55
Molybdenum	0.55 to 0.75	Copper	0.35 to 0.55
Silicon	0.50 to 0.70		

I would note that these are very wide ranges for a tool steel, ranges so wide that I would never accept them for an industrial application.

Steve Barrenger had a small sample I got from Al Kahkonen tested for me before I found this old data sheet and the results showed the following from one sample.

Carbon	0.32	Manganese	0.45
Chrome	0.67	Nickel	0.82

Molybdenum	0.53	Copper	0.53
Phosphorous	0.004	Sulphur	0.005

While some of these values are outside of the manufacture wide ranges - it does look like the same steel and, after all, it did have the Flutagon shape. The Phosphorous and Sulphur, by the way, are bad actors in most steels and these low values are good.

Steve's testing friends thought that this steel looked like a highly modified 4130 and thought maybe it came from Europe. Well, it has too much Nickel and Moly in it for a 4130 steel along with unexpected silicon and copper. The copper being very unusual in most steels except those for which it is added for corrosion purposes such as the Corten Weathering steels. The steel looks much more like a modified 8630 or modified 8640. Besides its use as a blacksmiths steel, in the Flutagon form this steel was also sold as a flame hardening die steel, under the name of Atlantic 33. It is also called out as carburizing steel followed with flame hardening which would be consistent with steels of the 8630 type used for case hardened gearing.

What about this DO NOT TEMPER or maybe it should be NO NEED TO TEMPER? Well, first we can understand World War II training and field use need for a steel tough enough to get by without tempering. In fact, this isn't unlike what some blacksmiths like to do with the air quenching steels like S7 and H13. They don't temper them and because they are such tough steels, they get away with this most of the time. In both case of S7 and H13 they would make a better tool if in

fact they did temper. When Flutagon was introduced during WWII, water hardening tool steel W1 and some oil hardening tool steel O1 where the prime steels for blacksmithing tools. If you don't temper these steels, they will break just looking at them. (If you drop a W1 tool after quench and before tempering it will often break.) So, this super tough Flutagon made real sense for easy field use - just heat it above critical, quench in water and use.

But would it be a better tool if tempered? I think so but don't have any data to prove it. Secondly, if we are going to use this steel for hot cuts, punches and hardies then we will get them to temper temperature in use and it will most likely improve them to go ahead and temper. As I have said before I COME FROM THE ALWAYS TEMPER SCHOOL of tool making.

Now with the use of this steel such as Atlantic 33 for flame hardened cold work dies I can understand the manufacturer's instructions not to temper. The reason is that if you temper you will drop the hardness of this steel quite a bit and greatly increase die wear. But then if I was going to the trouble to make cold work dies for other than some very short run application I would be using one of the much better cold work die steels such as D2. For short run application I would stick with 4140 or case hardened 8620. Easy to get, work with and heat-treat. This last paragraph has little to do with blacksmithing - but may explain to some why Atlantic 33 was sold as No Quench Required. For what it is worth, Tom Clark makes his tongs from 8620.

Lou Mueller Slot Cutting Demo By Bob Ehrenberger & the Blacksmiths Assoc. of Missouri

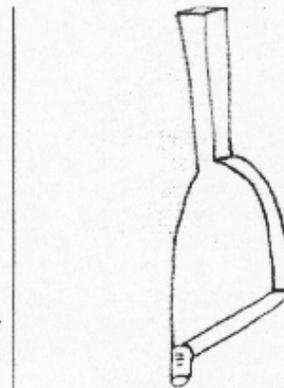
When Lou comes to the forge he doesn't leave his tool and die background far behind. Lou's method of cutting slots is a perfect example. He tools up like he is setting up a punch press, but adapts his methods for hot work and hand tools.

The design on the punch is the key. First it has a tip that indexes the tool to the work. Second the cutting surface is slanted so you get a shearing action and don't have to punch out the whole slug at once.

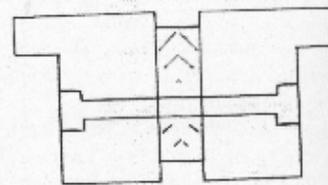
The slotting punch is used on a piece of stock that has a hole drilled in it to index the start of the slot. The tip of the punch is inserted in the hole, the cutting edge is lined up where you want the slot, and the punch is driven through the stock.

It is important that the stock is backed up to keep it from deforming. This can be done by adjusting the jaws of your vice to leave a space for the punch to travel into, if your vice has nice sharp edges this can work pretty well.

Since most vices don't have nice edges, another option is to make a slot cutting die block. Lou's block was milled out of a piece of tool steel which was hardened before use. The holes were drilled and recessed so the bolts didn't interfere with the vice. A spacer is put in on each end to give the proper clearance on the slotting punch. Lou says that it 1/64 is about the right clearance, you can go up to 1/32" but after that it gets to be kind of sloppy and will leave a pretty bad rag edge. This should be more of a shearing action than a punching one. The dog ears on the block sit on the vice jaws for support, not relying on friction to hold it.



Slotting Punch
& Die Block



New England Blacksmiths

Nickel Silver Brazing Alternative to MIG

By John Emmerling

Several years ago I began to look for alternatives to tig and mig welding in the construction of lighting and components. Since joinery cleanliness and ease of cleanup is paramount, mig and tig welding did not always work to my advantage. I wanted to use as little filler material as possible and have a strong joint that required minimal cleanup. So, I began to explore brazing. I first used coated brass rod. The brazing worked well, but I did not like the excess flux on the brass rod while brazing because I couldn't see the joint clearly, its cleanup seemed excessive, and the strength was not up to expectations. Next, I tried low fuming bronze bare rod and dipped it in the flux as necessary. It worked well and was an improvement over coated brass rod. However, there were two drawbacks: one, the strength, while generally adequate, was not always so, and two, if the finish of the piece was to be natural buffed iron, the bronze color was a detriment.

After searching the internet, I found a nickel/silver rod that works well. Allstate II comes in 1/16th and 3/32nd bare rod. Its equivalent is Harris-Welco 17. (Harris-Welco 17 is not available in 3/32nd bare). The strength of these nickel/silver rods is 50% greater than low fuming bronze and the color, while warmer in tone (platinum colored) than buffed iron, blends in nicely when buffed. Since it is stronger than low fuming bronze, a smaller amount is needed which helps in color blending. Also, these rods have excellent capillary action and tend to follow the heat readily. A fillet can be obtained by simply pulling back on the heat source, adding more filler rod, and gently washing the joint with heat. Cleanup is minimal.

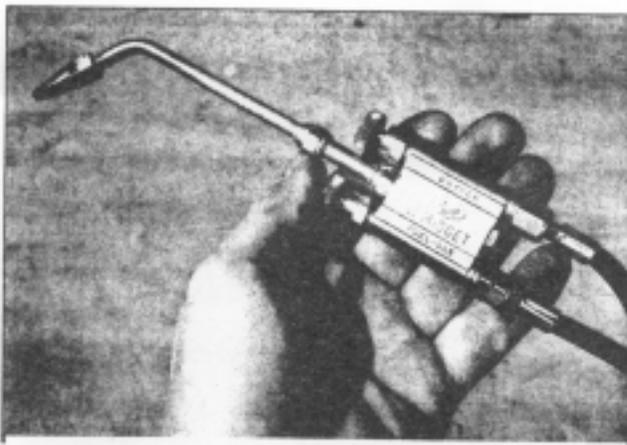
The flux used is boric acid. I bought the Allstate recommended flux, read the label that said it was boric acid, and began using the same boric acid I use in mixing forge welding flux. I bought the boric acid at Nuremberg Scientific in Portland, OR. The boric acid is wetted and applied to the parts to be joined with an acid brush. Only a very dilute solution is needed. The flux can be removed with warm water and/or use of a wire wheel.

I also purchased a Henrob torch several years ago and had been using it regularly. Anyone who has used a Hen-

rob to braze with knows that after a period of time the weight of the torch and the ergonomics of the pistol grip become tiring. Not long ago I discovered the Meco Midget torch and its lightweight hose (Fig 1). This little torch is amazing for its size, weight (6 oz.), maneuverability, and heating capacity. Tips available go from a zero to #3. I use the #2 and #3 tips most frequently. At a cost of \$105.00 for the torch and \$8.00 for each tip, I consider it a good bargain. For info on this torch, go to: www.tinmantech.com. The Harris-Welco 17 brazing rods were purchased thru Quimby Welding in Portland, OR, at \$54.00 per 5 pounds of 1/16th bare rod. They are a special order item and can be drop shipped for minimal delay. I use more of the 1/16th in general and occasionally 3/32nd for larger gaps. Info on Allstate II can be found at: www.fredpartcycleddesign.com.

John Emmerling
Gearhart Ironwerks
Gearhart, Oregon

John is a member of NWBA and has graciously submitted this tech tip to the AFI. This article may appear in the Hot Iron News or in other publications.



Meco Midget Torch, available from Tinmantech.com

Tuyere - Nov-Dec 2005

CONTROLLED HAND FORGING

Lesson Two: Hot Punching

By Doug Wilson

Illustrations by Tom Latané

Lesson Number Two-

Create holes or recesses in bars or plate by driving punches into or through hot material.



Punching- layout and specifications

(Holes or impressions can be made any shape you can make a punch.)

Punch a $3/8"$ round hole through the center of a $3/8" \times 1"$ bar with the hole's center $3"$ from the end of the bar. Drift (stretch) the hole to finished size.

The finished hole should be $3/8"$ round, with clean sharp edges.

The hole should pass through the bar at 90 degrees.

The wide surfaces of the bar should be flat with no discernible hammer marks.

The bar should remain $3/8"$ thick.

The bar will bulge out slightly on either side of the hole.

The original edges of the bar should be straight in line on each side of the hole and without any twisting.

Intent:

Students will learn to hot punch clean accurate holes and to check their results for accuracy.

Tools Needed:

Forge, anvil, hammer, round punch, center punch, square and ruler.

Materials:

$24"$ of $3/8" \times 1"$ hot rolled mild steel.

$24"$ of $3/8"$ hot rolled round bar (to check final size of punched hole).

Method:

When working to a specific hole size, start with a punch slightly smaller than the finished hole size. After the hole is made it can be enlarged to final size by drifting (stretching) with the punch.

The Punch

The punch may be made of plain carbon tool steel at least $5/8"$ in cross section, forged to shape and normalized (air cooled until room temperature from a red heat). W1 or O1 drill rod, available at industrial supply shops, would be a good steel for this punch.

The business end of the punch should be a tapered round cross section $2 1/2"$ long, $9/32"$ to $5/16"$ round at its end and filed or ground flat with sharp edges after normalizing.

The top end should be tapered slightly to reduce mushrooming in use.

A hand held punch should be $10"$ to $11"$ long. A punch held in tongs should be $3 1/2"$ to $4"$ long.

Step One:

Make a center punch mark in the center of the bar $3"$ from its end. Take a bright yellow heat where the bar is center punched. Place the bar flat across the face of the anvil, center punch mark up. Carefully place the punch over the center punch mark. Strike a single solid blow to sink the punch into the hot bar. Make sure the end of the punch is still where it is supposed to be. Continue striking solid blows until the punch is nearly through; another



Some different styles of punches

CONTROLLED HAND FORGING



Correct and incorrect alignment of the punch

two or three blows. The punch will feel solid against the face of the anvil. If you have done this quickly the bar will still be at a bright orange heat.

Hints:

Wear a glove on the hand that is holding the punch.

Quench your punch after every four or five blows. This will help to prevent the punch from deforming.

A few soapstone X-marks on the center punched side of the bar will help you get the punched side of the bar facing up when you first put it on the anvil.

Scraping the surface of the bar with your hammer will help you locate the punch mark. (Scale will fall into the punch mark leaving a small black spot.)

Learn to hit the punch directly and hard on the first blow. Avoid aiming blows.

The cold end of the bar can be supported on your thigh or on an adjustable stand set anvil high.

Step Two:

Immediately turn the bar over on the anvil. Look for slight bulges on either side of the hole and a dark spot where the punch was driven into the first side of the bar. Position the end of the punch exactly over the dark spot. Strike several heavy blows. You will feel the punch solid against the anvil face again. Move the bar, with the punch in the hole, over the pritchell hole (the round hole in the heel of the anvil). Strike one or two more blows over the pritchell hole and a small slug will be driven out of the hole. Now, straighten and flatten the bar with light hammer blows on the anvil face. (The bar should still show color during this part of the process.)

At this point you will have a hole. It should be a bit smaller than the desired size.

Notes:

If the punch doesn't clear the slug from the hole it is likely because the punch was misaligned when the bar was turned over or because the punch didn't have sharp edges on the business end.

The slug should be driven out from the second side of the bar. Avoid the temptation to turn the bar back over to the first side and try to drive the slug out.

Illustration of misaligned punch with slug hanging from one side of the hole.

Step Three:

Now you need to drift (stretch) the hole to the desired size. Heat the bar to an orange heat again if necessary. Place the hole over the pritchell hole, insert the punch and drive it in a bit further. Remove the punch, turn the bar over and drive the punch from the second side. Continue this sequence until the hole is just large enough for the 3/8" round bar to fit through easily. The drifted hole should be just a bit larger than the 3/8" round bar so that when it is cool the 3/8" round will still fit through the hole.

Hints:

When drifting, work a bit from one side of the bar and then from the other. This will make the hole more uniform in size. If you only drift from one side the hole would be wider on the top than on the bottom.

Finally, straighten and flatten the bar with light blows and a low heat.

Targets:

Try to punch and drift the hole and straighten the bar in one heat.

(Beginners may need a second heat to accomplish this.)

Check your results using the 3/8" round bar, a square and a straight-edged rule. The 3/8" round bar should just fit through the hole you punched. The hole should pass through the bar at 90 degrees. The bar should be flat and uniform in thickness. The bar should be straight and without twist. The surfaces of the bar should be smooth with no discernable hammer marks.

Forging Dynamics:

The flat bottom of the punch pushes the steel beneath it outward as it is driven into the hot bar. The sides of the bar bulge outward slightly.

When the bar is turned over and punched from the second side the sharp edges of the punch end shear out a small slug.

Driving the punch further into the hot bar stretches the hole larger, increasing the bulges on either side of the bar.

Steel expands when it is hot and shrinks as it cools. When hot, the drifted hole should be just a bit larger than the 3/8" round bar so that when it is cool the 3/8" round will still fit through the hole.

The Florida Clinker Breaker

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