Newsletter

Volume 1, Number 2 Sept. 1996 Bruce Freeman, editor

Membership Meeting - Sunday, September 29

NJBA member Marshall Bienstock has graciously offered to host the September membership meeting at his forge in **Howell**, NJ. We will present a **power hammer demonstration,** possibly testing some specially surfaced dies. (See "Chairman's Soapbox Speech," and "Hammer Dies Serve ...," below.) We might also begin work on a **group project** - so come dressed for blacksmithing. (See "Networking 2. & 3.," below.) The meeting will begin at noon on Sunday, Sept. 29.

To get to Marshall's, find your way to US Route 9 in Howell (Monmouth Co., NJ). About 3 miles north of Interstate Route 195, or 4 miles south of NJ Route 33 turn east onto Casino Drive. Box 663 is about one-quarter mile down the road. Turn into the driveway, drive past the house and to the last outbuilding. We'll try to have signs posted.

Chairman's Soapbox

My first Soapbox Speech appeared in the first newsletter without that title, but I though it would be a good idea to continue it as a precedent, forcing all future chairpeople to at least contribute one article to each newsletter. So for any future chairpeople, HA HA HA, blame me.

I'm hoping to include in each article a brief summary of recent, and soon to be recent, happenings of the Association, possibly some preaching about the direction our Association is taking, and maybe about Blacksmithing in general. In effect - whatever I feel like writing about. So here goes.

Your Board has been hard at work (unfortunately it's more real work than NJBA this summer) getting the ball rolling on several fronts. By the time you read this, we should have published our first official brochure, thanks mainly to the efforts of Bruce Freeman, giving ourselves something slightly professional to use in advertising our existence. We also have active efforts to become incorporated and obtain insurance so that we can effectively operate in public venues. We previously announced our acceptance as a chapter of ABANA (its worth saying it again here).

On the technology front, Andy is plunging ahead with his pet project, a home-grown anvil. (See the article later in this newsletter. - Editor) The most recent development is the potential use of a modern technology, plasma transfer arc (PTA) coating to put a hard face on the anvil. Basically the process allows one to put a ridiculously hard and wear resistant coating on a cheap cast steel anvil. This process promises to be a breakthrough technology for many blacksmithing applications. If all goes well, the coating will be demonstrated at our next meeting on a pair of dies used in a 25-lb. Little Giant power hammer. Aside from bringing Andy fame & fortune, success with this project could certainly help put our fledgling organization on the map. Stay tuned for developments.

Now for the soapbox. We need to recruit new members. *It is the duty of each and every one of you to be as rude, boorish, and unrelenting as we know you are capable of in coercing everybody you know into joining our association.* Of course it would help if they are already interested in blacksmithing, but as we all know, blacksmithing is so much fun that if you give them a chance, everybody will be happy that you forced them into it.

All joking aside, the most important job for a new organization is to recruit enough members to do all the work that needs doing, provide stable funding, and keep our meeting interesting. We each need to personally contact anyone we know who is remotely interested in metalworking, and encourage them to join. We are off to a terrific start, but we need to grow to survive. Please do your part.

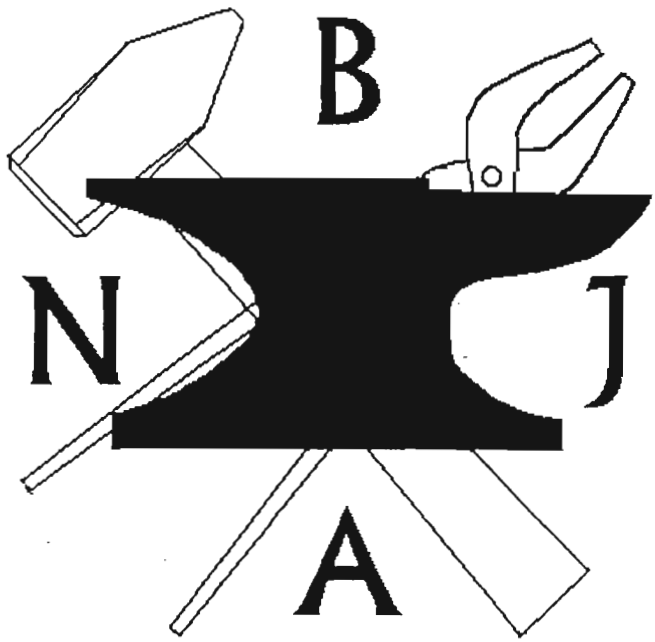
See you at the next meeting.

Pete Engle

NJBA Membership Doubles! by B. Freeman

As membership chairman I am pleased to report that our membership has nearly doubled since our founding in May: 12 originally, 23 now. I admit that the absolute numbers don't look so impressive, but this increase has been due to efforts of individual officers, without any particular membership drive.

The membership drive will be starting very soon, now. We are finishing work on a brochure which we plan to distribute throughout the area. Copies of this brochure should be ready in time for the September membership meeting.



Logo "Contest" (?)

We have had exactly one logo submitted - namely the one you see above. Like it or not, that's now the *de facto* logo of the NJBA. Anyone who thinks he can do better is invited to submit his idea, sketch or artwork.

How to Contact the NJBA Directors:

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Andy Vida-Szucs	(908) 308-9039	osan@netlabs.net

Networking by Bruce Freeman

1. Hunterdon Historical Museum

One of the tasks I've taken on for NJBA is to make contacts with other groups around the state with common interests. A month or more ago I had made some phone calls and made a few such contacts. One of these was with **Andy Drysdale**, Executive Director of the **Hunterdon Historical Museum in Clinton, NJ**. (Phone: 908-735-4101) Recently, while speaking with fellow NJBA director, Andy Vida-Szucs, about possible places for our members to have access to forges, I suggested we visit the Hunterdon Historical Museum the next Saturday, and Andy immediately agreed.

Ten-thirty Saturday morning I picked up Andy at his home in Freehold and we headed towards Clinton, NJ. After a trip along back roads of our lovely state, we found ourselves at the Hunterdon Historical Museum. As we entered, we noticed that there was a Civil War encampment there that weekend. The HHM is centered about a large mill building. Apparently this was originally a grist mill, but later a water turbine there was used to generate electricity. There were many examples of belt-driven machinery in the mill, and we spent some time admiring these and the various shafts, gears and pulleys on their massive mounts. We then strolled outside and on to the blacksmith shop. We were disappointed to find the shop closed. (This serves as a reminder to those of us who volunteer at Historic Allaire Village what a disappointment it is to go to such a place and find the buildings closed, and the smithy silent.)

We therefore headed back to locate Andy Drysdale. We found him by accident when one of the soldiers of the **3rd New Jersey Volunteers** called out to "Chaplain Drysdale," who was in full uniform (of the 11th New Jersey Volunteers). Checking the schedule of events for the day, I read that we had arrived at the beginning of a

> Patriotic rally at the parade ground. President Lincoln and General McDowell will inspire the public to volunteer and save the Union from destruction. The fine Ladies and Gentlemen of Clinton are invited to rally around the Flag and support the young men answering Father Abraham's call to arms. A recruiting officer and surgeon will muster in and inspect the new recruits.

Indeed, "Lincoln" was present in coat and top hat, towering over all assembled. However I suspect the loyal "New Jersey farm boys" who volunteered that afternoon (despite the entreaties of the "mother" of one of them, who was gallantly reassured by the general, with a kiss to her hand) did so less as a result to the words of the president than in response to the General's speculation that the lovely young ladies helping out about the camp would likely reward any new volunteer with a big kiss.

After these events concluded, we sought out Chaplain Drysdale and spoke to him at length about the NJBA and the HHM. He agreed there would be much opportunity to work together. Andy was a blacksmith himself for some time, at Waterloo Village, and worked as a blacksmith this summer at Wild West City, in Netcong, NJ. The blacksmith shop at HHM is run principally by blacksmith and farrier, Gil Meeker, who has installed a power hammer in the shop. Gil is not able to work the shop for all the school tours, and Andy is very interested in having volunteer blacksmiths to work and interpret at HHM, despite the fact that such volunteers haven't always worked out in the past. This presents the opportunity for members of the NJBA to work with HHM to set up a **blacksmith guild** organized along the very successful lines of that at Historic Allaire Village. Since we were keeping Andy from his duties, and probably from his lunch, we said our good-byes and headed back to the car.

We decided not to visit Millbrook Village or Waterloo Village that day as they were too distant. Instead we chose to take a shorter side trip to visit **Cooper's Mill in Chester, NJ**. I am very familiar with this lovely restored mill (on Route 24, just west of Chester, NJ) but Andy had never visited it. Off we headed to Chester, but ...

2. Washington Township Land Trust

...along the way we entered Long Valley. There we saw a large, undistinguished wooden building with the front door open and a sign telling us that tours of the mill were being given today. After some hemming and hawing, since touring this mill might mean missing out on Cooper's Mill, we decided to go in.

As we entered, we read that the **Obadiah LaTourette Mill** was a pre-Revolutionary War construction that had been operated as a grain mill and a saw mill. It had undergone much deterioration and was in the midst of reconstruction and renovation by its current owners, the **Washington Township Land Trust**. The work in progress involved the replacement of 12"x12" beams ranging from five to about 12 feet long - massive, to say the least. The work was being done by Walter Hollien and Jim Pavone, the latter of whom drives out from Long Island on Saturdays for the privilege of working dawn to dusk on the project. Andy and I were given a tour by Caryl Brackenridge.

Andy immediately spotted a beautiful anvil mounted on a bench by the wall. At this, we introduced ourselves as directors of NJBA, eliciting their immediate interest. They need iron parts made for their millstone crane, and asked whether we could make these. One of these is a massive "wing nut," which may be quite a challenge to reproduce. They also need a **bail** for this crane, which lift and flips the upper millstone for sharpening. Although massive, this assembly might be a feasible **group project for a membership meeting**. (We are looking into it: See part 3.)

After a nice tour of the mill, which needs a great deal of work yet, we spoke some more, and ended up assisting moving a few five-foot 12"x12" beams to where they will be installed. As we left, we signed their register and promised to send materials from NJBA and to keep in contact. They have only occasional services of a blacksmith, and could use additional assistance.

Despite the late hour (6 p.m.) we decided to cruise by **Cooper's Mill** in Chester. As expected, it was closed, but we peeked in the windows and admired the building, the water wheel and the flume. We also paid particular attention to the millstone crane.

3. Further Efforts and Excursions

We intend to continue "forging" relationships with other organizations around the state. The next such excursion will have occurred by the time you receive this newsletter: We are visiting **Walnford Mill**, **Cooper's Mill**, possibly the mills at the **Hunterdon Historical Museum** and **Waterloo Village**, and, once more, **LaTourette Mill**. The purpose of this trip is to learn more about the parts the **Washington Township Land Trust** needs for the millstone crane in the LaTourette Mill.

I've gotten special permission to visit the **Walnford Mill**, which is part of the **Monmouth Co. Park System**, but which is not yet open to the public. In making this contact, I also learned that some parts may still be commercially available, so we will hold off on making any part that could likely be purchased. A report on this trip will be provided in the next newsletter.

I also noted that there will be a **blacksmithing demonstration** on September 28, 1-4 p.m. at **Cooper's Mill**. If I make it to that I'll apprise you in the next newsletter.

If any of our members would enjoy participating in making such contacts, either by phone or by visit, be sure to let me know. If anyone has suggestions of organizations to contact, and especially the name of a contact person, please phone me or drop me a line.

Hammer Dies Serve as Test for Anvil Design

NJBA member Andy Vida-Szucs reports that he is in the process of designing and manufacturing a set of **blacksmiths anvils** to fill a perceived niche in the artist-blacksmith market. He intends to provide the highest quality, most usable anvils possible at a price between $2.50 and $3.00 per pound, which he believes to be significantly less expensive than any of the other high quality anvils presently available on the market.

Producing high quality tools at an affordable price is no mean feat. The material requirements present some interesting problems for tool designers and must be considered with care, and Andy has shared his thoughts on the matter:

1. The anvil must be large and heavy enough to a stable platform and a sufficiently large working surface.

2. The working surface of the anvil must be hard enough to stand up to many years of heavy use .

3. The manufacturing process must be cost-effective.

Several possibilities for design and manufacture arise out of this set of basic requirements. For example, There are several ways in which to provide for a **hard striking surface**. One of those ways is to make the anvil from solid tool steel. At first this sounds like a pretty good way to go, however when one considers the cost of materials, which may run as high as $5 a pound, this option quickly loses its appeal. Add to that the costs of hardening such an anvil, which is not as easy and straight forward as it may seem, and this choice loses whatever appeal it may still have.

Another way is to have the bulk of the anvil made of a less expensive structural grade material. The working faces would then be clad by some means, with a material that would provide the required surface hardness. This approach satisfies the great mass requirement and that of a sufficiently hard working surface.

There are basically two practical manufacturing approaches: forging and casting. **Forging** involves the use of a large power hammer and metal dies where a piece of steel, brought to a sufficiently high temperature, is placed between the dies and hammered until it conforms to the shape of the cavity that has been sunken into the die blocks. This process will usually produce a part of superior strength. However, a die block for a typical anvil will run anywhere from about $20,000 to $50,000 and up, depending upon the type of dies to be made and their size.

Casting, on the other hand, can provide a relatively inexpensive alternative to forging. In addition, the casting process allows for substantially greater freedom in the design of a part. Furthermore, properly cast parts, while usually not as strong as their forged counterparts, may still possess more than sufficient physical properties for the jobs they will be called upon to perform. In the case of anvils, casting has proven to be very much as good as forging.

The final design question involved the application of a hardenable surface to the structural substrate. Again, there are several methods which may be employed including seam welding a plate onto the body, hardfacing via stick welding, and hardfacing via flame spraying or the **Plasma Transferred Arc** (PTA) process. Several methods of seam welding were considered, including explosives. These all proved too expensive and some simply could not guarantee a complete bond between the parts. Flame spraying was also considered, but investigations indicated it would indeed not be able to produce the thickness required (0.25" minimum) and more significantly would not give bond strengths anywhere approaching what would be needed to endure the pounding an anvil must be able to withstand. The method that would provide such properties was the Plasma Transferred Arc process. Unlike flame spraying, which requires relatively low tech/low cost equipment the PTA process requires relatively very sophisticated equipment and large electrical currents on the order of 400 amperes and higher.

In order to verify that PTA was indeed the right method for hardfacing the anvils, a **test case** was in order. This is where NJBA member Marshall Bienstock came into the picture. Marshall has a 25 pound power hammer in his shop and volunteered a set of his **hammer dies** for the tests. Andy has borrowed those hammer dies and has delivered them to A&A Inc. of South Plainfield, NJ, where a 0.250" layer of a material called "18C" will be applied to the dies and ground flat. Once grinding is finished, the 18C face will have a Rockwell 'C' hardness between 50 and 51, meaning that no further heat treatment will be required, which is another major advantage users of the PTA process enjoy. Delivery of the finished dies back to Marshall's shop should occur the week of September 5th or the 12th and testing, which Andy describes as, "...beating the living daylights out of the dies on a wide variety of materials...," will begin immediately. The dies will be tested on materials ranging from wrought iron, at the easier end of the spectrum, to materials such as S5 and D2 tool steels, which tend to be far on equipment. We will bring you the results of the hammer die tests and keep you posted on the progress of the anvil project in future

issues. If possible, **these dies will be featured in the power hammer demonstration at the September membership meeting.**

Some Anvil History & Identification Tips

This information was contributed to ABANA's news group, "**theForge**" by Page Thomas (pthomas@post.smu.edu).

From *The American Blacksmith*, September 1914. History of Development of the Anvil--1, by James Cran.

"...The present owners [of the **Mouse Hole** Forge], Brooks & Cooper, have run the works for upwards of 38 years, and are still making anvils that are hard to beat ... and they operate their forge to this day with no other power than that developed by an old-fashioned water wheel. The same old-fashioned helve hammer, or 'metal helve' as it is locally termed, is still doing duty and is operated by the already mentioned water wheel. The building itself, with its old-fashioned solid stone walls and low arched windows and doorways, shows but slight signs of the ravages usually worked by time, and are apparently good, barring misfortune, for centuries to come. Originally the Mouse Hole anvil was made up of 6 pieces by the building up process. The corners of the base or feet, the horn and tail or heel was welded on to a centerpiece. After this the steel face was welded on in sections, trimmed and finished to the desired shape by hand tools. The face was then ground and hardened and, after hardening, the face was again ground and finished."

The following are from advertisements in *The American Blacksmith* from 1906-1915:

Columbus Anvil and Forging Co., West Frankfort St., Columbus, Ohio. "We are experts at repairing old wrought anvils. We also manufacture the celebrated Arm and Hammer brand anvil."

Eagle Anvil Works, Trenton, New Jersey. In 1911 changed name to **Fisher** & Norris, Trenton, New Jersey. Known as the Trenton Anvil. Oldest manufacturing [sic] of anvils in the U.S., 1843. "The face consists of a single piece of the very best cast steel, perfectly welded and of the hardest temper. The horn is made of tough untempered steel and will neither break nor bend. All 'Eagle' anvils made with the latest Fisher Patent double thick steel on both edges of the face. From 10 to 1300 lbs." **How to identify: A spread eagle** [1922 the eagle is enclosed in a horseshoe] The weight of the anvil is on the right foot. **"FISHER"** stamped on front of foot below the tail. Above this on the top of the foot is **"PATENT"**. Forged eyelets are on each foot under the tail and horn.

Peter Wright & Sons, England. Wiebusch & Hilcer, Ltd., New York Office, 9-15 Murray Street, New York City. **"Peter / Wright / Patent / Solid Wrought"**

Columbian Hardware Company, Cleveland, Ohio. "Columbian All-Steel Anvil", 'Columbian' on body.

Hay-Budden Mfg. Co., Brooklyn N.Y. "Hay-Budden solid Wrought Anvils. Gold Medal Award in 1898 at Omaha and 1901 at Pan American. Made of the best American Wrought Iron and faced with best crucible cast steel. **"Hay-Budden / Manufacturing Co. / Brooklyn, N.Y. / U.S.A."**

Soederfors Bruks Aktiebolog, Falan, Sweden. General Sales Agent, Horace T. Potts & Company, Philadelphia, U.S.A. "Paragon Solid Anvil. Made of one piece of steel. There are no welds to come apart." **"Solid Steel / Paragon [enclosed in rectangle] / Sweden"**

Vulcan, made entirely of tough untempered steel. The body is charcoal iron, and the face is covered with one solid piece of tool steel welded to the body. The symbol is Arm and Hammer inside a circle in raised letters. *Note that many consider these anvils to be of generally poor quality and useless for blacksmithing - PGE.*

That's it until next time. I hope that some of you go out and find treasures in your barns and garages.

Calendar of Events

If NJBA members are interested in carpooling to any of the following events, they may contact Bruce Freeman (home: 908-922-8408; work: 609-716-2827) to coordinate the effort:

Saturday, September 14 or 21, Tour of Washington Cathedral led by Clare **Yellin** (you should recognize that surname!) This is an activity of the Blacksmith Guild of the Potomac. Contact their hotline (703-527-0409) for details.

Saturday, September 28, 1-4 p.m., Blacksmithing at Cooper's Mill (Route 24, just west of Chester, NJ. This information taken from a posting at the mill. No additional details available at this time.)

Sunday, September 29, noon to whenever, NJBA Membership Meeting at the forge of Marshall Bienstock, 663 Casino Dr., Howell, NJ. (Phone: 908-780-0871) Power hammer demonstration, and possibly a group forging project. See the lead article on page 1 for details. Take US Route 9 to Howell. About 3 miles north of Interstate Route 195, or 4 miles south of NJ Route 33 turn east onto Casino Drive. Box 663 is about one-quarter mile down the road. Turn into the driveway, drive past the house and to the last outbuilding. We'll try to have signs posted.

Saturday, October 5, Brewfest and Street Fair, Long Valley, NJ. (West end of Route 24.) Co-sponsored by the Washington Township Land Trust, owners and restorers of the Obadiah LaTourette Mill in Long Valley. (See "Networking" article, above.)

Saturday, October 12, Gulf Branch "Pioneer Day" demonstration. (BGOP. See Saturday, Sept. 14, for hotline.)

Sat./Sun., Oct. 12-13, Appalachian Blacksmiths Association Fall Conference, at Cedar Lakes State Park, near Ripley, WV. Theme: "Is it Art Yet?" Demonstrators include Mike Snyder - farmstead blacksmith, Joe Mullins - bronze metal caster, and Butch Frazier - repousse smith. Tool auction to benefit ABA.

Sat./Sun., Nov. 2-3, East Coast All Blacksmith Christmas Show, Agricultural History Farm Park, Derwood, MD. (Sponsored by three ABANA chapters and two other organizations.) 10-4 each day. Sales and demonstration spaces available. Camping available (for blacksmiths). For further information and applications, contact: Stu Booher (301-424-2889), Bob Morris (301-253-2084), Ken Zastrow (301-622-0897), or Bill Wojik (540-253-5121).

ROASTING SPIT

By: David Fink of Lumpkin,Ga.

Material Needed: 1/2" x 1/2" x 24" - 2 pieces
1/8" x 1/2" x 7" - 2 pieces
1/8" x 1/2" x 10" - 2 pieces
1/8" x 1/2" x 5" - 2 pieces
3/8" x 3/8" x 28" - 1 piece

1- Stack the 1/8 x 7 on the 1/8 x 10 and secure with wire while welding. Taper the welded area as shown in figure 1. Repeat with other like pieces.

2- Weld the above parts to the top of each of the 1/2 x 24" pieces as shown in figure 2.

3- Forge a point on the other end of the 1/2 x 24.

4- Heat the welded end and pull the 7" piece up and forge into a "U" shape. Reheat and repeat the operation on the 10" piece to form an object similar to that in figure 4.

5- Upset one end of the 3/8" bar to about 1/2" square and flatten. Over the edge of the anvil, forge this flattened section into a round one and punch a hole in it's center of a little over 5/16" diameter. Forge the 3" under this eye into a rounded cross section as shown in 5a and b.

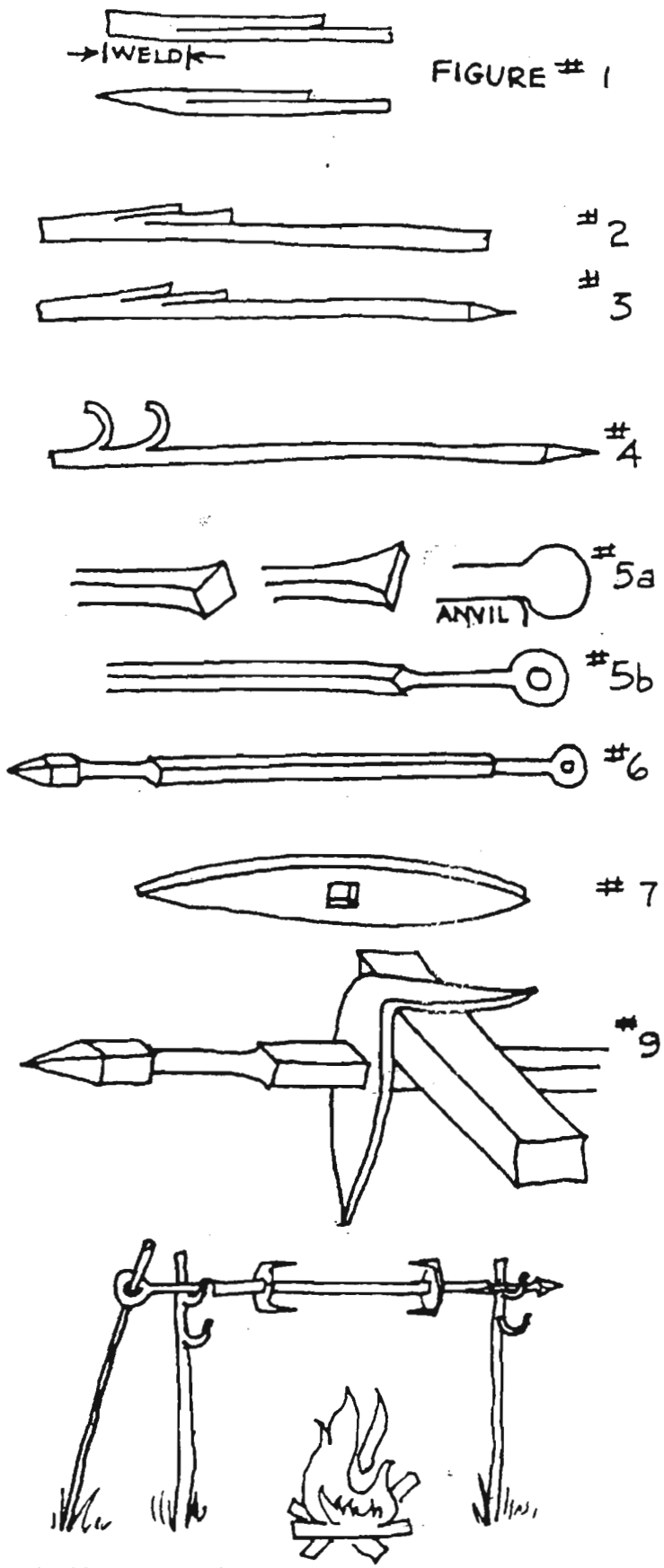
6- Forge the opposite end of the 3/8" bar to a tapered point and forge the 3" behind that point to a rounded cross section similar to the other end as shown in figure 6.

7- Forge both of the 1/8 x 1/2 x 5" pieces to a long sharp tapered point on both ends. Measure the resulting pieces and mark the center point. Punch a 1/4" square hole in the center of each piece then drift to 3/8" square.

8- Slip these onto the 3/8 square bar (made in steps 5 and 6 above) and heat each of them in turn.

9- Use a scrap piece of 1/2 " thick material as a spacer to form the last parts into a squared "U" shape as shown in figure 9.

10- Optional. A 20" x 1/4" round rod can be pointed on one end to hold cross bar in position.



Reprinted from newsletter of the Ocmulgee Blacksmith Guild, March-April '95.

AN INTRO TO SCROLLS

By: Jeff Mohr, Watkinsville,Georgia

I get a lot of beginning smiths through my shop. If they can turn a scroll, I'm lucky. I've had a lot of experience teaching beginning smiths how to do just that. It's a simple process but one that's hard to master. The only way to get good at it is by much practice. When beginning, take it slow - hit, stop, look - then hit, stop, and look again.It takes a lot more time to get yourself out of trouble so it's better to save yourself time by working slowly. A small cone for the hardy hole is handy for helping to correct the mistakes made in turning scrolls.

Start by forming a taper on the end of the stock (as shown in Figure 1). Push 1 to 2 inches of the tapered end over the far edge of the anvil and bend it down (Fig.2) then turn the piece so that the tip now points up. Strike the work at the point indicated by the arrows in the sequence of figures at right ——————►

Always remember that in general, the hammer hand is the laborer - the other hand is the manager. This is especially apparent in scroll making. After bending the tip over with the first few light blows, to get to the tip in order to start turning the scroll, raise your left arm (assuming you're right handed) real high so that the tip is in such a position that the hammer blow is directed straight down towards the anvil. Lower your arm a little on each successive blow as the scroll is rolling around. As you move along the tapered stock the force of the hammer blows is increased slightly since you are striking increasing thicker stock, but the first blows are really light taps.

After you have formed a small scroll similar to that in the last illustration, you can increase the size of the scroll by repeating the procedure. To get a larger radius on the increasingly larger scroll, just push more and more material over the edge of the anvil. **Practice!!!**

There are many examples of perfect scrolls in nature. Study a sea shell or a snail shell to really see what your goal is. A well made scroll has no flat spots in it. It is a line that smoothly flows as it curves in an ever increasingly loose radius from the center outward.

Jeff

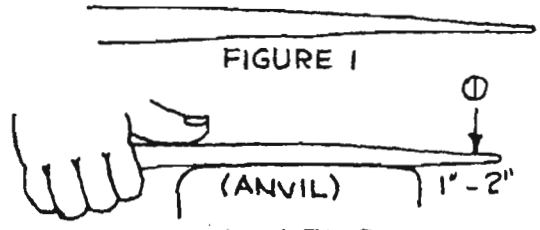
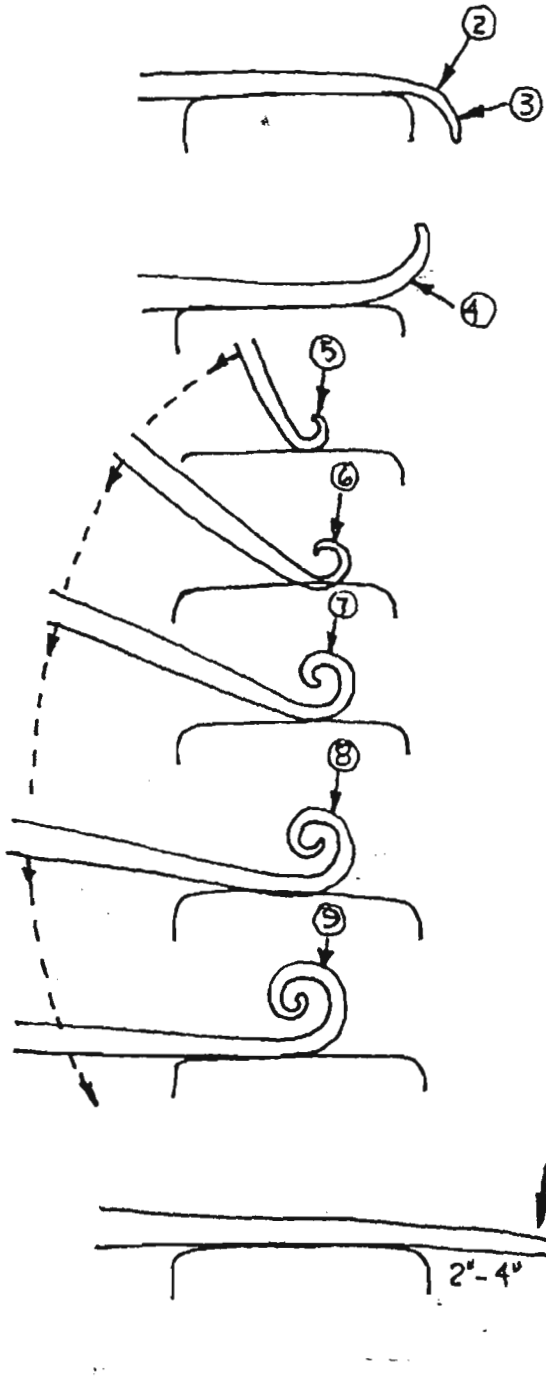


FIGURE 2



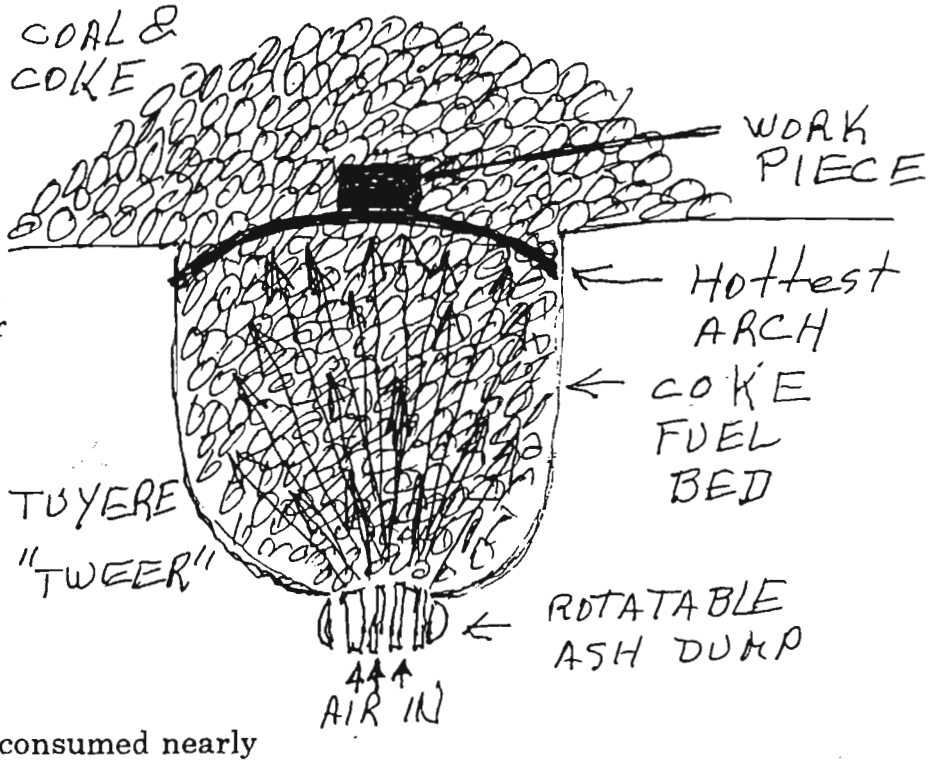
Reprinted from the newsletter of the Ocmulgee Blacksmith Guild, May/June '96

THE BEGINNERS CORNER - FORGE WELDING

One of the more spectacular operations ordinarily done by a blacksmith is forge welding. It is often photographed and seems a difficult operation that beginners shy away from doing. Yet they feel that if they can do this operation they will have mastered one of blacksmithings great skills. How to do this task is partly covered here, but the part covered is critical to your success. The various shapes which make the task more successful are often shown in books and are not covered here.

Key to successful forge welding is understanding heat and its control. So let us begin with the coal forge fire which will produce the heat. If you have taken high school chemistry and used a Bunsen burner or you have used a propane torch or you have used an oxy-acetylene torch you should have learned about the flame these produce. Some distance out from the end of the tip is a band of different color and you should have learned that just at the center outer edge of this band is the hottest spot in the flame. Now transfer this idea to a coal flame. Instead of gas we have carbon in the form of coke through which we are blowing air. Only the approximately 21 % of the air which is oxygen is helping to oxidize the carbon and turn it into heat. The other part of the air only serves to move the oxygen along and cool the fire and work.

In the drawing at the right you see a cross section of a coke fire heating a piece of work. Just below the work is an imaginary arch which is labled "hottest arch". This is similar to the gas flame hottest point. It can be moved up or down in the forge by blowing more or less air into the tuyere. In the region below the hottest arch the fire will have excess oxygen. We call this an oxidizing flame because it has excess oxygen in it and it will burn the work. Above the hottest arch the flame has consumed nearly all of its available oxygen and it has excess carbon (in relation to the air needed to support complete combustion) and we call this a carbonizing flame. Because the hottest arch is not a perfect line additional coke surrounds the work helping to keep the heat near it, burning any remaining oxygen and helping reflect the heat back at the work. The work piece will get hottest nearest the hottest arch line. It will be cooled both above and below it.



Reprinted from the Indiana Forge Fire, August, 1996

The Beginners Corner - Forge welding - continued page 2

Now let us look at the work pieces and some things you should keep in mind about them. The sketch to the right shows two pieces of metal just about to be welded together. Study them carefully as we go along.
FL is the flux layer. It serves the purposes of keeping air (oxygen especially) away from the surface. It also helps to clean any remaining surface oxides, oils, light rust, scale and put these into the flux solution. These are the bright parts which spray out when welding. [DANGER POINT: Wear safety glasses and protective clothing when welding to avoid this molten spray. A number of smiths have learned to fling this onto the floor just before welding to reduce the spray.] The flux layer must be entirely hammered clear of the surfaces for the surfaces to successfully bond.
ML is a semi molten area and is the surface which will be actually joined. This surface is very thin and heavy initial hammering will displace it bringing to the surface the cooler plastic layer (PL) which will probably not weld.
PL is a semi plastic layer which is almost molten, but not quite.
HL is a hot layer just behind the plastic layer and while hot it will not weld.
The Core is the coolest part of the work piece. This situation rapidly reverses after the work piece is removed from the fire. The rapidity of reversal is controlled by the mass and heat of the core.

You may have heard smiths talk about soaking a piece. Soaking means that the piece is left in the fire for an extended period of time. Provided the fire and flux are right this will serve to bring the core up as close as possible to the same temperature as the surface. This process can not be rushed because it takes some time for the heat to travel to the interior of the work piece. In practice the work will be slowly brought up to welding heat - the surface ML will become nearly molten - over several minutes or much more depending on the size of the work piece. This slow increase reduces the chance that the surface will over heat and burn. It is important that the core have suffient heat to carry the work through the welding steps which almost all work to cool the work pieces. Only the hammer blows add energy (heat) to the pieces -a useful point to remember. The cold hammer face and the massive cold sink of the anvil surface draw heat from the work pieces and quickly reduce the molten layer to a plastic layer then a hot layer - too cool to use. Remember that heat flows toward cold.

The welding process begins with cleaning the fire. This means that clikers - taffy bonded ash and coke - are removed from the fire, fresh coke is available below the hot arch and there are no air obstructions to full flame development. Next the piece is shaped to aid the process where possible. The two pieces to be welded are put in the fire, preheated to allow the flux to bond to the surface, removed and fluxed, returned to the fire and are slowly brought up to welding heat. Look for an appearent "wet surface" on the steel. [DANGER POINT: Your eyes are not designed to look directly into a forge fire. They will eventually be damaged if you do. Wear protective welders lenses which reduce both visable and invisable radiation. If your eyes are tired or hurt after your use of the forge get darker lenses. Do not take the path of earlier smiths who did not have this safety aid. Your sight is too valuable to waste.]

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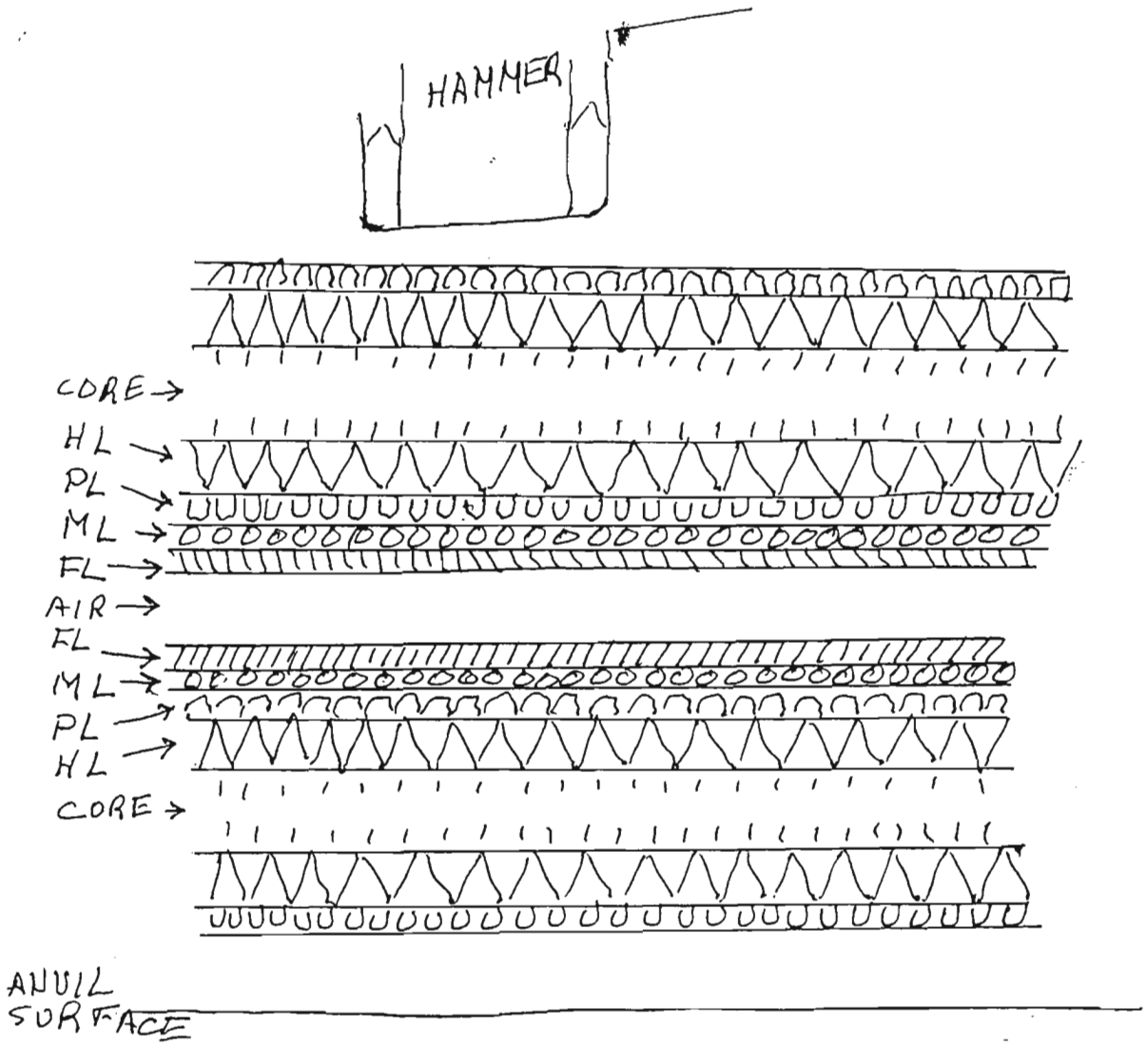
THE BEGINNERS CORNER - Forge Welding - continued page 3



The pieces will probably be turned in the fire so that the core can heat throughly. The last heating is with the to-be-welded surfaces facing down into the hottest part of the flame. As this is proceeding prepare the anvil and tools. Bring the pieces out of the fire and swing them at the floor to remove excess flux. Join the pieces and hammer the two pieces together starting usually at the point where the thinest part is next to the cooling anvil face. Remember that the flux must be fully forced out over the whole weld. Remember that if you strike too hard you will not only remove the flux, but also the molten layer needed for bonding and cooler subsurfaces will be brought into contact. Only after the piece is well bonded can you begin to strike more firmly. If at first you do not succeed, reflux the piece, reheat and try again. Practice will help you learn the finer points. Good luck with your forge welding!!

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How to Join the NJBA

NJBA dues are $15 per year. Please make out your check to William Gerhauser (NJBA Treasurer). You may note on the "memo" line that the check is for NJBA dues. **Please mail checks to Bruce Freemanm** (NJBA membership), **222 Laurel Place, Neptune, NJ 07753**, along with your completed membership form. You will receive a receipt for your membership dues within four weeks.

Required Information
(This information will be listed in a roster available to other members, unless you request otherwise.)

Name_____ Home Phone_____

Address, City, State, Zip_____

Optional Information
List any of additional information that you would like included in the membership roster (use a separate sheet if necessary.)

Other Phone , FAX , E- mail_____

Years of experience as a professional/amateur (circle one) blacksmith (not required for membership)_____

Your occupation and areas of knowledge and interest_____

_____

What do you want to get from your membership in NJBA?_____

_____

New Jersey Blacksmith Association

Newsletter

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