SOFA SOUNDS

SOF&A SOUTHERN OHIO FORGE & ANVIL
Artist-Blacksmiths Association of North America

APRIL/MAY 1992

MARK YOUR CALENDAR: Unless otherwise noted, all meetings will be held at the Studebaker Frontier Homestead on Rt. 202 about four miles north of I-70 near Tipp City. Please don't park on the grass or block access to the production area. Donations of items to the newsletter support raffle are always welcome. Please bring your work or tooling for display. The public and guests are welcome. Finger food and cold drinks provided on a break-even, donation plate basis. The forges at the homestead are available before and after meetings for individual projects. PLEASE BRING AND WEAR SAFETY GLASSES!

April 4th, 1 PM	Demonstration by Hank Steinmetz and Don Mumford on fixture bending.
May 2nd, 1 PM	Demonstration by Mike Dowler decorative corner treatments for faces and leaves.
June 6th, 1 PM	Demonstrator needed.
July 11th, 1 PM	Tentative: Work day to repair several of the homestead forges.
August 1st, 1 PM	Demonstrator needed.
September 5th, 1 PM	Demonstrator needed.

BE ON THE LOOKOUT! Mark Lucas (2252 E. Possum Rd., Springfield - 323-3805) had two anvils stolen from his garage, a 305 lb Peter Wright and 150 lb Acme. If you run across anyone trying to sell two anvils like this, please call Mark.

1992 ABANA Conference: Remember the next ABANA Conference will be June 18-20th at California Polytechnic Institute in San Luis Obispo, CA. They are planning a first-class event with some of the finest forging talent available in the world as demonstrators.

SOF&A BOARD OF DIRECTORS ELECTION: Several SOF&A Board of Directors positions will come up for election at the May meeting. If you are interested in helping to run SOF&A, please volunteer to be considered. Also consider who else you would like to be elected to the board. Once elected, the new board then appoints group officers.

Chapter of ABANA

Forge Furnaces - Combustion Facts; Answers to Some Questions on Gas Forges

During the ABANA conference I found myself discussing some aspects of the new SANDIA furnace. Many questions were raised as to whether you can forge weld with a gas furnace and why is it necessary to preheat the air. In addition there were questions about fuels; can you use natural gas as well as propane? I prepared a fact sheet at the conference for a few of the attendees and the following is a more detailed explanation of that data, which comes from the Combustion Handbook, put out by North American Manufacturing Company.

Question 1: **Can steel be forge welded in a gas furnace?**

Answer: Yes. It was demonstrated with the Scandia furnace at the conference with Robb Gunter. Also, which may be of more interest, Mitch Fitzgibbon does it regularly with his propane furnace without air preheat. To forge weld you need that metal to be about 2500°. A rule of thumb is that the furnace gasses need to be 100-200 degrees hotter than the work, so 2700° gasses will be hot enough.

Question 2: **How high a flame temperature can we get?**

Answer: Flame temperature measurement is notoriously inaccurate so use the following values for comparison only.

Observed flame temperatures: Cold Air-Natural Gas — 2895-3562° 1400° Air-Natural Gas — 3800-4100°

These figures show that even with cold air the flame can get hot enough to weld. Remember that temperature is only a distant relative of heat input. In other works, if the burner is big enough to overcome the furnace losses, the piece to be forged will approach the flame temperature.

Question 3: **Why pre-heat the air?**

Answer: Air is made up of 20% oxygen by volume, and 80% other gases, mainly nitrogen. Oxygen is needed for burning, but nitrogen is a free loader. But all the air must get to combustion temperature. This uses up some of the heat available in the fuel. Hence preheated air is more efficient. Fuel is saved when some of the heat otherwise lost to exhaust gases is taken back in addition to increasing the flame temperature. For a 2300° furnace, fuel savings can be calculated as follows:

60° Air	0% savings
800° Air	30% savings
1000° Air	36% savings
1200° Air	41% savings

Industry gets as much as 2100° preheat on a 2300° furnace, so you can see the savings possible. There are some pros and cons to preheating air, which will be left to another article.

Question 4: **What is the Comparison between Natural Gas and Propane?**

Answer: Calculated flame temperatures are as follows:

Cold Air	Natural Gas	3525°
Cold Air	Propane	3573°

Not much difference between the two. The main difference between the two gasses is that propane contains about 2.5 times the heat per cubic foot, which makes for a more compact system.

If you really want to get the temperature up, see what pure oxygen will do for flame temperatures.

Oxygen	Natural Gas	4790°
Oxygen	Propane	5130°

Clearly, welding temperatures can be attained with both gases, if we do not lose too much heat to the atmosphere. Hence, good insulation is needed.

Question 5: **How about heat losses?**

Answer: The two obvious losses, in addition to the heat lost up the flue, are heat loss through the insulation and losses due to heating air that is not used to supply oxygen to combustion. The problem is similar to keeping homes warm in the North. Since approximately half the heat goes up the flue, electric heat has some merit. However, electric heat is radiant heat only, and lacks the heat transfer properties of gasses, which both conduct and radiate.

Insulation is a big area, which should be dealt with separately. The rammable refractory biscuit, used in the Scandia furnace, which is durable and can resist fluxes, is good. It does not drain too much heat to get it up to working temperature, which is a problem of most brick hearths.

Question 6: **How about excess air?**

Answer: If you use just enough cold air to burn all the fuel and have no extra oxygen left over, then 40% of the heat goes to heating the work. If, however, there is a 25% amount of excess air, then only 30% will go to heating the work; a loss of one-third of the heat.

There are many ways to ensure that air and fuel stay in ratio, but the one most commonly used by blacksmiths, and the simplest, is adjusting the flame by eye. A flame tinged with orange that licks out the furnace door, is slightly fuel rich, a good starting point. However, as extra air is added to the flame, the flame turns blue and often the sound from the burner increases.

Question 7: **How about secondary air?**

Answer: The other less obvious way to introduce too much air is to suck air into the furnace through cracks as well as through the door opening. This we combat with furnace pressure control, or damping off the flue to increase the pressure in the furnace. You cannot suck cold air if you are blowing out hot exhaust gases.

Question 8: **Why does the furnace suck in cold air?**

Answer: Hot air and gasses rise because they are more buoyant than room temperature air. This makes the lowest point in the furnace where cold air is most likely to first leak in. This is exactly where the hearth is and of course our work. The consequence is chilled work, or even worse, work that is cooler on one side than the other.

One type of industrial forge furnace that does not use a separate flue, is the slot forge, in which the work is pushed in through an open slot and since there is no flue and hot gasses exit around the work. This keeps cold air out and has an added benefit, that the hot gasses blow past the work, which increases heat transfer.

Another common practice with slot forges in industry is to spread a layer of "grog," crushed refractory, over the hearth. This saves the hearth from mechanical damage, allows gasses to get underneath the work, and keeps old scale from sticking to the work.

In summary, you should definitely think about trying a gas furnace, but remember the following safety tips:

1. Ventilate the room well. You cannot smell carbon-monoxide which is a killer.
2. Do not let unburned gasses accumulate in the furnace. If they do, purge the furnace before trying to relight it.
3. Always have your igniter burning before you turn on the gas.
4. Do not leave a burner unattended, not for one minute.
5. Remember, Propane is a heavier-than-air gas. It can accumulate in low spots such as basements and sump holes waiting for a spark from a switch or motor to ignite it.

THE BLACKSMITH AND THE I.R.S.: I spoke to Mike Shafer recently. He is an Atlanta-area dentist who has a growing part-time blacksmithing business. Mike said he was in the process of having his blacksmithing business records audited by the I.R.S. and was surprised to find they will not necessarily accept cancelled checks to individuals as invoices, since they can be annotated after processing to indicate what payment was for. Mike recommended

(Continued on next page)

Reprinted from *Bituminous Bits*

PROPANE GAS FORGES

by John Smith

Last year I built a propane forge the same as Jeffrey Funk (see the March 1988 issue of The Rivet), with a steel arched top lined with Kao-wool, firebrick base and sides, and two burners coming in through the top. I built this forge for one purpose --taking 36 inch long heats -- for making the bases of my fireplace toolsets in one heat. It does a wonderful job and has already paid for itself several times over. It has two drawbacks; it takes quite a while to heat up, and it uses a lot of propane.

For 95% of the forge work we do, a 9 inch or 10 inch heat is enough. So I build a small forge of firebricks, with a single burner coming in the side, and this was quick and fairly efficient, but did not give an even heat.

A lot of efficiency is lost when the flame hits a brick wall a few inches away; in fact the brick area opposite the burner was black, even when the rest of the inside of the forge was bright orange.

I attended Northwest Blacksmith Association meeting in the fall where Darryl Nelson of Fire Mountain Forge had a new type of propane forge, which reached welding heat in about 5 minutes from light up, and ran on hardly any propane.
It was cylindrical - a piece of 10 inch pipe - lined with 1 inch thick Kao-wool. The burner came in horizontally near the top, creating a circular, swirling flame, giving a very efficient and even heat. I knew I had to have one!
There was, however, one thing that really bothered me about Darryl's forge, and that was the exposed Kao-wool, with the burner aimed right at it. (In Jeff Funk's forge the burners are aimed away from the Kao-wool.)

Kao-wool is extremely irritating to the throat, and when I have handled it without a mask I have experienced a very irritated throat and tight breathing similar to breathing galvanizing fumes, for several hours.

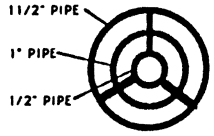
The brand name that is easily available here is "Inswool," from A P Green Refractories, and on the box it says to avoid breathing without a mask when handling as it gives "Temporary" lung irritation.
When Kao-wool is exposed inside a forge, with the burner flame blowing on it and the steel that is heating up is bound to touch it at times, it seems to me that this must cause particles to become airborne.

One of the reasons for giving up coal is to avoid the harmful airborne coal dust and ash - and I see no point in trading one health hazard for another if it possible to avoid both. So I built a round forge using a castable refractory material instead of Kao-wool.

It doesn't heat up as quickly, but once hot runs at a nice forging temperature at about 1/2 to 1 psi of propane pressure. At increased pressure it reaches forge welding temperature easily.

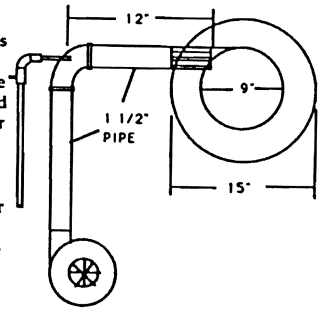
The castable refractory material I used is from A P Green and is called CA2004. There are several different mixes available, ranging from $25 to $70 per 25 Kg bag. CA2004 is about $35, and so far is working fine. You must add water and mix it up like concrete. After it has cured for 24 hours it is important to dry it out thoroughly before lighting it as trapped moisture can turn to steam and explode.
I set mine on top of our wood stove for a week. The stove was alight continuously and it dried the forge nicely, although there was steam created during the initial firing. It was heated slowly and we took several hours before we got the inside to glow. I did this outside, partly in case it did explode, but also because the steam coming off did not smell very nice.

Every thing went fine, and the next day we brought it inside and started using it. Initially I had a piece of 1 1/2 inch pipe with no concentric pipe added.....
.....And it really roared very unpleasantly. When I added the two extra pieces of pipe "See plans" it quieted right down.
Thanks, Jeff, for this important detail. Also, without the extra pipes in the burner, it was a bit temperamental, and until it warmed up it would occasionally blow itself out. Now the flame pattern is much better and it is not as touchy with the air/gas ratio. A big improvement. The heat throughout the forge is really even.

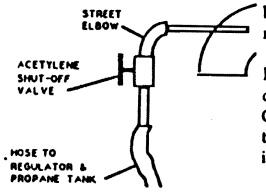


I built my forge specifically for it to be used by two people at once - one working at each end - so I just have loose firebricks stacked up to close off the ends, with an adjustable opening to put the steel in. It is important to use high-temperature firebricks. I used "Prairie" from A P Green. (Regular fireplace firebricks fall apart when they get hot, as they do on the side facing the inside of the forge.)

My forge is fourteen inches long and the burner is in the center. It could be scaled up or down to suit individual requirements, and one end or both could be made from the castable mix, with a slot for work to go in,



and another slot in the back for heating the middle of a long bar.



I used what I had, but did follow A P Green's recommendation of making the lining 3 inches thick.

A CAUTIONARY NOTE: Propane gives off carbon monoxide which can be deadly. Do not operate a propane forge in a closed shop unless it is properly vented, and even then a supply of fresh replacement air is necessary. Medical books say carbon monoxide is harmful at a concentration of 100 ppm, which isn't very much.

I haven't used my coal forge since the blower burned out in November, and you know, I don't miss it. Using propane is so darned simple.

Editors note: John says that a 100 pound bottle of propane lasts him about 36 hours and that the cost of running the forge is about 70 cents per hour

Reprinted from*THE RIVET*, Westefn Canadian Blacksmiths Guild, Feb 1989. By John Smith

PROPANE GAS FORGES

A gas forge presents possible hazards when compared with a coal forge. Gas and air in the right mixture with a spark will go bang. The gas forge will eat up all the oxygen in a closed room and leave carbon monoxide which ain't too healthy.

You must be safety conscious when using gas. Do not store or place the bottles near a heat source or on a platform which will turn over. **Be on the look-out for leaks. Check all the connections with soapy water. Do not use a flame.** Do not leave the forge on unattended. Do not look inside the forge when lighting. Be aware of flame-outs.

A gas forge can be safe, fast, and quiet, is inexpensive to build, is clean, will work you to death, will warm your shop on cold days, is addictive and is expensive to operate when compared with coal or coke.

After having seen the gas forges of the Fire Mountain Forge, Gene Chapman, Hans Peot, and the one auctioned off at Tipp City, I had to have one. So Clay Spencer and I each built a circular gas forge.
All of these gas forges were a spin-off of Darryl Nelson's basic design which is shown on the preceding page and on the left.

The smallest forge was Gene's. He had slipped a 3 Lb coffee can over another 3 Lb can. He used an exhaust pipe attached to a hair dryer for his air supply. He used a light dimmer switch to vary the air flow.

The gas line was regulated at a low pressure, had a cutoff valve and went into the elbow. I believe it was nothing but 1/4" copper tubing. There was no orifice or concentric flame holder.

I.R.S. Continued: writing a business check out to 'petty cash' and then keeping that money in a separate envelope. When buying business-related items from individuals (e.g., at a flea market), use a receipt book, available at any office supply outlet, to obtain a signed and annotated receipt. The receipt goes into the envelope such that the total of cash and receipts always equals the petty cash drawn account. It is also a good business practice to staple cancelled checks to receipts for other business-related purchases.

The coffee cans were lined with 1" thick Kao-wool. The ends were closed with firebricks. A broken firebrick was on the bottom of the forge. Gene forged and heat treated knife blades in this forge.

I believe that most gas forges are too big and therefore expensive to operate.

Clay made his forge, a small one, out of a Freon bottle. He cut one end out and a hole in the other, and lined it with Kao-wool. He followed the drawings on the previous page. Clay made a pivot hinge on the front and attached a Kao-wool lined door.

A needle valve had to be put into the gas line to obtain a reduced gas flow and a finer gas adjustment. At a low pressure and with the door closed, the gas mixture will burn at the gas inlet behind the flame holder. This presents a problem, now the inlet pipe which is aninsulated is being heated.

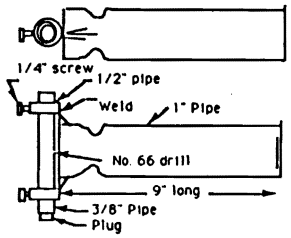
I made my forge out of a 11 1/2" ID heavy wall pipe which was 14" long. I welded a short piece of pipe larger than the air inlet pipe to the large pipe. This way I can detach the burner from the forge. I also welded two pieces of angle iron to the large pipe for a base. I cast a 2500 degree refractory called Plicast Tuff Mix into the pipe using a 6" stove pipe as a center core. A piece of plywood with spacers nailed to it were used to position the stovepipe and pipe body. The two pipes were stood on end and the Plicast was rammed in from the other end. Paper was stuffed in front of the burner to fill the void.

The refractory was left to cure for about a day and a half. Then the forge was heated by burning the gas without air for short durations during a day. The next day it was run full bore for four hours. I was able to weld a large Damascus billet in this home-made gas forge.

I used about 50 Lb of refractory at a cost of $12 and 50 Lb of scrap metal @ 17 cents a pound. I had a used blower and the gas hose, regulator, fittings, cutoff valve and gage. You can build the same type gas forge for less than $100.

Clay and I bought the refractory products from:
Frank W Schaefer, Inc, P O Box 1508, Dayton, Ohio 45401, 513/253-2306

The Products were: Plibrico DuraBlanket- 8 Lb, 1"x 24" @ $3/sqft (Kao-Wool)
&
Plibrico Plicast Tuff-Mix @ $24 per 100Lb



Look in the yellow pages under refractories or ceramics.

by Jim Batson
Reprinted from Bits Vol. 5, No. 5 Sep-Oct 89,

GAS FORGE BURNER UPDATE

In the Sept-Oct 1989, Bituminous Bits, Jim wrote of our experiments with gas forges that Jim had seen on the west coast and I had seen at the Western Regional Conference and that we both had seen at the Quad State Roundup.

Since then we have made different nozzles and burners and used in the two forges described in the referenced Bituminous Bits.

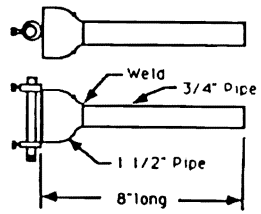
Jim was invited to demonstrate at a conference at Alpine, TX and saw a forge there used by farriers. It had two burners made out of 1" pipe, with a gas jet pointing down into a venturi fullered near the end of the pipe. The 9 inch long pipe was fullered or necked down to a 3/4 inch ID about 1 1/4" from the end. A tiny hole was drilled in the side of a 4" length of 3/8" pipe. We used a No. 66 drill. The hole was pointed down the center of the nozzle and held there by clamp screws.

No blower is required. The end of the burner inside the furnace must be tangential to the round inside of the furnace and at the center of the length of the furnace for the most efficient operation. This gives a circular flow to the flame burning in the furnace and apparently makes it more efficient than square or rectangular cross section furnaces.

The ABANA plans for Recuperative Gas Fired Forge Furnace, by Robb Gunter, et al, from Sandia National Laboratories was the basis for the burner I have used in my Freon Bottle/ Kao-wool furnace.

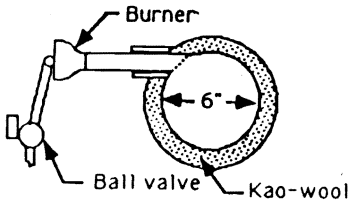
Neck down a piece of 1 1/2" Sch 40 black pipe to 3/4" inside diameter at 1 1/2" from the end with a spring fuller. Cut at center of the fuller and you have two pieces. Arc weld this to a piece of 3/4" Sch 40 black pipe 8" long.

The jet in the 3/8" pipe should be aimed straight down the center of this burner and the jet pipe can be right at the end of the 1 1/2" pipe or back about 1/4" without any noticeable change in performance.



In my furnace, which is about 1/2 the volume of the ABANA forge, one burner will operate from 5 to 15 psi pressure. The higher pressure is needed to forge weld, but it normally operates at 5 psi for most other forging with the jet drilled with the No. 66 drill.

This Kao-wool furnace heats up very fast since it has low thermal lag and mass (this characteristic is similar to the ABANA forge). The insulation is not very durable and requires renewing the Kao-wool every 3 months unless you are careful to never snag the sides as you move work in and out of the furnace.



From our trials, it seems that the single burner, of either design, with the No. 66 drill jet is optimum for the 6" diameter by 11" long furnace. The castable refractory is slower to reach forging temperature, 15 minutes or more, but the refractory is very durable and much heavier and retains it's heat when a large, cold work piece is put in the furnace.
Clay Spencer Reprinted from Bituminous Bits, Vol. 6, No.1, Jan-Feb 1990

ANVIL HEATER: To heat up anvils on cold mornings, use an engine block heater - available from most farm or auto supply outlets. (By Mike Kaiser from the newsletter of the Blacksmith Guild of the Central Maryland).

HORSESHOE HOLDERS: Used horseshoes make excellent hangers for hammers (turn up part of lets) or for hanging stock (nail one side to a wall stud). (From the newsletter of the Appalachian Blacksmith Ass'n).

Reprinted from *The Hot Iron News*

THE TECHNICAL CORNER

Dear Editor:

In working with a propane furnace there is a totally different type of scale formed on the iron as from scale formed in a coal forge. The propane fire scale is hard, difficult to remove and tends to produce severe pitting.

Is there any source of information available that would help with this problem?

Paul Hinds
Milwaukie OR

Dear Paul:

There are two conditions present in any forge: heat and atmosphere. It's the interplay of these two factors that give all results, positive and negative. In a coal forge we have a relativly high temperature and an atmosphere of oxides of carbon. In a gas forge we have a relativly lower temperature and an atmosphere of oxides of carbon, oxides of hydrogen (mostly water) and a product called wet hydrogen.

The high temperature and intimate contact in a coal forge promote fast heating which reduces the time for scale to form. The carbonaceous atmosphere low in oxygen in a properly operated coal forge further reduce scaling.

In a gas forge the steel takes longer to heat and thus may scales more. It's also necessary to balance the atmsphere for the desired result. A lean mixture promotes scale from excess oxygen. A rich mixture produces less scale but a lot of wet hydrogen which is a severe decaburizing agent. The latter is quite detrimental to tool steels. For tool steel a neutral to slightly oxidizing fire is considered best. For decorative work a decidedly rich mixture should be used.

There can be a number of causes for the condition you discribe. The most common is poor mixture control or the ratio of fuel to air burned.

The forges with forced air blowers are generally easier to control. After adjusting to the approximate heat you require either the air or gas control should be adjusted to give the loudest "roar". Then it should be set so that a small amount of flame can be seen in the exaust. This will be a slightly rich mixture. For a neutral fire adjust so the flames just disappear.

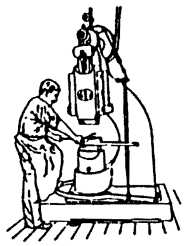
If the problem still exists I would check to make sure the flame is not impinging directly on the work. Until the combustion process is complete there is free oxygen in the mixture which can cause scaling. In a refractory furnace the flame should heat the walls of the furnace which will incandese and radiate infra-red and broad spectrum light. It is actually this radiation that does most of the heating of the work.

Other causes can be; too high a heat for the amount of work to be done to the piece, too many heats for the amount of work done or use of a high carbon or alloy steel.

Although a gas furnace is easier to just dive into and use than a coal forge, in the end you will find it requires every bit as much experience, care and attention as a coal forge. It is not a cure-all and it's unique character needs to be understood to get most out of it.

Hope this will be of some help to you. tech ed

If anyone out there has had similar experience and found solutions, let me know. There always seems to be several solutions to any problem. Editor.



(From the newsletter of the New York State Designer-Blacksmiths Ass'n)

Why a Propane Forge?
Harvey Taylor

Notes:

Advantages:

Will not burn up steel.
Can work on small and thin items without burning
Won't lose small parts as in coal forge
Faster start up time
No cleaning and fire maintenance
Can weld at any time without cleaning fire
Can operate in more locations without bothering environment
No chimney required
Much cleaner fire
Forge can help heat shop
Can have many irons in fire being heated and ready for forging

Disadvantages:

Sometimes more scale

Performance Characteristics of the Two Main Design Types of Gas Forges

Type 1. Natural Aspirated Propane

Examples: NC Tool Company Whisper Series
Recuperative Gas Forges Rob Gunter
Ken Mankel Forges
Valley Hot Box

Advantages of natural aspirated forges

Relatively quiet
Relatively cheap
Simple Design (No electricity, no moving parts, no chimney, no blower
Relatively light
Fast

Disadvantages of Natural Aspiration Forges

Cannot control Forge Atmosphere Flame is mostly oxydizing
High level of scaling
Must be used in a confined combustion chamber

Absolute Requirements:

Good ventilation (Propane burns O2 and produces CO2)
Ceramic Refractory

Type 2. Blown Propane Forges

Examples: Johnson Gas Forge
McEnglevan Gas Forge
Mitch Fitzgibbons
Art Jones

Advantages of Blown Propane Forges

Safer- Uses low pressure
Can control atmosphere in forge (Oxydizing or Reducive)
Can adjust the forge to optimum combustion efficiency by adjusting gas and/or air
Forge environment is positively pressurized. No cold spots
Forge can be adjusted to any size - can be used to heat larger items

Disadvantages of Blown Propane Forges

All propane applications are very loud
Much less portable than natural aspirated forges because of the blower and the use of heavy refractory

FORGE WELDING A36 and AVOIDING DEAD LAPS: To forge weld A36, heat to a bright red and flux with borax, then sprinkle on some E-Z weld when the borax has liquified. Use light blows initially. - To avoid dead laps when drawing out a wedge or point in larger stock, Bob Bergman suggest you initially cut the stock at an angle before forging. (By Fred Caylor from the newsletter of the Tullie Smith Hose Blacksmith Guild).

SHOP TIPS

by Brad Silberberg, Bradley Metal Design, Inc.

A math teacher-friend of mine recently opened my eyes to a great new tool for our shop. He casually mentioned that the Pittsburgh school system is lending students calculators that work with fractions as well as decimals. They are distributing a 115 function calculator made by Casio with all the trigonometric functions, etc. I tried to find this model locally with no success. Then I remembered that my friend said that he had heard that Radio Shack also had a calculator that worked with fractions. I made calls to Radio Shack locations and was told that no such model existed. The next week, I was at a local mall and stopped in to a "Shack" to see for myself. What I found was a model #65.935 Fractional-decimal, yard-foot-inch calculator. Not only will it do calculations in any combination of these units, convert back and forth from decimal to fraction (like: 5/8" to 0.625 and back), but it is solar powered to boot! I paid $29 for it, and I know it will pay for itself when it prevents my next mistake in finding the width of two ½" bars with a 1 5/8" space between them, and frame members that are 11/16" thick, and....

I am having great success with a quick-change power hammer die system that eliminates the need for knocking wedges in and out to change tooling. Since the dies for my air hammer are very accurately machined to be very square and of equal size, I have made tight-fitting boxes of steel plate that slip over any of my hammer dies, and secure with large set screws. To the tops of the boxes I welded relatively thin, hardened tool steel die faces. Since the big die blocks are never moved, I can change working faces in seconds without having to re-align everything. With the blocks in place I lose about 3" of the stroke of the hammer, but it makes very little difference when forging stock up to 2" round. I can gain stroke length and power by removing one or both of the boxes, and then replace them in seconds to refine my forgings. So far, I have made one set of combination broad fuller and round edged flat dies, one set of combination taper and edging-up dies (for chisels, etc.), and a box to bolt down spring fullers, bottom swages, etc.

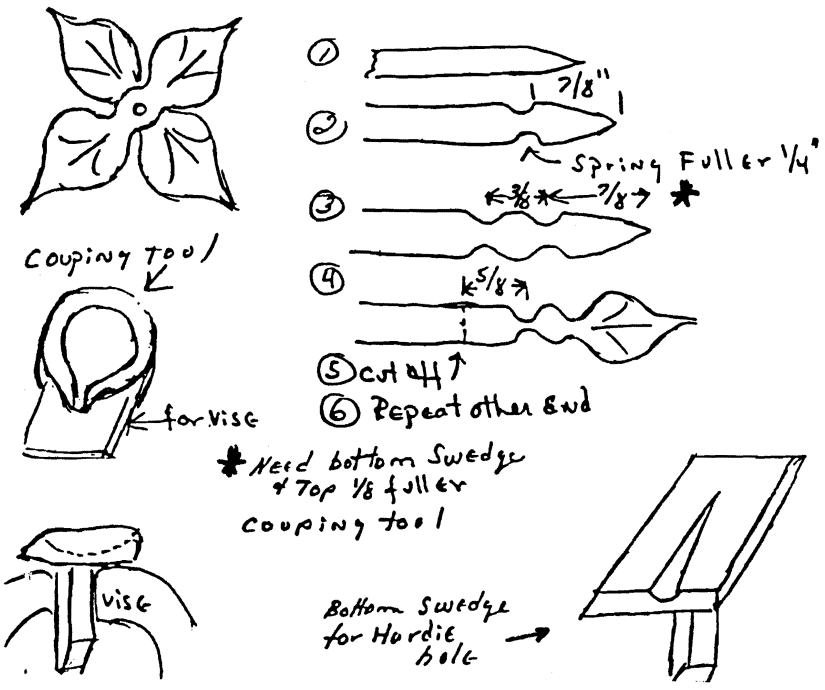
We got tired of tripping over extension cords on our shop floor, so we invested about $35 and bought an overhead cord reel from W.W. Granger. It has a 25 foot cord with a 3 outlet end, and it pulls out and retracts like a window blind. Just pull it down, plug in your tool, let it retract, and your cord is up in the air and out of the way. We hung one up over our layout table to plug in angle grinders, drills, etc. and we may add another.

Beginner's Tip: When making a hammer, never harden the entire head. Harden only the outer half inch or so of face and peen. Hardening the whole head often results in cracking the thin vertical sides of the eye. First, forge the peen end of the hammer, the carefully slit and drift the eye. Next cut the head off of the bar and dress up the face. Heat the head to a bright red and allow it to cool slowly to room temperature while buried in an insulating material. Shape the face and peen with files, grinders, etc. and polish smooth and shiny. Stick the hammer face straight down into the fire and bring it up to hardening temperature about ½" back. Quench the face not quite up to the eye. Next, tie a piece of rag over the hardened face, and put the peen end down into the fire. Keep the rag wet with water from a dipper can. The peen should come up to heat quickly, and the wet rag will keep the face from tempering until it does. Now quench the peen up to the eye, occasionally dipping the face until both ends are cold. Temper the face and peen immediately to a dark bronze color with a propane torch.

(From the newsletter of the Blacksmith Guild of the Potomac)

(From demonstration by Bob Becker, ABANA 90')

Decrative Leaf - Flat Stock - 3/16 x 1/2



1. Cut 4
2. Repeat other End

It is with the smith
standing at his anvil,
Forging crude iron.
The ring of the hammer
deafens his ears,
Perfects his eyes,
The heat of the fire
Sears his flesh.
But his eyes are fixed
on the tool he is shaping,
And he toils
till he perfects it.

(From the newsletter of the Northeast Blacksmith Ass'n)

DONATED BY KARL SEEBRUCH

Bolt Head Marking Chart

Grade Marking	Specification	Material	Nominal Size, Dia. In.	Proof Load PSI (MPa)	Tensile Strength Min. PSI (MPa)	Bolt Rockwell Hardness Min.	Bolt Rockwell Hardness Max.	Nut Rockwell Hardness Min.	Nut Rockwell Hardness Max.
	ASTM A307 Grade A SAE J429 Grade 1	Low carbon steel	1/4 thru 1½	33,000	60,000	B70	B100	—	—
	SAE J429 Grade 2	Low carbon steel	1/4 thru 3/4 over 3/4 to 1½	55,000 33,000	74,000 60,000	B80	B100	—	C32
5.8	ISO SAE J1199 Property Class 5.8	Low or medium carbon steel	M5 thru M24	55,100 (380)	75,400 (520)	B82	B95	—	C32
	ASTM A449 Type 1 SAE J429 Grade 5	Medium carbon steel, quenched & tempered	1/4 thru 1 over 1 to 1½	85,000 74,000	120,000 105,000	C25 C19	C34 C30	– –	C32 C32
8.8	ISO / DIN SAE J1199 Property Class 8.8	Medium carbon steel, quenched & tempered	M3 thru M16 M17 thru M36	84,100 (580) 87,000 (600)	116,000 (800) 120,350 (830)	C20 C23	C30 C34	—	C32
	SAE J429 Grade 5.1 (SEMS)	Low or medium carbon steel, quenched & tempered with assembled washer	No. 6 thru 5/8	85,000	120,000	C25	C40	—	—
9.8	ISO SAE J1199 Property Class 9.8	Medium carbon steel, quenched & tempered	M1.6 thru M16	94,250 (650)	130,500 (900)	C27	C36	—	C32
	SAE J429 Grade 7	Medium carbon alloy steel, quenched & tempered, roll threaded after heat treatment	1/4 thru 1½	105,000	133,000	C28	C34	—	—
	ASTM A354 Grade BD Bowma-Torq®/ Grade 8 SAE J429 Grade 8	Medium carbon alloy steel, quenched & tempered	1/4 thru 1½	120,000	150,000	C33	C39	C24	C36
	SAE J429 Grade 8.2	Low carbon boron martensite steel, fully killed, fine grain, quenched & tempered	1/4 thru 1	120,000	150,000	C35	C42	—	—
10.9	ISO SAE J1199 Property Class 10.9	Medium carbon alloy steel, quenched & tempered	M6 thru M36	120,350 (830)	150,800 (1040)	C33	C39	C26	C36
12.9	ISO Property Class 12.9	Medium carbon alloy steel, quenched & tempered	M1.6 thru M36	140,650 (970)	176,900 (1220)	C38	C44	C26	C36
	Bowmalloy®	Proprietary medium carbon alloy steel, quenched & tempered	1/4 thru 1½	156,000	180,000 Min. 200,000 Max.	C38	C42	C26	C36

*Manufacturer's identification symbols are required per ASTM, ISO, or SAE

The Insta-Forge from Buffalo Blacksmith Products (Box 1036, Buffalo, WY 82834 - 307-684-5817) is portable, yet produces about 5,000°F using propane and pure oxygen.

HAND-TIED BROOMS for your fireplace sets. Contact Linda Ferguson, P.O. Box 388, Emerson, GA 30137 - 404-386-3346.

FOR SALE: 100 lb Bradely powerhammer, $500, GC, call 419-937-2543 in Boscom, OH.

While the Eastwood Company (580 Lancaster Ave, Box 296, Malvern, PA 19355 - 800-345-1178) specializes in auto restoration tools and techniques, many of their tools would also have applications in blacksmithing. Catalog on request. (Two items - rods to weld aluminum or pot metal using a propane torch and polyethylene mallets for doing repousse.)

HELP WANTED: This is an opportunity for an individual with some skils in metalworking shop operations, such as welding, torch cutting, machining, blacksmithing and/or other metal-working operations. The ability to read drawings develop methods and set-ups and complete a job is helpful. Our shop is involved in blacksmithing, metal fabrication, machining and rolling, forming and bending structural steel, plate, bar and tube. We are willing to train to expand the abilities of a qualified individual. Contact Mr. Carpenter at Max Weiss Co., Milwaukee, WI - 414-355-8220

A Recuperative Gas Forge Assembly Workshop will be held in Sodus, NY on May 2-3. Cost is $325, which includes receiving one of the assembled gas forges. These are based on the plans Robb Gunter developed for ABANA. Contact Bob Trout at 716-258-2339.

WANTED: Castiron forge, Buffalo or Champion in GC to be used in 1880-period historical farmstead blacksmith shop. Contact Chuck Sigler, 317 Carol Lane, Union, OH 45322 - 513-836-1064.

The Arrowmont School of Arts and Crafts will be conducting a knifemaking workshop by Peter Jagoda on August 3-7. To obtain a summer workshop schedule and further information contact Arrowmont, P.O. Box 567, Gatlinburg, TN 37738 - 615-436-5860.

Blacksmith Project Plan Books, designed by a working blacksmith, are available in three different formats. For further information contact The Iron Knee Forge, 1055 Hook Rd., Westminster, MD 21157.

The Turley Forge has three-week beginning blacksmithing courses throughout the year. Many smiths have had their introduction here. Contact Frank Turley, Rt 10, Box 88C, Santa Fe, NM 87501 - 505-471-8608.

FOR SALE: Iron working shop, variety of equipment. Contact Walter Szuflita, 2153 Union Rd., Buffalo, NY - 716-826-1013.

Jerry Hoffman, who produces The Blacksmith Journal, is now offering logo's for your letterhead, etc. For a listing of available styles contact him at Rt. 1, Box 189, Lonedell, MO 63060 - 314-629-4061.

Company marketing specialty items would like a catalog of any historical reproductions you make, especially copper and tin. They would also like information regarding the historical authenticity of said work. Contact Hal Bergan, 222 N. Midvale Blvd., Suite 23, Madison, WI 53705 - 800-236-3587.

Little Tree Designs (115 E. Mendocino Ave., Willits, CA 95490 - 800-227-1934) is now offering 196 lb cast anvils which can be designed with logos. Send for free catalog of their blacksmithing-related products.

Hint from Clayton Carr: If you know someone who cruises a lot of antique stores and flea market, provide them with a drawing of any tooling you are interested in, the sizes you need (e.g., top and bottom swages) and the maximum price you would be willing to pay for a tool in good condition.

FOR SALE: 25 lb Little Giant with 50 lb hammer spring installed plus spare springs and several sets of dies. Can deliver. Contact John Smith, RR 6, Box 52, Centralia, IL 62801 - 618-249-6444.

FOR SALE: One pound (#S1069) and five pound (#S1070) tin cans with lids. Great for flux and rivets. Can are plain tin so they work well in period shops. Contact Bob Tuftee, Gansink & Supply Co., 1151 N. Ellsworth Ave., Ville Park, IL 60181 - 708-834-0830.

The 300-page book, "THE LITTLE GIANT POWERHAMMER: REBUILDING, HISTORY AND USE" is available from the author, Richard Kern, at H&K Publishing, P.O. Box 284, Xenia, OH 45385 for $29.95 postpaid in the U.S. This is an excellent reference book even if you do not own a Little Giant.

The Hartwick Pines State Park will host Black Iron Days on August 22-23 this year. This is essentially an annual conference for the smith's in Michigan. For further information contact Steve Anderson, c/o Rt 3, Box 3840, Grayling, MI 49738 - 517-384-7068. This park is off I-75.

The Northwest Ohio Blacksmiths will have their Sixth Annual Hammer-In on May 2-3 at the AuGlaize Village near Defiance, OH. This event keeps getting better and better with a little something for everyone. For further information contact Duff Raker at 313-847-1248, Tom Goodman at 419-823-3280 or Bob Willman at 419-353-6221.

The Bear Mountain Outdoor School (Hightown, VA 24444 - 703-468-2700) will sponsor two beginning blacksmithing classes on Apr 12-18 and Oct 4-10. They also have classes in knifemaking, log cabin construction, timber framing and building with stone, among others. Contact the school for a 1992 class schedule.

Interested in a job with requires one year of school at the junior college level, yet earns more than some college-educated engineers? The one year tool and die making class at Sinclair Community College has placed all but one of their graduates immediately after graduation. There will continue to be a very strong demand for hands-on tool and die makers in the future. For further information contact Ronald Hutchins at Sinclair's Engineering Technologies Department - 513-226-2918.

The SOF&A VCR Tape Library is now in operation. See Hank Steinmetz before the SOF&A meetings.

Reminder, please pick up coal before SOF&A meeting if at all possible. Load your own coal (bring your own containers) and then pay Emmert Studebaker.

BLACKSMITHING EQUIPMENT FOR SALE: The following generally have a variety of equipment, including powerhammers, for sale: Neil Brown - 219-724-7554; Russell Cashion - 615-731-3215; Benny Wilson - 615-758-7176; Fred Caylor - 317-769-6351 (he also reconditions powerhammers); David Oliver - 615-878-5712 and John Kosirnik - 517-456-7881/4494. Locally try Joe Abele - 276-2977 or Steve Roth - 836-8520. For heavy-duty, castiron firepots contact Bob Zeller - 849-1771.

MILD STEEL 1/4" SQUARE AVAILABLE: Steve Anderson will have a limited quantity of dead soft 1/4" square hot rolled steel for sale for $.25 per foot at the April SOF&A meeting. If you are unable to attend this meeting, contact Steve afterwards at P.O.Box 396, Clinton, MI 49236-0396 to see if he has any remaining.

Welding Flux

Dick Franklin

Forge welding requires clean surfaces, the right temperature, proper scarfing, and a workable hamming strategy. Unless you have a clean surface, you can have all of the other elements of welding correct and the process will fail. The job of welding flux is to help provide clean surfaces.

Steel forms a "scale" on its surface when it is heated. The chemical composition of the scale is usually complex, but it is principally an iron oxide combined with other chemicals from the fire. There are circumstances when steel can be heated in the fire and scale doesn't form, but these are rare and almost never encountered in ordinary blacksmithing. Generally, every time you heat steel, scale will form if it is exposed to the atmosphere of the fire.

The melting point of all the ordinary scale is well above the burning point of steel. Scale stays solid at welding temperatures. Steel covered with scale can't weld since there is a solid sandwiched between the two pieces which will prevent them from fusing.

Welding success depends on removing scale from the area to be welded and preventing it from forming during the process. This is the job of a welding flux, which can be greatly assisted by wire brushing before applying the flux.

A good welding flux must prevent the forge gases from directly contacting the steel during the heating process to prevent scale from forming. It must also intervene between the steel and priorly formed scale. Steel and scale have different temperature coefficients of expansion. As the steel and scale is heated, the relative motion loosens the scale. The flux must be able to flow between the scale and the steel to keep new scale from forming between the loosened scale and the steel. The flux has a double function, preventing scale from forming and assisting in removal of scale by floating it above the surface of the steel.

The scale that floats on the surface of a liquid flux may be removed with a wire brush if the surface is one that a wire brush can reach it. Otherwise the combination of shaping the surfaces to be welded, scarfing, and the hammering strategy must be such that the liquid flux being forced from the weld area will carry the scale with it.

The flux must become liquid below the temperature at which scale forms rapidly. It its liquid state that flux must be fluid enough to flow into small cracks and wet surfaces readily. Borax meets these conditions and is probably the best all around welding flux.

The old EZ Weld had these qualities and in addition it contained iron filings. While the liquid part of the flux did its cleaning job, the iron filings had a large surface exposed to the forges heat and melted before the steel to be welded. These tiny puddles of molten iron help the fusing process, but the also leave pimples in the area that was fluxed and not hammered. While the filings help in the welding process, they can detract from the finished look of the weld.

Studebaker Award Granted in 1992

Dick Franklin

The Studebaker Award is given by the Southern Ohio Forge and Anvil Association (SOFA) to people who have made significant contributions to SOFA. The Award is named in honor of Emmert Studebaker who is a founding pillar of ABANA and a great benefactor of SOFA. The Award has been given only four times in the history of SOFA. It is not awarded lightly.

The selection of an individual is based upon recommendations of peers and the approval of the Board of Trustees of SOFA. A panel of eleven members of SOFA selected Bob Zeller. Bob's selection continues the tradition of recognizing the very best in SOFA and who have and continue to contribute to the SOFA's operation.

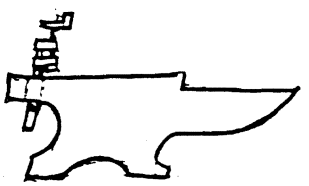
Competition is keen. Several people were highly recommended. Among these people were Denny Bischoff, Ron Thompson, Ron Van Vickle and Steve Roth. All of these people have and continue to contribute heavily to the success of SOFA.

Congratulations to Bob Zeller, winner of the Studebaker Award. He deserves it and sets a high standard for future awards.

MEETING NOTES:

Prior to the February 1st demonstration Ron Thompson noted that he needed to make some nails with decorative heads for the log-kit house he is finishing near Sidney. Ron simply took large common nails, put them in his nailheader and cold forged the head into a four-sided, flat top nailhead. He noted they look reasonably close to hand-forged ones.

It was also announced that Armco Steel in Middleton will now sell pea-size coke in less than one ton lots for $89.00 per ton (about 4.5¢ per pound). Unfortunately I neglected to ask for further details. If you can provide information on who to contact and where to pick up coke at Armco, please call me at 513-427-2447 and I'll pass the information along in the newsletter.

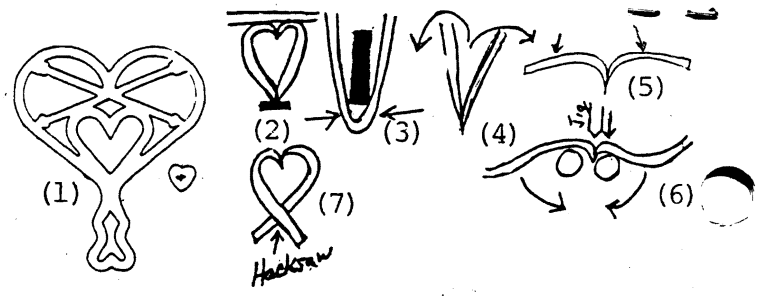


For the demonstration, Bob Cruikshank made most of the parts for a door thumb latch, emphasizing his personal decorative touches to the basic procedures. Since I'm short of newsletter space this issue, I'll have to refer you to the VCR tape made for details. However, one piece of interesting tooling Bob had borrowed from Larry Gindlesperger was an anvil hold-down made from a pipe clamp. A short piece of black iron pipe was threaded at one end for screwing into the pipe clamp head. The bottom length of the pipe was forged square to fit the hardy hole and drilled and filed for a key slot under the anvil. A wedge driven into the key locked the hold-down via a cross piece above the hardy hole top. A piece of flat stock had been added to the bottom of the sliding part of the clamp to meet the work to be held.

* * * * * * * *

For the March 7th meeting, Emmert Studebaker showed how he makes the legs for his heart-shaped based trivet and Larry Gindlesperger demonstrated scroll making.

Emmert's trivet base was cut out by Precision Laser Fabrication in Dayton and Emmert noted they do very nice work. The trivet design is shown as (1). The three legs (2) continued the heart motif with their bases also being a heart cut-out. To start a length of gas welding rod was bent around a piece of flat stock held in the legvise (3), the bend forged into a point and then the legs brought around using a jig to hold the point "V" to overlap. By hacksawing through the overlapped area, Emmert ensured matched joint. This area was then tackwelded, ground smooth and then the leg welded to the bottom of the trivet and the heart-shaped foot pads. To give the trivet color Emmert used a oxy/ace torch to put tempering colors several places on the trivet. Emmert noted a lot of handfiling and touch up go into one of these trivets.



Following Emmert, Larry noted there are several ways to determine scroll layout, with several complicated mathamatical formulas available, unwinding a string from around a square bar to make a spiral (the larger the square bar, the more space between spiral lines) and the two probably most commonly used: 1 - "Looks good to to me" and 2 - "That's about right".

He demonstrated several different scroll points noting to, whereever possible, avoid making mistakes in the first place and then correct those you do make before proceeding. He then demonstrated methods for bending scrolls including a fork form held in the legvise, a scroll fork and using a scroll form if a number of identical scrolls were required. (VCR tape available.)

ABANA Membership Application

Name_____ ☐ New Member ☐ Renewal

Address_____ Phone_____

City_____ State_____ Zip_____

☐ Regular Membership-----$35 ☐ Family Membership-----$40 ☐ Senior Citizen-----$25

☐ MasterCard ☐ Visa ☐ Check/Money Order

Card Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Exp. Date ☐☐/☐☐

Mail application to: **ABANA, P.O. Box 1181, Nashville, IN 47448** Phone 812-988-6919

Dues Distribution: 1 Year Subscription to Anvils Ring: 68.5% $24.00, Adm. Offices & ABANA projects: 31.5% $11.00

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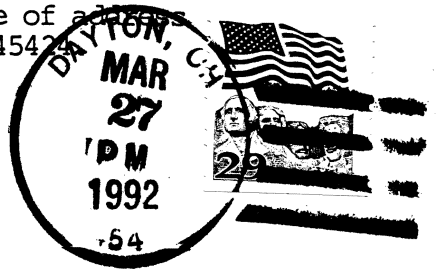

NOTE: YOUR SOFA MEMBERSHIP EXPIRES WITH THE MONTH ON YOUR MAILING LABEL.

FIRST CLASS

Richard A. Franklin
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Dayton, OH 45424

Membership Expires: 6 / 92