



SOFA SOUNDS

AUGUST/SEPTEMBER 1992

SOFA
SOUTHERN OHIO FORGE & ANVIL

Artist-Blacksmiths Association of North America

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NEWSLETTER EDITOR

Ken Scharabok (513-427-2447)

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!

August 1st, 1 PM

Demonstrations by Joe Abele and Steve Roth.

September 5th, 1 PM

Demonstrations by Bick Franklin on welding.

September 18th-20th

Quad-State Blacksmithing Round-Up. If you have not received a registration package by the end of July, contact Dick Franklin, 7158 Klyemore Drive Dayton, OH 45424.

October

NO MEETING

November 7th, 1 PM

Demonstrator needed.

December 5th, 1 PM

Demonstration by Paul Kuenle.

by LARRY VLIET

member Vancouver Island Blacksmith Ass.

THEORY OF HEAT TREATMENT OF CARBON TOOLSTEEL FOR WOODWORKERS

An understanding of the nature of carbon steel is necessary for achieving consistently successful heat treatment of it. Iron, steel, and cast iron all contain iron as their principal element. Pure iron has less than 0.008% carbon while steel may have anywhere from 0.008 to 2.0% carbon and cast iron has greater than 2.0% carbon. For steel it is not just the presence of carbon but the heat treatment of the carbon-iron mixture that determines the physical properties: hardness (ability to resist deformation), and toughness (ability to absorb stress or shock and disperse it without damage). Steel is a crystalline structure. The individual crystals group themselves into visible units called grains. The size of the grains is controlled by

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the rate at which the metal cools from liquid state: slow cooling produces large crystals. As steel cools slowly it goes through several phases or changes in its molecular structure. The temperatures at which these occur are called the critical temperatures. These critical temperatures vary with the carbon content.

When heated to between a light cherry to an orange colour (approximately 1600°F) it is in a solid but still plastic state known as *austenite*: a high energy molecular configuration (face centered cubic iron) with the carbon in solution. As it cools to below the A3 line (see fig.1), it changes or transforms into a lower energy molecular configuration (body centered cubic iron with the now excess carbon no longer in solution) that will eventually form stable grain types.

Several grain types may be produced (depending upon the amount of carbon available).

1. *Ferrite* is iron that has not combined with carbon and is soft and ductile.
2. *Cementite* is an iron crystal with a high carbon content and is very hard and brittle.
3. *Pearlite* is a lamellar aggregate of ferrite and cementite that is harder and less ductile than ferrite but is softer and less brittle than cementite.

However if the steel is cooled very quickly from the austenite state, a different form of grain is formed: *martensite*. Martensite is a very hard and brittle fine grained structure that is full of severe internal stresses that may cause distortions and cracking, unless tempered. Tempering is a heat treatment process of reheating hardened steel (martensite) to some temperature below the lower critical temperature. As the tempering temperature is increased the martensite is gradually changed into a structure consisting of spheroids of cementite in a matrix of ferrite. These changes are accompanied by a decreasing hardness and increasing toughness. Therefore the tempering temperature depends upon the desired properties and the purpose for which the steel is to be used. If considerable toughness is required the tempering temperature should be high. If considerable hardness is required then the tempering temperature should be low.

PRACTICAL HEAT TREATMENT OF CARBON TOOLSTEEL FOR WOODWORKERS

1. HOT WORKING CARBON TOOL STEEL

Working carbon tool steel when it is not in a plastic state causes internal fractures (dislocations at the grain boundaries) that will increase the chance that the steel will crack during hardening or during later use. Heat your work to above a cherry red (1420°F - transformation point A2 in fig.1 [this is also the point where steel becomes non magnetic]) but not above light yellow (approximately 2300°F) or you will be burning out the carbon in the steel.

Each time the piece is heated you lose some of the surface due to oxidation. Therefore shape the piece with as few heats as possible. Some types of heat (charcoal or coke fired) are less prone to burning out the carbon than others.

2. ANNEALING CARBON TOOL STEEL

After hot working, a piece may have developed enough internal stresses to cause problems when hardening. The piece should be given a heat treatment known as *annealing*. Annealing is softening the steel by heating the piece to above the A3 transformation point, holding the piece at that temperature till it is uniformly heated and then allowing it to cool slowly in the furnace or in a bucket of dry ashes, lime, fireclay, cement, etc.. This allows the carbon content to go into solution, then as it cools, new crystals can form without the stresses caused by working the steel. After the cooling is completed the piece may be cleaned up by removing surface oxidation scale, belt grinding & polishing to remove any surface scratches that may cause problems during hardening. Scratches may act as points of stress concentration that can cause cracking.

3. HARDENING CARBON TOOL STEEL

Hardening of the carbon tool steel is done by heating the piece to slightly above the A3 critical point (approximately 1800°F - orange heat; note: this temperature varies with the carbon content) and holding

It there till the whole piece is uniformly heated. It should be cooled rapidly (quenched) in the appropriate cooling media. In descending order of quickness in quenching -

- a) brine (10% salt)
- b) water
- c) oil

note: the temperatute of the quenching media can affect the rate of quenching.

If cooled too slowly the austenite will not all be transformed into martensite. However some steel types if cooled to quickly develop enough internal stress that they severely crack. Follow the steel manufacturer's heat treatment instructions. If you are uncertain of what steel type you have then heat a test piece and quench it in oil and check for hardness by testing it with a file : if the file can not bite into the steel then it is likely fully hardened, if it can bite into it easily then likely the quench was not quick enough and a water quench should have been used. How you quench it can be very important. Just putting the piece in the quench medium can cause uneven cooling. The medium can boil and the resulting bubbles act as insulation between the medium and the piece. The piece should therefore be quickly moved through the quenching medium in a figure eight pattern to reduce the chance of the bubbles insulating one part of the piece more than another part.

4. TEMPERING CARBON TOOL STEEL

Rarely is a piece used in the 'as quenched' state due to its extreme lack of toughness. Tempering, as mentioned previously , is a method of reducing some of the hardness and increasing the toughness of the piece. Fortunately the temperature range that is used in tempering can be correlated to the surface oxidation colours that occur when oxygen reacts with the polished surface of the heated steel. The tempering heat should be controllable enough that the heat is applied evenly and the correct tempering colour can be seen in time for you to remove the piece and quench it. Some times it is desirable to perform the tempering process a second time to ensure that a thorough tempering has been done (one surface of the piece will need to be polished again so that the new tempering colours may be seen) . Note it is not necessary to quench after tempering unless one portion of the piece has been over heated and its heat will travel to a thinner section and draw too much of the hardness away.

5. TOOL STEEL TYPES

Water Hardening Carbon Tool Steels

For wood cutting hand tools a plain carbon tool steel such as **W1** is adequate. It are available as water hardening (with a carbon content of between 0.6 to 1.4% carbon, depending upon the manufacturer) Good for tools that must hold an exceptional edge. The edge holding ability of the steel is closely related to the hardness and therefore to the carbon content.

Another water hardening carbon tool steel is **W2** (with a carbon content of between 0.6 to 1.4% carbon, depending upon the manufacturer; plus 0.25% vandium to increase its toughness).

Oil Hardening Carbon Tool Steels

A low alloy oil hardening tool steel such as **O1** (0.90% C, 0.50% chromium, 0.50% tungsten) is used as an alternative to W2 where shape presents heat-treating problems. It is easier to forge but will not harden to quite the same degree as W2.

There are many more types of steels

EFFECTS OF ALLOYING ELEMENTS

CARBON - is the main element responsible for the hardness and wear resistance of steel. The edge holding ability of a steel is closely related to its hardness and there fore the carbon content is of major importance for cutting tools:

- | | |
|--------------|------------------------------------|
| 0.0 - 0.25%C | low-carbon, machinery steels |
| 0.30 - 0.60% | medium-carbon, the forging grades |
| 0.60 - 1.40% | high-carbon spring and tool steels |

0.65 - 0.75%	machinery parts, hammers
0.75 - 0.90%	cold chisels, shear blades, rock drills smith's tools set hammers, swages, and flatteners.
0.90 - 1.10%	drills, milling tools, threading dies, cold striking dies, punches
1.10 - 1.40%	small cutters, drills, taps, wood-cutting tools, turning tools, razors.

Correct heat treatment (hardening & tempering) is required to take advantage of carbon tool steel's properties.

Because carbon as the major alloy does not allow great depth of hardness, other alloying elements are used to improve the tool steel's heat treating properties by a) increased hardenability, b) retention of fine grain structure, c) reducing softening during tempering.

VANDIUM - inhibits grain growth which produces a tougher steel

MOLYBENDIUM -inhibits grain growth, increases toughness, and increases hardenability.

CHROMIUM - increases hardenability, wear resistance and heat resistance.

NICKEL - improved toughness, increased hardenability, corrosion resistance.

These alloys and others may be used in many varying combinations and quantities for specific properties. Their heat treatment requirements may vary considerably therefore follow the manufacturer's recommendations.

SOURCES

Wilkinson Steel carries polished carbon drill rod in standard 3' lengths. The diameters available are 1/16 through 1" in 1/16" increments. Carbon content is 1.10%. Hardening 1440-1470°F. Tempering 210-570°F. Yielding a hardness in the Rc 55-65 range.

Recycled steel from industrial manufacturers, automotive parts can provide structural high carbon steel and alloy steel. Automotive leaf springs are AISI types 1085 to 1095 plain carbon spring steel. Files are typically 1.2 -1.4 % carbon.

Knife makers, according to Jack Andrews ("Edge of the Anvil"), find the following steels suitable for them:

- W2 (contains 0.25% vandium)
- F3 (special purpose carbon tungsten)
- O1 (0.90% carbon, 0.50% chromium, 0.50% tungsten)



The June 92 newsletter of the Blacksmith Guild of Central Maryland contained information that Dixie Gunworks (Gunpowder Lane, P.O. Box 130, Union City, TN 38261 - 800-238-6785 contains sketch books featuring period clothing, tools, utensils, etc. of the Revolutionary War which could be used as idea generators or to document the historical accuracy of your work. The same issue also reported on three of their members taking a Scout Troop to see the ironwork at the Washington National Cathedral. This cathedral contains one of the finest collections of ironwork in the U.S. and should be a 'must see' if you are in the Washington DC area. Ask one of the staff for a list of the work and its creator.

The Guild of Metalsmiths has published a 35 page, 8½"x11" book titled "Iron Menagerie" which has 175 detailed photos and explicit step-by-step procedures and tools required to forge 16 different animal heads. Order from Norm Larson Books, 5426 E. Hwy 246, Lompoc, CA 93436, credit card orders to 800-743-4766, for \$16.95 plus \$2.00 postage. I understand Centaur Forge will also carry this book.

HELP WANTED: Top flight, award-winning ornamental iron shop seeks experienced metal worker skilled in forging, layout and precise fabrication. If you're looking for challenging projects and an opportunity to grow with a company on the move, this is it. Salary and benefits based on experience. Call David Ponsler at Wonderland Products, Inc., P.O. Box 6074, Jacksonville, FL 32205 - 904-786-0144.

If you like to make various types of hooks, the May-June 1992 issue of the newsletter of the Alabama Forge Council is devoted to the subject with 13 different ones. Membership in AFC is \$15.00 to Alabama Forge Council, 176 Brentwood Lane, Madison, AL 35758. They always have a dandy, well-illustrated newsletter.

To continue his daughter's interested in blacksmithing, Casey McKenna, as related in the newsletter of the Inland Northwest Blacksmith Ass'n, made here a unit consisting of a down-sized treadle hammer which stands 58" tall with a 14" fall and 10-pound head, an anvil made from a length of RR track and included both on a work table along with a small legvice and other tooling.

WANTED: Wizard heads for collection. Contact Jimmy Hyde, 5094 Stagecoach Rd., Ellenwood, GA 30049 with a sketch and your asking price. The most unusual the better.

APPRENTICESHIP WANTED: Seeking a long-term apprenticeship with a Mastersmith of Architectural Iron. Am willing to relocate anywhere in the U.S. Cooperative and willing to abide by stipulations needed for this type of arrangement. Will provide a resume for interested parties on request. Contact Orlando Martinez, 520 Fountain, Ann Arbor, MI 48103 - 313-741-7192.

WANTED: 50-100 pound power hammer. Contact Ken Roby, 16665 West Park Circle Dr., Chagrin Falls, OH 44023.

From the Michigan Artist Blacksmith Ass'n comes word about Craig Shergold, a 7-year old boy suffering from terminal cancer. It is his ambition to be included in the Guinness Book of World Records for the largest number of business cards ever collected by one person. Please send to Craig Shergold, c/o Children's Make a Wish Foundation, 32 Perimeter Center East, Atlanta, GA 30346.

Allison's Wells School of Arts & Crafts, Inc., P.O. Box 950, Canton, MS 39046 - 601-859-5826 or 800-489-2787 is now accepting applications for tenancy, a unique opportunity to participate in their Artist' Incubator Program. This is a resident program designed to provide class work, intensive studio activity and exposure to other crafts to prepare an artist for full-time professional work in their area of concentration. For further information contact the school.

FOR SALE: Large Buffalo forge with chimney and handcranked blower. This unit has only been used a few times! Will consider trade on a 25 or 50 lb power hammer. Also have a nice Peter Wright anvil for sale. Contact Art Klopp, Tiffin, OH - 419-448-1858.

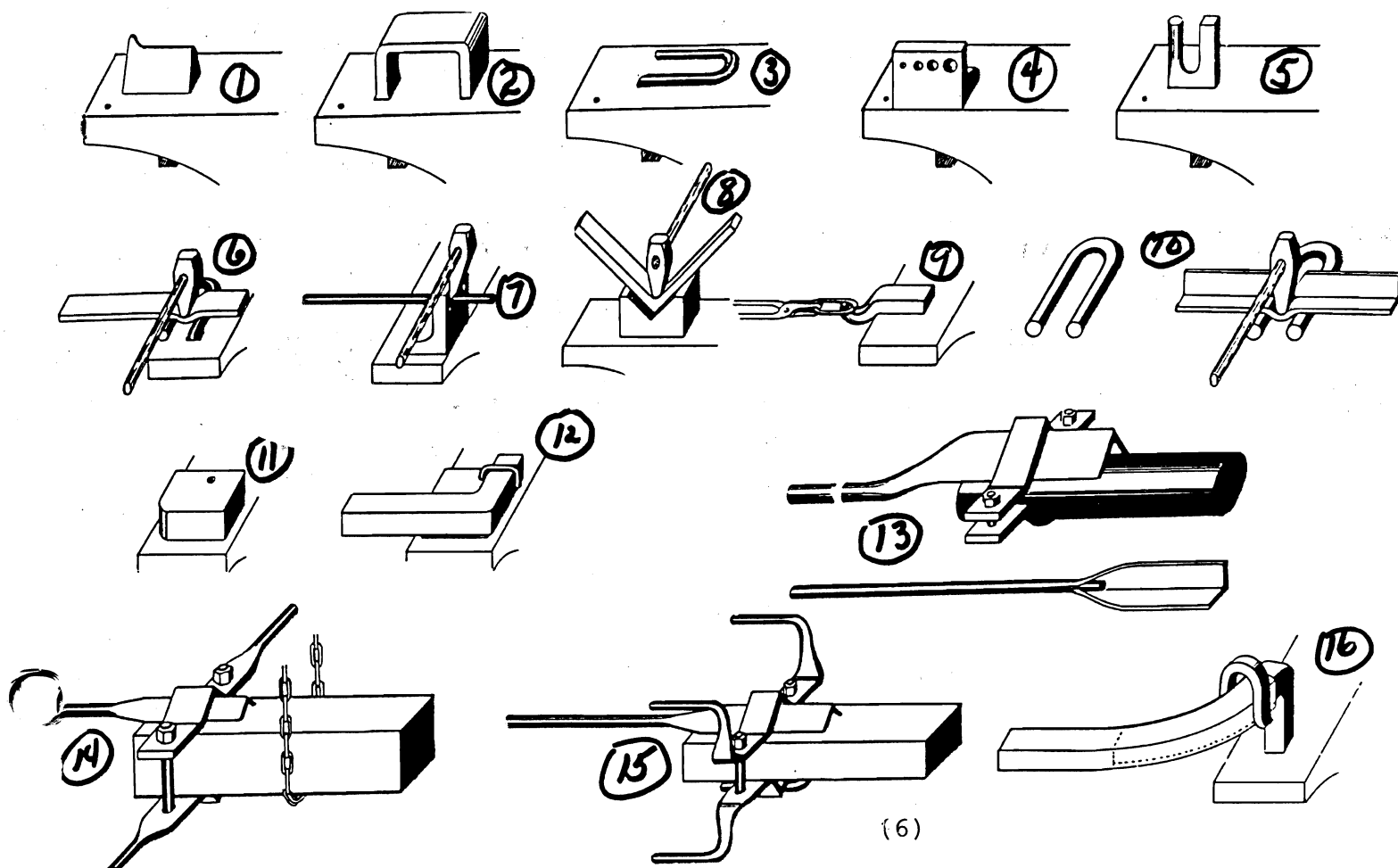
Caesar's Creek Pioneer Village near Waynesville, OH will host Old Machinery Days on August 14-16, 1992. A full weekend of events at a nominal fee (camping available on grounds). Contact Jim Hurst - 513-877-2765, Gene Bustle - 513-899-3008 or Bruce Lindemood - 513-897-5848. Literally something for everyone.

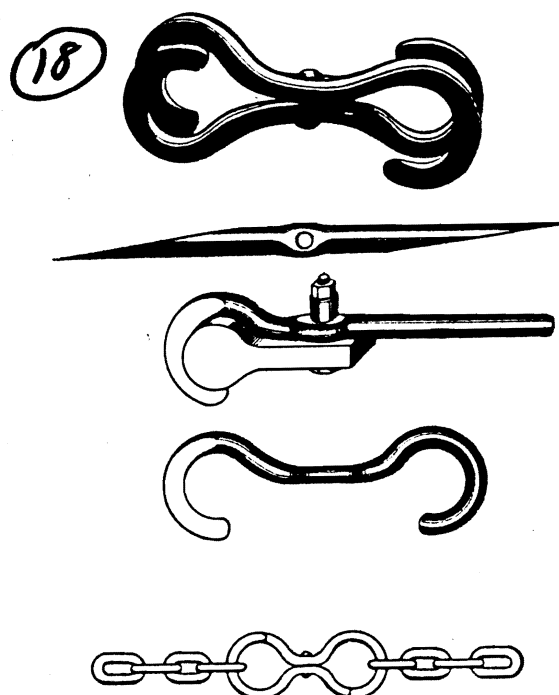
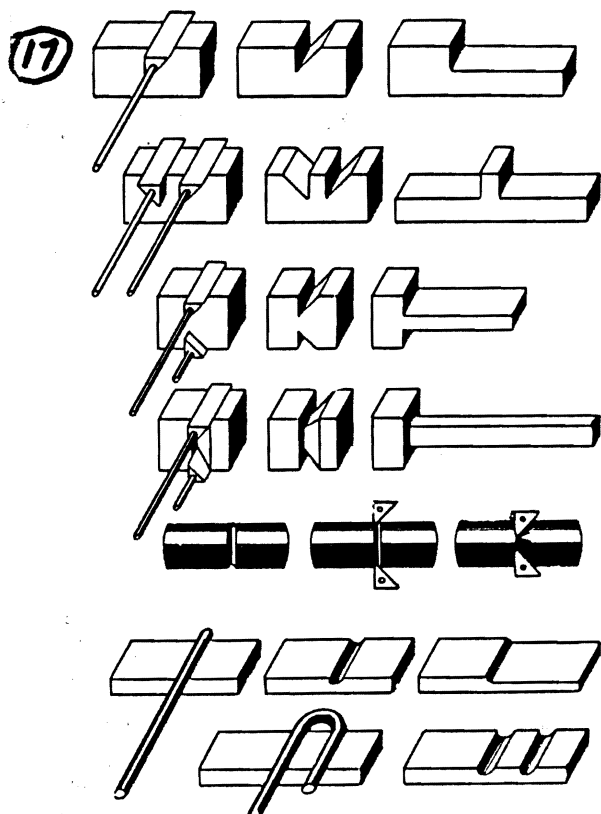
The Alabama Forge Council will hold their 1992 Blacksmith Conference & Workshop on September 11-13 at the Tannehill Historic State Park near Bessemer, AL. Demonstrators will be Doug Hendrickson, Chuck Patrick, Bob Patrick and Larry Wood. For further information contact Clay Spenser at 205-837-6996.

I was very pleased to hear Clay Spenser will be running for the ABANA board at the next election. He has done a bang up job for the Alabama chapter and would be an asset to the board.

BLACKSMITHING TOOLS AND TECHNIQUES: (SOF&A member Hunter Pilkinton of Waverly, TN kindly loaned me his copy of "Blacksmith's Manual Illustrated" by J. W. Lillico, published in England. The following correspond to a few of the illustrations. An excellent book on using powerhammer tools in particular!)

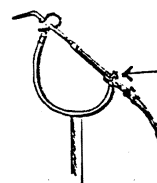
1. Bottom fuller with a stop forged on. This is to keep the forging from rolling off when fullering.
2. Tool known as a saddle for working in split or hard to reach areas.
3. Bending link (also see #10).
4. Cutting tool which is made to come flush with the side of the anvil. See #7.
5. Fork tool which is used for bending.
6. Method of bending a bar at right angles by using a bending link.
7. Method of using the curring tool to cut off stock.
8. One method of using a V-swage with a fuller to shape square corners.
9. Method of welding a link by using a link tool.
10. Bending link used to bend an angle bar at right angles.
- 11 & 12. Block used to bend small angle bars by gripping the bar at one end and pulling it around, at the same time hammering it on top to avoid puckering.
13. Portabar which is clamped to a forging. To make a portabar weld a piece of angle bar to a round bar as shown.
14. Pair of handles which act as a pair of clamps to clamp the partabar when forging. In this case the striker acts in conjunction with the smith, by putting his weight on the portabar to enable the smith to turn the forging as required.
15. Another design of handles.
16. Method of bending small angle bars. Supposing the angle bar to be bend is 2"x2", take a bar of 2" square and bend it to the same radius which is required on the angle bar, then bend one end to fit the hole in the anvil as shown. When the angle bar is hot, grip the end as shown and pull it against the 2" square bar.
17. Miscellaneous examples forged work in different stages using side steps.
18. Double "S" link used to quickly join and unjoin chains.





BLACKSMITHING TIPS AND TECHNIQUES: The following were, for the most part, paraphrased from other ABANA Chapter newsletter. While the information presented herein, and elsewhere in this newsletter, is believed to be accurate, neither SOF&A nor ABANA assume any responsibility for the accuracy, fitness, proper design, safety or safe use of any information, technique, material, tool design, use, etc. USE IS SOLELY AT THE USER'S OWN RISK!!!

- **OXY/ACE TORCH HOLDER:** This holder used by Roy Plumlee, as described in the newsletter of the Illinois Valley Blacksmith Ass'n, allows him to put the torch out of his way when he is twerking a gate, grill, etc., yet keep it handy. When the arrow is pointing he added a broom handle wall clip (available in most hardware stores) which keeps the torch in place.



- **BRAZING BANDSAW BLADES:** Hunter Pilkinton of Wavery, TN uses this jig to solder two ends of bandsaw blades together. The old door hinge is held in the vice by the leg, the ends mated in the cut out square, the two sides held tight with clamps and then soldered. He emphasized the two ends should be precisely tapered and clean.



- **FINISH COATING:** When laminating, layering or appliqueing pieces which will be subject to weather (outside), always prime the inside surface thoroughly. A good example is a railing with a flat bar capped with half round or half oval. If a painted finish is desired, I prime the inside surfaces with two coats of latex metal primer. If natural finish is desired, I use two coats of Valoil #30 Sealer. If possible put the pieces together when the primer is still tacky, it will really seal the inside against corrosion. So often one sees this type of rail where water has gotten in between and the ensuing rust has separated the pieces. One can NEVER get at those inside surfaces again, so do it right. (By Francis Whitaker from the newsletter of the Blacksmiths Ass'n of Missouri).

ABANA

Artist-Blacksmiths' Association of North America



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PRESIDENT'S MESSAGE August 1992

Dear ABANA Chapters,

We are well into a great summer season. There are plenty of chapter activities going on around the country right now, and some being planned for the Fall. Likewise, the ABANA Board continues its planning as well. You know from all you have read and heard that ABANA is growing, and getting stronger. You have seen a few results from ABANA's growth in the last couple of years, and we have much more to look forward to. We would appear to be better off than we have ever been. That can only be considered good news for all of us. Thanks to those whom you have sent to the Board, we are in a position to do more for our membership. I bring the subject of ABANA Board projects up at this time because we are now putting plans together for 1993, partially based on input we received from you in the form of Surveys and Chapter calls.

You know from recent Chapter calls that the ABANA Board is exploring and improving several areas. The ABANA Library Committee is working on improvements in the Library. Some of these improvements are due to help from some very talented folks from Chapters around the country. Insurance for Chapters has been a topic that has come up on numerous occasions, and we are still exploring our options there. We are adding a booklet called *The Blacksmiths Resource Register* to the ABANA Office that will list the names and specialties of ABANA members all around the country. (To be included in the register, contact the ABANA Office.) We have added new sales items including ABANA T-shirts and the MacFarlane Pattern Book. There are other ideas and plans in the works I don't have room to detail, but you get the idea. We are committed to continuous improvement of everything we do, along with exploring new areas and ideas.

In another month or so, you will have the opportunity to vote for new ABANA Board members. Several ABANA Board members will be leaving the Board this term. They have all done outstanding jobs, and exactly who is leaving will be detailed next month. It will be necessary to realign responsibilities in order to cover the work they're leaving behind. The decisions you make will help to shape ABANA's future. There is a lot at stake, we need you to stay involved. We need you to vote.

Most of you know I am a safety nut, so I won't pass up the opportunity to throw out this reminder: many of you will be explaining the art and craft to new members this Summer and Fall -- don't forget to make safe working habits a high priority item as you speak to, and demonstrate for them. I know we all have been doing a pretty fair job of it; reports of serious accidents are few and far between. Still, we can't afford to let our guard for a moment, because that's all the time it takes to change a life forever. Hopefully, the safe working habits learned from you by members of your chapter will be spread by them to others who are learning. What a nice arrangement!

Until next time,

Clayton Carr
ABANA President

(From the newsletter of the New England Blacksmiths')

1/2" x 1-1/2"

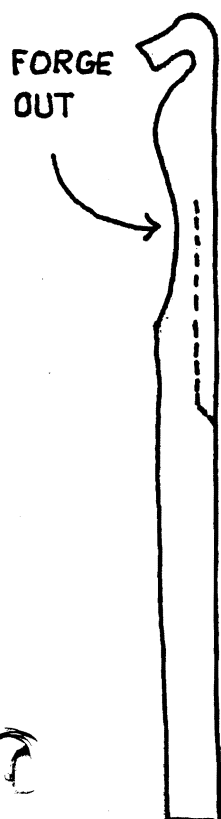
UPSET

PUNCH 3/8" HOLE
AND CHISEL OUT
STOCK

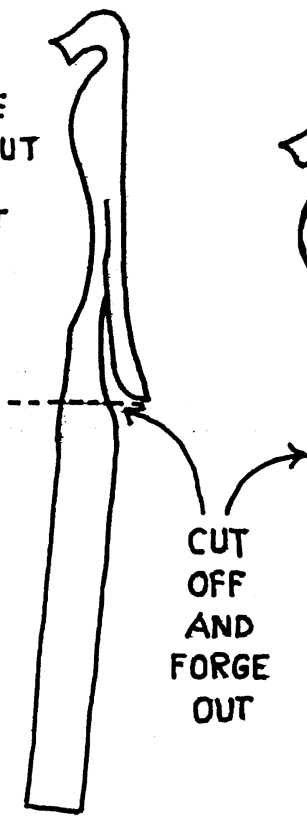
CUT OFF

HAMMER DOWN

ROUND UP WITH
HAMMER



SCORE
FOR CUT
&
CUT



BEND OUT
AND SHAPE
BACK

FORGE
TAIL TO
TAPER

DEFINE WITH
CHISEL
CUTS

TWIST

WRAP
TAIL



DAVID COURT
11/91

FRANCIS WHITAKER'S SEA HORSE

Finishes and Patinas

by Nana Schowalter

Part two -

A report on Interpretive Sculpture Class and copper working techniques.

Part one of this article appeared in the previous UMBA newsletter. It is an account of a class taken at the John C. Campbell Folk School in Brasstown, NC. In this half of my report I will cover patinas for copper in blues and greens, as well as some silver brazing techniques. Please heed all aforementioned safety guidelines.

Basic metal preparation techniques were covered in the first half of this article, so please refer to it for clarification. The application of blue and green patinas can be done using both a cold and hot method. As mentioned in the previous article, a black patina offers a base for these two colors and results in a richer shade. However, the colors can be reached using a clean piece of copper as well.

I will start with the cold method. The cold patina solution is available premixed from RIO GRANDE and is applied by immersion or by brush. I recommend trying several small pieces and taking note of how you achieve each shade. The work is simply immersed in the solution for a second or two and hung to damp dry. When the

(For Part #1, see the June/July 92 issue)

surface is no longer shiny wet, immerse again. Continue this process until the desired color is reached. The chemical ingredient in this patina is ammonium hydroxide, and colors range from blue to velvet green.

The hot method of applying a velvet green is to first prepare the piece by either cleaning in Sparex or by liver of sulfur bath. The black base will result in a richer shade of green. Granules of cupric nitrate should be dissolved in a small amount of water. Try about one tablespoon granules to one cup water. I generally set a good sized sheet of roofing copper over some fire bricks as a work surface for small pieces. It helps to catch the drips. For larger pieces, weather vanes or sculptures, just protect the floor with newspaper. Please heed safety guidelines when using hot patinas. VENTILATE.

With the torch in one hand and the patina brush in the other, slowly heat the work. Test the temperature of the surface by touching the brush to it at regular intervals. You have reached the right temperature when the liquid slowly turns to steam when applied. If the surface is overheated the result will be green with black specks. The degree of color is increased by continuous reapplication of the chemical.

For the first attempts at patination I suggest that the

pieces of copper are not precious to you. Simply cut out some circles or other shapes and develop dexterity and color consistency. When you feel a little more in control then try the techniques on more important pieces. Any number of objects can be patinated, with a variety of raising, forming or repousse-techniques applied to the piece before coloring. Remember that hot patinas will anneal the work and leave it quite soft, so if stiffness and strength are a consideration think it through first. Using patinated copper as an accent to forged ironwork offers many possibilities in design. Imagine a window grill with red and green copper leaves or a glass topped table with red and yellow accent elements. Table top sized copper weathervanes are good exercises in basic copper working techniques and patinas. It's always a good idea to take notes on how you achieve a particular effect so it can be duplicated in the future.

So much for copper patinas in the weekend workshop. In one day I learned how to get black, white, yellow, orange, red, purple, green and blue. That alone was worth driving 750 miles. This is really only the beginning. There are many books available on the patination process and an infinite numbers of colors attainable. Again, consult your library, the RIO GRANDE catalogue, or

Centaur Forge.

Silver brazing of copper is most commonly considered a means of connecting pieces together. It can also serve as another way to color a piece. The silver solder can be melted over a surface resulting in a shiny reflective finish.

SILVER - First clean the copper in Sparex. Then coat both sides with a mixture of Borax and silver solder flux. This is described under RED. Set the work on pumice gravel and heat slowly and in a circular motion at a distance of about 10". First circle around the work then apply heat directly to the work. Watch the flux bubble turn white, then clear. Then slowly touch the work with a strand of silver solder, testing for enough heat to melt it. The heat of the copper should cause the solder to melt, not the flame of the torch. When it begins to melt, continue to add solder until desired surface area is covered. Hold the flame to the area a bit longer to allow for the even flow of the silver.

If a limited area is to be covered in silver the remaining background copper will have turned red or a variety of colors. If you wish to keep this coloration then soak the work in hot soapy water for ten minutes to remove residual flux. If you wish to return the copper to its original bright finish then soak it in Sparex for 5 minutes, and rinse. To bring the silver and

copper up to a very bright shine, buff on a wheel with buffing compound.

A variation of this technique can be had by laminating two pieces of copper. The base piece will become silver, and the raised piece will be shiny copper. Cut out the work to the desired shape. Clean both pieces in Sparex. Flux both sides of base and the bottom of the raised piece. Set the work in the desired position. Heat the work as described earlier. When the flux becomes clear begin to apply silver solder. If necessary, briefly hold down the raised piece until it adheres to the base piece. Continue melting the silver onto the base piece until it is covered. Hold the heat on the work a bit longer to allow the silver to flow evenly. Soak the work in Sparex for 5 minutes and polish.

Basic silver brazing techniques are fairly simple and serve to connect two or more surfaces to each other. In class we brazed a variety of shapes together which required a certain amount of jiggling and clamping. The technique involves cleaning the work to be brazed in Sparex or with steel wool. Selectively apply flux to the areas where the connection is to take place. Place the work on pumice if small or position and clamp in proper alignment if the work is larger. Apply heat to a large area first, then circle in to the joint area. Watch for the stages of

flux mentioned earlier, and when clear, begin to apply silver solder sparingly. Capillary action will allow the solder to travel quite fast and you may have a joint before you realize it.

Brazing is done at a much higher temperature than soldering, and will discolor the copper. Brazed surfaces can be cleaned by using Sparex or steel wool, or by sandblasting. The advantage of silver brazing is that the joint is far stronger than the parent metal. When an object has been silver brazed the application of hot patinas will not necessarily affect the joints. A soldered object may fall apart with the use of hot patinas because the melting point of solder is much lower.

In conclusion I would like to stress that many blacksmithing techniques of forging can be applied to copper work. The added advantage of patination of the finished piece allows for a wide range of possibilities in designing iron and copper work. Understanding a variety of skills allows for expanded opportunities in object making, be they functional or sculptural. So much to learn, and life so short!

Thank-you, members of UMBA for subsidizing this educational experience in the Smoky Mountains.

Sincerely,
Nana Schowalter

ATTENTION MINATURE ANVIL COLLECTORS: Ron Porter, a collector of miniature anvils, would like to set up a display area at Quad-State 1992 and possibly do some trading. If you are interested in participating, please give Ron a call at 317-689-8450. We will try to make display space available.

FORGE

Vancouver Island Blacksmith's Association



Dedicated to the king of Crafts

Vol. 6, No. 4 April 1992

Story over page



JOHN GANTON in Arizona

There aren't too many people that want to take a blacksmith shop with them on their winter vacation in Arizona, but I've met a lot of people that say, "I'd like to do some blacksmithing but I don't have any room for a shop." I've been very pleased how well my portable shop has worked out and anyone with a corner of a garage for storage can be a blacksmith.

It takes me about five minutes to set up the propane forge and in the next five minutes while the forge is reaching working temperature I have the rest of the shop set up.

The key to a portable shop is the propane forge. The fuel is readily available; the forge is light weight; and most important of all, there is no smoke. I worked next to my landlord's white wall. My forge used an eleven inch length of eight inch diameter thin wall tubing lined with one inch of Kaowool and a smear of "Ceriset". My scrap pile yielded a forge stand using a slightly bent step-stool and the door off a metal cabinet. I bought an atmospheric propane burner so I could be independent of electric power but I don't like it as well as the "conventional" burners we've been making using an electric blower.

The pictures show how I combined

a four inch leg vice and its stand with a twenty pound block of steel that just drops into a socket. This 'anvil' was adequate for light work but a block thirty or thirty five pounds would be less restrictive. The block just lifts out of its socket so it can be moved separately from the vice and stand. The vice makes the best "third hand" I've ever used and only occasionally is it in the way of work on the anvil.

For small tools I brought: a 3 pound cross pein, a 2 pound cross pein and a one pound ball pein; five pair of tongs; a hardy; a bending fork made from an old wrench; two spring cutters; a hack saw; a tool roll of small tools used mainly for animal heads; and a hot set.

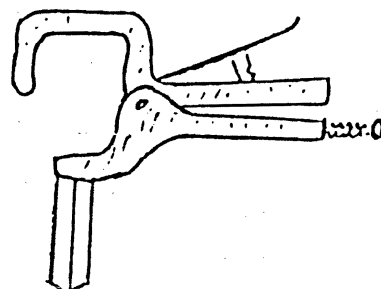
I was amazed how much I could do with this simple shop. I missed my power hack saw more than my 224 pound anvil. With light weight equipment there are no restrictions on the type of work you can do but there are limitations on the size of stock you can cope with. I was using three quarter inch square stock for animal heads and I would have been better off with a heavier anvil.

John Ganton



- **TEMPERING KNIVE BLADES:** I forge, grind and finish a blade of W2 steel or Damascus to a complete finish. The blade is all but sharpened, and is about 1/32" or thereabouts thick at the cutting edge at the time of heat treating. A nitrite/nitrate salt is melted in a stainless pipe placed in a furnace. When the solution reaches 1500°F, I lower the blade into the solution. In one or two minutes the blade reaches temperature evenly, not overheated, nor underheated, and with no thermal shock. The blade is withdrawn and quenched into another salt bath at 400°F. When the solution has cooled back down to 400°F, the blade is withdrawn and allowed to cool to under 175°F in still air in the shop. What is achieved is a super fine grain structure, several points higher on the Rockwell scale of hardness, yet it is tougher, not more brittle. When tempered, the steel can be left at a higher Rockwell hardness, yet be substantially tougher because the blade is essentially stress free. As significant to me is that the blade is not scaled in the process at all!!! Decarburization is reduced from .010 to .0010 per inch. The surface is unaffected visually. (By John Smith from the newsletter of the Illinois Valley Blacksmith Ass'n).

- **HOLDDOWN TOOL:** Starting with an 11-R Vise Grip Welding Clamp, first cut off the jaw on the side where the adjusting screw is located. Next take a piece of stock the size of your hardy hole (about 4-6" long) and weld the stock to the cut off jaw. This hardy holddown is simple and quick to make but works great! (By Mike Shaffer from the newsletter of the Tullie Smith House Blacksmith Guild).



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