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THE ANVIL'S RING

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Beginnings

by Albert Anderson, Editor

It is with a great deal of anticipation and excitement that I assume the position of editor of The Anvil’s Ring. As an ABANA member for a number of years and a co-founder of the Pennsylvania Artist-Blacksmiths’ Association, I have come to hold enormous respect for the ABANA organization: its purposes, its members’ accomplishments and its journal. It has been a source of much knowledge, inspiration and entertainment as well as many friendships. I commence these editorial duties with the realization that they play an important role in the continuance of a strong and lively professional association.

The editorial offices are now located at the Pennsylvania State University. The staff is composed of managing editor, Nancy Lego, assistant editors, Cathy Cunningham and Glynnis Johns, and myself. The mailing address is 268 Chambers Building, University Park, PA 16802. Our phone number is (814) 865-6570. The office is open 8:00 a.m. to 5:00 p.m. on weekdays. We hope to be hearing from many of you in the months ahead and invite submissions of articles and photographs for publication in these pages.

Robert and Kathleen Owings were very helpful during the transition and their generosity in helping smooth the way to this first issue is much appreciated. Michael Bondi also gave a great deal of time and energy in orienting me to what seemed at times like a monumental number of unfamiliar materials and procedures. Other members of the ABANA Board including Mark Smith, Leonard Masters, Joe Pehoski, Clayton Carr, and Bill Callaway demonstrated unfailing knowledge, patience, and courtesy in answering my many questions over the phone and in supplying materials for this issue. Janelle Gilbert was also a wonderful help and an always cheerful telephone presence when everything seemed to be hopelessly confusing. Thank you all!

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Moving into the 90's

BY DOROTHY STEIGLER, ABANA PRESIDENT

Dear friends. Here we are, moving into the 90's! There was a short time, not too long ago, when we all wondered if we would make it. Take a look at the 1990 budget in the last issue. You will see that ABANA is doing very well once again.

We are in the process of selecting a replacement Board member for the position vacated by Ham Hammond. Ham resigned as of January 1 because of a great many projects at home and in order to spend more time with his family. Since each Board member is asked to carry the burden of many responsibilities, we will choose Ham's replacement with care. I will let you know who the Board selected when the ballots are counted.

By this time you should have received your conference registration packet. There is a substantial reduction in registration fees for those who pre-register so return your registration early, if you haven't yet done so. ABANA Board conference committee chairman, Mike Bondi, is putting auction plans into motion with a challenge to each chapter to submit a project designed and executed by its members. There are already some very fine projects in the making so this year's auction should prove to be very exciting. If your chapter wishes to participate, please contact Mike at 1818 Shorey Street, Oak-land, CA 94607.

ABANA has selected Alan Flashing of Dallas, Texas to photograph the exhibition and other events at the conference. Alan ably covered the Cardiff conference and we can expect the same in New York.

I want to thank Robert and Kathleen Owings, retiring editors of The Anvil's Ring, for their hard work. They are both going to enjoy the extra time together now that they have turned the reins of the journal over to Albert Anderson beginning with this issue. Please show your support for the new editor by submitting your articles, photographs, and comments to him at 268 Chambers Building, University Park, PA 16802.

I wish you a wonderful spring and hope to see you at Alfred.

---

Regional News Items Wanted

The regional editors of The Anvil's Ring need news items from ABANA members in their respective regions for the preparation of regional reports to be published quarterly in these pages. Items should be of general interest to the readership and consist of blacksmithing related news such as exhibitions, awards, grants or fellowships, conferences or symposia, major commissions, business ventures, publications, travel, and other members' activities. No item is too small to be considered. We want to know what you are doing!

If in doubt about who your regional editor is, select the one nearest to you. If your region is not represented, contact The Anvil's Ring editor with your nominations. Nominees should be able to write well and have a good knowledge of professional activities in the area to be represented. Regions currently without an editor are: the Lower Midwest, the Northwest and the Far West.

The following individuals are ready to receive your contributions:

MIDDLE ATLANTIC
Daniel Perry
3320 Olyphant Avenue
Scranton, PA 18509

CANADA
Rory MacKay
R.R. #3
Gananoque, ON K7G 2V5
Canada

UPPER MIDWEST
Bob Walsh
Route #1, Box 83
Stockholm, WI 54769

NEW ENGLAND
David Court
Bay Hill Road
Northfield, NH 03276

SOUTHEAST
Catherine Morgan
Route 6, Box 6219
Clarkeville, GA 30523

SOUTHWEST
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121 H Street
Petaluma, CA 94952
(707) 778-8261
Publishing Opportunity

We would like to consider publishing the products of your members in an upcoming issue of the Iowa Architect magazine. This is the professional journal of the Iowa Chapter of the American Institute of Architects, issued bimonthly in an eight state central midwest region. We feature products and furniture on the leading edge of design. Our circulation is over 5,000.

As a member of the Editorial Board, my tasks involve presenting products through two articles; “Different By Design” and “Design Digest.” “Different By Design” is produced in either color or black and white. Featured are well designed products of any kind from any field that may interest our readers. Needed for publication are 4” x 5” color transparencies or 35mm color slides and 8” x 10” black and white glossies. The use of color is determined by the editors so it is essential we have both formats.

“Design Digest” is produced in black and white only. Products typically featured are those which are interesting to interior designers. Black and white glossies in an 8” x 10” format are needed for publication.

Only quality products which are represented by high quality photographs will be considered for publication. Product information including the designer’s name, product cost and source of availability is also required.

Photographs and information should be directed to:

Steven C. Low
700 Hubbell Building
Des Moines, IA 50309

If there are additional questions about the products featured or the information required, please call (515) 244-7167.

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Des Moines, IA

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See “Calendar” section of magazine for schedule of exhibitions.
Fantastic!

Your cover photo of the clock jack is fantastic. Keep up the good work!

IKE BAY
Portland, OR

Ed. - Robert Owings gets the credit for using it; we'll try to keep up his good work.

Tale of the Dragon

Perched here on a hundred pounds of cold steel
waiting for a shot of spiritual adrenaline from some cosmic outpost;
Conspiring how to escape from the really real
and catch a glimpse of that dusty ghost
whose scars and burns only God can heal.

Is there a place where yellow iron is cool to touch
and sweat turns to beer,
Where scale is light as feathers
and rust only forms in your ear?

The lines in the steel tell you nought,
but all of the hours you fought the smoke and fumes.

The edge, the edge is where the truth be known,
the skill of the maker be shown
Free of cracks and pits that give us fits
and forged to within a shadow of a smile forming on a warrior's lips.

ED SMALL
Keyser, WV

Information Wanted

I am looking for contacts with Canadian craftsmen for cultural and informational exchanges. It is imperative that correspondents write in Italian. My address is Ferri Battuti, Sottoguda - Marmolada, 32020 Rocca Pietore (BL) Italia.

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An Invitation

BY CHARLES ORLANDO

The Artist-Blacksmiths’ Association of North America invites you to join fellow blacksmiths from around the world at their 1990 conference to be held at Alfred State College in Alfred, New York from June 27 to July 1, 1990.

The theme of the conference is “Old Traditions-New Dimensions” and our selection of demonstrators and lecturers on blacksmithing, and all the areas related to the craft, will reflect that theme. Of course there will be many presenters who work in the style and manner of earlier centuries, but there are also many who reflect new and different approaches to working metals. Contemporary business practices and working procedures will also be featured with care taken to integrate the old with the new. We are sure that there is something for everyone, from the hobbyist smith who works in garage or basement to the professional who makes his or her living from blacksmithing and metalwork.

A special teaching station will be established with four shop setups. Experienced smiths, who are recognized as excellent teachers, will respond to the requests of participants by demonstrating requested skills and procedures. They will then allow the learners to try the procedure under supervision. In this way, the conference can have direct practical application.

The exhibition, which will be held in the gallery at Alfred University, will be full of exciting and interesting works submitted by our members. Blade-
Alfred State College, site of the 1990 ABANA Conference.

Smiths, sculptors, and craftsmen in metals other than iron will be represented.

Included in the program are opportunities for family members to be involved in crafts and recreational activities so that this event can be a family vacation as well as a productive working conference, all at a price you can afford. Swimming, crafts, bowling, demonstrations, and many sightseeing locations are within an easy day's drive. Have your family come with you to share in the excitement.

ABANA's membership has been growing over the past year. For many, this will be the first conference, but for others, it will be the latest in a number of such events. There is something exciting planned for everyone. We have planned an extraordinary event which will exceed your expectations.

The whole campus will be devoted to the ABANA conference, providing a location where you can enjoy the camaraderie of like-minded people in a stimulating atmosphere. Come join us at Alfred State College.

Charles Orlando is Chairman of the 1990 ABANA Conference and Vice-President of the New York State Designer Blacksmiths.
ABANA 1990 Conference Demonstrators

Many talented demonstrators will be at the conference to share their knowledge. They include such notable individuals as

Clare Yellin  
George Dixon  
Charles Normandale  
Jack Andrews  
Cathy Morgan  
Mitch FitzGibbon  
Bob Becker  
Bob Griffith  
Clay Spencer  
Mathias Peters  
Joel Schwartz  
David Norris  
Lynton McKenzie  
Tom Latane  
Peter Cassidy  
Simone Benetton

Randy McDaniel  
Ray Nager  
Leonard Urso  
Glenn Gilmore  
Richard Wattenmaker  
Tom Joyce  
Bill Senseney  
Serge Marechal  
Ed Grove  
Philip Baldwin and Dan Maragni  
Jean Wiatt of the LCM Corporation  
and  
Peter Ross and the Colonial Williamsburg blacksmiths

Don’t miss out on the opportunity to experience all this talent at one time and location. For registration materials, if you haven’t already received them, or additional information about the conference, contact Charles Orlando, P.O. Box 37, Belmont, NY 14813, (716) 268-7383, or Karen Canne, ACES Central Dining Hall, Alfred State College, Alfred, NY 14802, (607) 587-4348.
Business Program Highlights

Among the many fine business oriented programs scheduled for the conference are two which are titled “Presentation” and “Case Studies.” The “Presentation” seminar will consist of ways members can present themselves and their work effectively through business cards, stationery, photos, slides, drawings, portfolios and videos. In order to make this a helpful session, conferees are encouraged to participate by bringing along those things they now use to present themselves and their ideas.

The second seminar, “Case Studies,” will be a forum for members to present a single recent commission from first contact through design, negotiation, fabrication, installation, and review. These presentations will answer questions such as: Why did the client contact and choose you? What were the design considerations and solutions? How did the negotiations proceed for design, time schedule, pricing, and payment? How did you build the work? What installation problems were encountered? What did you learn from the job? It should be emphasized that the case studies need not be limited to large jobs.

There will be a strict 20 minute time limit for each presentation plus eight minutes for questions from the audience. A schedule will be posted so that everyone will be able to choose which presentations they wish to attend and work them into their busy conference schedules.

If you wish to make a presentation or have questions related to either program, contact Paul Lundquist, Business Programs Chairperson at 382 White Oak Creek Road, Burnsville, NC 28714, (704) 675-5258.

Auction Donations Requested

An auction will be held on Saturday evening June 30. Donations of items for the auction and for the daily “Iron in the Hat” drawings will be gratefully accepted. They need not be restricted to iron work but could include items such as other craft objects, books or prints. Send donations to:

Charles Orlando,
P.O. Box 37, Ackerman Hill Road,
Belmont, New York 14813.

Items will also be accepted at the conference prior to the auction. If they are hand carried to the conference, contact James Robarr at the conference site upon arrival.

Paley Studio Tour Highlights

A tour of Albert Paley’s studio in Rochester is planned for Wednesday, June 27, as a special pre-conference event. The tour will include Paley’s original shop where the Renwick Gates were built and in which he was located for 14 years. Most of the forge work and sand blasting is done in this location. The equipment includes a Nazel 2B, forges, and his heavy duty twisting machine which will be used in a demonstration.

The tour will then move to the new studio located in a landmark building in old Rochester where there will be a demonstration on finishing techniques. This is the fabrication shop where light forging, welding, and finishing operations are performed. A 120 ton ram and a high capacity air compressor, used for the operation of large air grinders and air clamps, are located here. It is also the site of Paley’s office and a gallery where some of his sculpture and photographs of his other work are on display. The bus ride between the two shop areas will include a drive past some of Paley’s work around the city of Rochester.

All participants in the tour should bring eye and hearing protectors which will also be required at the conference at demonstrations and teaching sites.

There is a limit of 80 participants for the tour and pre-registration is required. See the conference registration packet for additional details including departure time and cost.
Volunteers Still Needed

We are still in need of volunteers to assist with the conference beginning Monday, June 25, and ending Monday, July 2, 1990. You may camp on land owned by local blacksmiths or stay in the Alfred College dormitories. Lodging and meals will be provided for those who work setting up on Monday, Tuesday, and Wednesday and cleaning up on Sunday and Monday after the conference.

If you wish to volunteer, contact Bruce Byington, 5221 Gulick Road, Honeoye, NY 14471, (716) 229-2232. We will mail your assignment to you before you leave home for the conference. If you are unable to make a commitment to help at the present time, you may come to the volunteer desk at any time during the conference to see if there is need of your assistance. Thank you for your help in making the 1990 conference a success.

ABANA General Membership Meeting

Will be held Friday, June 29th from 4:30 p.m. to 5:30 p.m. at the 1990 conference on the campus of Alfred State College.

Agenda:
1. Reading of the minutes
2. Reports of standing committees
3. Reports of select committees
4. Unfinished business
5. New business
6. Adjourn

All members are encouraged to attend and participate.
Work By Conference Demonstrators

Charles
Normandale,
England.
Pool gate, 2.0 m h.
x 1.05 m w. Mild steel.
Peter Cassidy,
Rowley, MA.
Iron and bronze handrails made by Cassidy Bros.
Forge Inc. for the Bonwit Teller Department Store, Boston, MA.

Photo: Kevin Salemme.
Charles
Normandale,
England.
Well grill, 0.80 m
square. Forged
mild steel.
Charles
Normandale,
England.
Main entrance
gates to Cranleigh
School, Cranleigh,
Surrey, 3.1 m h. x
5.2 m w.
Forged mild and
stainless steel.
Robert Griffith,
Montrose, PA.
Untitled vessel,
6'2" h. x 38" w.
x 24" d. Mild
steel and bronze,
paint and gold
leaf. Forged and
fabricated.

Photo by:
Ward V. Roe.
Very Large Forgings

PART I

BY WALLACE M. YATER

Few people today realize that long before the industrial revolution and the development of steam power, very large forgings weighing hundreds and sometimes thousands of pounds were made using hand methods. Conceptually, the production of these forgings was a simple outgrowth of the way iron itself was produced by the direct reduction "bloomery" process. In this process, a clinkery looking bloom or mass of partially welded iron droplets, slag, and bits of unburned charcoal accumulated at the bottom of the smelting furnace.

The mass was consolidated by gentle hammering at a welding heat and, when dense enough to stay together, by a sequence of several to ten or more operations involving folding, welding and drawing out to expel most of the non-iron impurities. This produced the first true wrought iron containing very low carbon, on the order of .03 percent, with streaks of slag visible to the naked eye running throughout. The slag acted as a very good welding flux and rust inhibitor.

After the folding and welding consolidation, a number of these wrought iron blooms were "laid up" together or in succession at a welding heat to produce an iron mass of any size desired. The only limit to size was what could be handled, hammered and brought to a welding heat in the largest reducing fire that could be managed and sustained for a sufficient length of time.

At no stage of its manufacture was the wrought iron ever a molten liquid. Because of this, slag, various inclusions, and oxidized non-sticking portions of welds were difficult to eliminate by further folding and welding. The quality of the finished product, then, depended to a large extent on the skill, care, and effort of the smith.

Old examples of handmade wrought iron are extremely variable. Many, which were laid up by welding together a number of blooms, contain voids and some were barely adequate to do the job for which they were intended. However, even though much of the old wrought iron may be poor by today's standards, in the context of the time and place of manufacture and the comparative development of other materials and technologies, it represents a truly remarkable achievement.

After the fall of Troy, around 1260 B.C., and before the reinvention of writing in Greece, about 700 B.C., populations died back and the associated collapse of long distance trade made tin and copper no longer available for bronze production. During this time, at some now unknown place in southeastern Europe or western Asia, the bloomery iron making process was discovered and perfected, resulting in a metal both more useful and cheaper than bronze. With the advantage of requiring only the raw materials of iron ore, wood for charcoal, and clay for furnaces and tuyeres, which could be gathered locally in many places, the process spread in fewer than a thousand years to all parts of the Old World; from England to Japan, and from China and India to sub-Saharan Africa. So revolutionary was this development and so greatly did it affect all other aspects of life, that we today call it the Iron Age.

Extensive slag heaps testify to the enormous increase in iron production associated with the rise of the Roman Empire. A number of multi-bloom beams up to six feet long, 50 to 110 pound anvils, anchors up to 1,000 pounds, pile shoes, and other large iron objects survive from archaeological sites. One of the most interesting of these is a 344 pound mass of blooms found near the town of Corbridge, England during the first decade of this century. During the second, third, and fourth centuries A.D., this was the site of Corstopitum, a Roman garrison and supply depot just south of the northern frontier at Hadrian's Wall. What makes this piece of iron so unique is that it was found unfinished in its original position in the remains of the very furnace used to

"... even though much of the old wrought iron may be poor by today's standards, in the context of the time and place of manufacture and the comparative development of other materials and technologies, it represents a truly remarkable achievement."

SPRING 1990

THE ANVIL'S RING 17
Figure 1. Outer rusted surface and sawed section of Roman iron bloom from Corstopitum.
Figure 2.
Two halves of Corstopitum iron bloom with welds and folds sketched in.
keep it at a welding heat while additional blooms, heated in other furnaces or in different parts of the same one, were added to it.

Judging from the appearance of the sawed section of the iron mass (figs. 1 and 2), the blooms were possibly poked or proded, with little real force, into the central cavity from alternating sides so as to keep most of the slag pockets and voids confined to the center. If the mass was to have been drawn into a beam, voids confined to the center or neutral axis would have had little effect on its resistance to bending. The absence of hammers and other tools at the site makes it impossible to guess what was to have been made from it. Another mystery is why such a large and valuable investment was so suddenly abandoned. The probable success of one of an increasing number of Scottish raids across the border is the most widely accepted explanation.

The remains of the furnace (figs. 3 and 4), approximately 6 feet in diameter and 5 high, are quite large for the size of the bloom which is 39 inches high, 4 1/2 inches by 5 inches at the base and 7 inches by 8 inches at the top. It is speculated that as the bloom was built up, the furnace and level of the tuyeres were built up with it by the addition of loose brick luted or sealed up with clay. This made possible the fabrication of any size mass of iron desired.

Historical and archaeological information about how such large masses of iron were manipulated and worked hot are so scarce as to be almost nonexistent. One possibility is suggested in figure 5 from the Newcomen Society showing gangs of 17th century Chinese workers lifting and forging a large anchor with sledge hammers.

About the same time that the Corstorphine bloom was being abandoned, buried, and preserved by the fall of the Western Empire, another large iron mass thousands of miles away beyond the eastern reaches of Rome's power, although in an area connected to it by rich trade, was being welded up in a similar manner at a site somewhere in north central India.

**The Iron Pillar of Delhi**

Hindu art, technology and civilization were at their zenith under the Gupta kings, approximately 320 to 480 A.D. During this period, at least three diplomatic missions were sent from India to Imperial Rome. Unfortunately, we have no knowledge of the iron masters or descriptions of the processes taken back to India with them. Perhaps just the mere knowledge that a very large forging could be made successfully in Roman territory or elsewhere was sufficient for King Kumara Gupta II, in about 415 A.D., to order skilled local smiths to forge a very large pedestal to support a likeness of Lord Vishnu for a new temple.

He dedicated the pillar to the glory of his father, King Chandra Gupta I, 375 to 413 A.D., with the following inscription in six lines of Sanskrit verse (fig. 6). "This lofty standard of the divine Vishnu was erected on Mount Vishnubada (Vishnu's foot) to King Candra, whose thoughts were devoted in faith to Vishnu. The beauty of that King's countenance was as that of the full moon (candra); by him, with his own arm, sole world wide domination was acquired and long held; and although, as if wearied, he has in bodily form quitted this earth, and passed..."
to the other-world country won by his merit, yet, like the embers of a quenched fire in a great forest, the glow of his foe-destroying energy quits not the earth;—by the breezes of his prowess the southern ocean is still perfumed;—by him, having crossed the seven mouths of the Indus River, were the Vihlikas vanquished in battle;—and when, warring in the Vange countries, he breastled and destroyed the enemies confederate against him, fame was inscribed on (their) arm by his sword.” (translation by Dr. Fleet as reported in the 1897 Journal of the Royal Asiatic Society of Great Britain and Ireland by Vincent A. Smith, M.R.A.S. Indian Civil Service)

The resulting monument, now known as the Iron Pillar of Delhi, is truly impressive; a 22 foot tall column tapering from 16 1/2 inches in diameter at the ground to 12 inches where it terminates in a highly ornamented capital, 3 1/2 feet high. Only 1 foot 8 inches below the ground, it flares out into a slightly irregular bulb 2 feet 4 inches in diameter with a flattened bottom from which protrude eight short iron rods leaded into the surrounding stones. This single mass of iron is estimated to weigh six tons (figs. 7 and 8).

The column was obviously made to last for an indefinite period, but in no way could King Kumara Gupta II and his craftsmen have ever dreamed that it would survive 1600 years, rarely equaled in size or perfection and never both at the same time until the nineteenth century. Even today it is considered a marvel by an increasingly technocratic society that has moved on to far greater accomplishments. However, we can now only guess at many details of its manufacture.

“How the pillar could have withstood 1600 years of rain and dampness with so little evidence of rust has received much attention and, in some quarters, is considered one of the great unsolved mysteries of the ancient world.”

That the pillar survived at all was a fluke of history. Within a century of Mohammed’s death in 632 A.D., Muslim armies were making increasingly numerous and more successful incursions into India. High on their hit list were Hindu and Jain temples which they looted and wrecked and replaced with mosques when they stayed long enough to establish rule. An inscription states that a mosque, now in ruins around the iron pillar, was built from the remains of 27 Hindu and Jain temples and the great
Figure 5. Forging a ship's anchor.
variety of ornamentation on many of the stones tends to bear this out.

Historians generally agree that the pillar was brought to its present location around 1050 by King Anangapada II, but so thorough was the destruction that the location of its former site is now unknown. Muslims would naturally have stripped it of the likeness of Vishnu before re-erecting it at a mosque, however, worse was yet to come. In 1739, Nadir Shah on a sweep of conquest out of Persia, deliberately fired cannon at it creating dents which are still visible today. This is also what may have opened up the large crack visible in figure 8, just above the midpoint of its height. Its seeming indestructability inspired a persistent legend. Like the myth of England’s invincibility, which supposedly continues so long as the ravens remain around the Tower of London, Hindu myth has it that as long as the iron pillar stands, the kingdom will not pass from them.

Figures 6 and 8 give some idea of the imperfect surface of the pillar resulting from slag inclusions, faulty welds, rust, vandalism, and even the removal of small pieces by scientists for metallurgical analysis. Discussion among modern craftsmen and scholars as to how much the present surface is the result of forging true as opposed to stock removal finishing followed by rust erosion revolves around these flaws.

How the pillar could have withstood 1600 years of rain and dampness with so little evidence of rust has received much attention and, in some quarters, is considered one of the great unsolved mysteries of the ancient world. Many modern metallurgists have studied this phenomenon and have written an assortment of papers on it. Many theories have been advanced but the real explanation is probably due to a combination of the following factors all working together: a climate with humidity below the
Figure 7. Iron Pillar of Delhi.
Figure 8. Close-up view of pillar showing crack and larger surface flaws.
critical 70 percent much of the time; an atmosphere tending to contain traces of ammonia from the many animals in the surrounding area rather than the destructive acid rain atmosphere common to modern industrial areas; a coating of refined butter, ghee or other oil that may have been kept on it during its 600 years at a Hindu temple before Moslem conquest; its physical mass which retains heat during the night preventing the condensation of dew most mornings; slag layers in the wrought iron that tend to slow the progression of rust, and compared to many modern steels, a low manganese and sulfur and higher phosphorus content due to the bark of the wood used to make charcoal to smelt the iron.

Sulfur in the presence of water and oxygen tends to form corrosive sulfuric acid, but even small amounts of iron phosphate in a microscopically thin film of rust tend to make the rust protective layer that resists falling off. This is the same principle by which modern, slow weathering steels like Corten rely on a copper, phosphorous, silicon, and chromium content to form a partially protective coating. Of all these factors, climate followed by thermal mass and fine slag inclusions are probably the most important.

A tiny specimen of iron from the pillar exposed to the weather in a damper location than the pillar site along with with specimens of other steels, and another set of the other steel specimens exposed near the pillar, show comparable corrosion rates in each location indicating nothing magical or unusual about the pillar iron. Reinforcing this, rust on the base of the pillar below ground has been found to be a full centimeter thick with pits as deep as ten times that.

Bardgett and Stanners, who were given a 2.05 gram sample of pillar iron by Dr. Nijhawan of the National Metallurgical Laboratory at Jamshedpur, point out that the corrosion rates of many other pieces of iron studied all over the world present a spectrum of durability and the iron from the pillar is only near the top of this range. They further feel that had the iron pillar been constructed 1600 years ago of a modern type of scale free, low copper iron or steel, it would now have an average depth of not more than 0.06 to 0.29 inches lost to rust. The apparent contradiction here in which copper can be described as both a rust inhibitor and a rust promoter should not be alarming. Alloying elements sometimes interact with each other in strange and unpredictable ways and finding the best combination for a particular purpose has long been an art dominated by "mix and try."

(To be continued in the next issue)

Wallace Yater is a professional blacksmith from Boonsboro, Maryland.
Artistry and Bent Pickets: The Cranbrook South Gates

by Kenneth Schmidt

This is the first of three articles which will examine work in iron at the Cranbrook Educational Community in Bloomfield Hills, Michigan. Cranbrook is a name we have come to associate with excellence in the arts. Much of the credit for this excellence must go to George G. Booth, who not only provided the vision and financial resources for the Cranbrook community, but was also an active participant in its planning and construction. In this first article we catch a rare glimpse of a patron, with knowledge of ironwork, interacting with a master blacksmith, Samuel Yellin.

It was the summer of 1917. George Gough Booth, a newspaper baron, philanthropist, and aesthete had just received a shipment of gates for his country mansion north of Detroit. They were the work of Philadelphia artist and craftsman, Samuel Yellin. It must have been an expectant time. The gates had been ordered late in December of 1916, and several letters had traveled between Detroit and Philadelphia, as patron and artist negotiated the details of the first of several commissions. But anticipation soon turned to distress.
"But anticipation soon turned to distress. One of the gates was slightly damaged in shipment and careful examination also exposed an unexpected construction technique. A letter to Mr. Yellin, dated July 13, 1917, included the following paragraphs:

I had noticed one thing that gives me a great deal of distress. In the first place, one of the large gates at least has had some heavy weight dropped on it and the center bar is slightly bent. Also some of the pickets have been bent and the tops somewhat injured. I do not consider this will be found serious as no doubt your men can straighten them up and put things in shape, but this injury discloses the fact that the tops of the fence pickets have been screwed on and do not pass through the main rail of the fence.

When I was at your shop you particularly explained that you did not put things together in that kind of a way, that your work was particularly strong and durable because of the fact that the work was not put together with screws when it was possible to do otherwise. Just as soon as the boys of the neighborhood discover that these pickets can be screwed off you will be in for supplying new tops and certainly this construction is quite contrary to anything I expected.1

The letters which followed between the two men reveal a determined and confident craftsman, and a patron who not only had the vision and means to create the Cranbrook Educational Community, but first hand working knowledge of ironwork and architecture.

George Booth, the third generation of Booths involved in metal, had been a designer and salesman of iron gates and other metal items before coming to manage The Detroit Evening News. Although Booth did not complete his high school education, his skill in ironwork design and sales enabled him to invest in a half interest in the Barnum Wire and Iron Company of Windsor, Ontario. He designed fences, gates, and grills and managed the concern. At the age of twenty three he sold the business and at the invitation of his father-in-law, James E. Scripps (founder and publisher of The Detroit Evening News), became the business manager of the paper. He eventually became the publisher and the chairman of The Evening News Association. By 1914 his fortune was secure and Booth devoted the remainder of his life to the creation and development of the Cranbrook Educational Community.

Booth's letter, which bemoaned the pickets, received a prompt response from Samuel Yellin:

Dear Sir:

I have your letter of July 13th in which you state that the tops of the fence pickets have been screwed on and do not pass through the main rail of the fence. If you look over carefully the drawing, [sic] you will see for yourself that most of them had to be done that way on account of the design, unless I were to split the horizontal bar which would weaken the gates a good deal. However, there will be no possibility for screwing off the pickets: I have this in mind, and everything will be worked out properly on the job.

My man will leave for Detroit either this Wednesday, July 18th, or Thursday, July 19th.

Trusting the above will be satisfactory, and thanking you for your kind promise to assist my man while on the job, I am

Very truly yours,

Samuel Yellin2

On August 6th, 1917, Booth informed Yellin that the installation of the gate was complete. And even though there seemed to be a number of problems to work out, the "general effect was very satisfactory." But the matter of the pickets still bothered Booth. In the August 6th letter he informed Yellin that he (Booth) was "still in the

George G. Booth. Sketch for proposed south gate. The actual gate varied considerably from Booth's initial idea. Photo courtesy of Cranbrook Educational Community.
dark as to why the straight pickets were not passed right through the rails of the fence even if the others were handled in the same manner in which they were.” He reminded Yellin of a conversation they had in his (Yellin’s) shop. Yellin had “condemned this very type of construction,” and Booth was convinced that it would be “quite practical to spread the rail slightly and close it again when the picket is in position.”

George Booth paid Mr. Yellin in full for the gates even though the two never agreed on the most appropriate technique for the pickets. The complete cost, including installation, and adjustments, was $1400. This was a considerable sum given the fact that the same year, Mrs. Eade, a teacher at Bloomfield Hills Elementary School received a raise. Her salary for the year was $1250.

Yellin’s final letter of August 8, 1917, left the matter of the pickets at a standoff:

I have your letter of August 6th, and wish to state that I have not in the least changed my views concerning the type of construction referred to in your letter. However, it is difficult to explain in writing just why I have resorted to a different method in this case. I expect to visit your city in the near future, and will then explain to you the matter personally.

I presume my man has paid for his board; as to the help expenses, you will kindly find out the amount, and have it charged to my account.

I am certainly delighted to hear that you are well pleased with the above gates. I have made special efforts to carry out everything in the best manner possible.

Yours very truly,

Samuel Yellin

This past year marked the 125th anniversary of the birth of George Gough Booth. He was known as one of the nation’s leading newspapermen during the first half of the century. An advocate of the arts, he helped establish the Detroit society of Arts and Crafts, and founded the Cranbrook Educational Community. But he was also an active participant in making his visions a reality. He made numerous drawings of his ideas for Cranbrook. And in the
case of the Yellin gates we have a rare view of the interaction between a patron and an artist. They both understood the craft of iron and shared a common design aesthetic. Both men valued fine craftsmanship and a natural handwrought texture. Both trusted their own judgements of the blacksmith’s art.

Kenneth Schmidt is a practicing metalsmith and an associate professor of art at Concordia College, Ann Arbor, Michigan.

1Cranbrook Archives, Cranbrook Foundation. Correspondence between George G. Booth and Samuel Yellin, 1917.
2Ibid.
3Ibid.
4Cranbrook Archives, Cranbrook Foundation. Minutes of the Board of Trustees meeting. December, 8th, 1916.
5Cranbrook Archives. Correspondence between G. Booth and S. Yellin.

6The Cranbrook Educational Community consists of six institutions: Christ Church of Cranbrook, Cranbrook School (for boys), Kingswood School Cranbrook (for girls), Brookside School Cranbrook, Cranbrook Institute of Science, and Cranbrook Academy of Art.

Samuel Yellin. North gate. Photo courtesy of Cranbrook Educational Community.
Installing A Forge Hood Ventilation System

by David Brown

One of the most valuable improvements I have been able to make in my shop over the years is a power ventilation system for exhausting coal smoke and soot that refuses to go up the stack. This system has made a noticeable improvement in the cleanliness of the retail display area and resulted in a dramatic decrease in the amount of coal smoke inhaled during the workday. The installation is most beneficial for forges placed where smoke overspill cannot be tolerated such as in a closed space where a stack is used with a hood.

The unit is installed on a custom built forge 3 by 5 feet in size. Two sides of the forge below the hood are effectively closed off by the device. Sections of 3 1/4" by 10" range hood exhaust duct work, including 90 degree elbow sections and an adapter for connecting to 6" round sheet metal pipe, are installed on the two remaining high sides. All of these items are available at local building supply stores. Smoke is picked up through louvres cut along the lower inside surface of the 3 1/4" by 10" ducts, instead of rolling out from under the hood into the shop. It is then channeled into the suction side of a squirrel cage blower and out through a shop-made adapter connected to a 6" round stove pipe. At the peak of the hood, a short piece of 4" round pipe extends into the exhaust tube where the side nearest the fan forms a baffle which causes negative pressure to draw smoke out of there as well. Both stack and power exhaust must go out through a window in my shop as the accompanying illustration shows.

The blower for this arrangement should have a minimum capacity of 265 cfm. In addition, an inexpensive motor speed control should be included on the installation. It would not be difficult to adapt the system to exhaust dust or fumes from other shop machinery, such as welding, grinding and buffing equipment, by using a larger blower and appropriate ducting and damper controls.

David Brown owns and operates Brown's Forge in Gatlinburg, Tennessee.
Some Thoughts on Blacksmithing

BY JOE HARRIS

Although I was exposed to blacksmithing for a brief period of time while still a teenager, I did not become seriously involved until 1980 at the age of 50. It didn’t take long to discover how diverse the interests of these folks we call blacksmiths are and to appreciate the strength of the bonds formed by their common interest.

Among the blacksmiths I have met are first of all the smiths who are just smiths, full time and professional. There are also bankers, lawyers, doctors, teachers, mechanics, welders, iron workers, truck drivers, railroaders, home makers, meat cutters and enough other occupation groups to fill several pages I would think. You get the idea. There is a broad cross section of society bonded by a common love of hammer, anvil, and forge.

Most of these folks you could know for a long time and never learn about their occupations and interests other than smithing. When they get together at a meeting, be it local, regional or international, there is just one subject of discussion – blacksmithing. They are warm, friendly and willing to share ideas, help solve problems or explain an unfamiliar technique to a willing listener. Is it any wonder that our ranks just keep growing.

Why are all these folks blacksmiths? The simple answer is the common bond of working with hot metal. To expand on that a bit, some are into smithing to earn money, both as full and part-time smiths. There are those, like me, for whom smithing is truly a hobby. Some I know are just carrying on a family tradition while others are more tool collectors than blacksmiths and just want to share the fellowship.

Full-time, professional blacksmithing ranges from one man shops to major employers. Part-time smiths range from those who spend their spare time forging items for craft shows to those who will accept as many commissions as the demands of full time employment elsewhere permit.

My son, Jeff, and I share a shop and many common interests. Jeff is the current editor of the ABA Newsletter. As smiths plying a hobby, here are some of the things we enjoy doing. We really enjoy making tools for the shop, both the conventional tools and the special one-time use tools. We also enjoy making things from junk: a rose from trolley wire, a cleaver from a broken car spring, a snake from a worn out rasp, a lizard or a snail from a railroad spike, a letter opener from a spike nail, a hook from a horseshoe, an aluminum and copper ladle from trolley wire and a broken fan blade, a wall hanging from a truck fender, or a ramp hoe (folks from Appalachia know what they are) from a jackhammer bit.

We also enjoy demonstrating for school children. Perhaps a few of their generation will one day join our ranks because of our efforts. That will be our reward.

And where do we find all these smiths? I think they can be found in every nation. Certainly, they live in every state of this country and in every province of Canada. They are located right downtown, in the suburbs and in the most isolated rural areas. They work in parks, factories, colleges, and museums. Usually, you will not find very many unless you make a real effort. I have run across several smiths who are not members of our organization and are slow to join. But our numbers are growing and I believe we are on course toward continuing that trend.

Joe Harris is President of the Appalachian Blacksmiths’ Association and an ABANA Director.
A Blacksmithing Tour of Europe

BY LEONARD MASTERS

To be on the cutting edge of history does not happen very often, but 1989 was that kind of year. Lilo and I went with a group of fellow blacksmiths to the First International Festival of Iron in Cardiff, Wales. After landing at Gatwick airport outside of London, we headed for Dick Quin nell’s shop in Leatherhead and then went on to Winchester to have a look at Tony Robinson’s stainless steel gates. After an overnight stop and tour of Oxford and Blenheim, Churchill’s birthplace, it was on to Cardiff. FIFI was a historic event in the sense that, for the first time, the public was invited to participate daily in the renaissance of blacksmithing through public forging stations, concerts, Welsh folk singing and exhibitions of forged iron work.

After the week long festival in Cardiff, we went by tour bus to St. David’s and Northern Wales with a stop at Dylan Thomas’s home. The gently rolling hills and mountains of Northern Wales gives one a different impression of the United Kingdom. Right outside our hotel that first night was one of the beautiful Davies Brothers’ gates, only recently restored.

We began the following morning with a visit to Ironbridge and the Great Gorge Museum. In the afternoon, thanks to Mike Roberts of BABA, we were able to visit Vaughts and see blacksmith tools being manufactured. After years of seeing nothing but old, used and rusty tools, it is a little mind boggling to see anvils and leg-vice castings waiting to be machined into new products. Tongs are still hand drawn under power hammers at Vaughts, instead of being die forged under a drop hammer.

Our last stop was London, the ultra cosmopolitan city with one foot in the future and the other in the past. A morning visit to the Victoria & Albert Museum for a guided tour of the refurbished iron gallery by Marian Campbell, Assistant Keeper of Metalwork, had its usual sobering effect on our vanities. We had an unexpected dividend in the Tower of London, when a small group of us were admitted to the work rooms where the armour is restored. There was a lively discussion, between Robert D. Smith (the head of restorations) and Clleston Sinyard, on how best to shape armour helmets. Talk about a lost art! Clleston is a Damascus knife-maker, but his knowledge of shaping metal comes from many years of shaping auto fenders. Listening to their discussion served to remind us how one craft skill is related to another, irrespective of time or geography. Clleston was able to offer several solutions to the problems they were encountering.

After the rest of the group left to return to the United States, Lilo and I took a bumpy hydrofoil ride to Belgium where we rented a car to tour Germany. We made stops at Liege to visit the Arms Museum, Aachen to talk to the 91 Conference sponsors and Remscheid to visit its tool and blacksmith shops museum and to check on various possibilities for the tour to the 2nd World Congress of Blacksmiths to be held in Aachen, May, 1991.

Our next stop was Hirzenhain to visit the Buderus Art Foundry and Museum. They still execute castings of unbelievable delicacy in iron. The museum has the largest collection of cast-iron stoves and firebacks while the foundry casts sculpture, in all types of metals, for artists.

Then, it was off to Prague, Czechoslovakia. I was curious to investigate the Czech’s world of blacksmithing. Josef Muck, a blacksmith, arranged for me to visit an art school in Turnov. The school was founded in 1884 and offers a three year course for blacksmiths. Students are admitted at age fifteen. The curriculum fully integrates blacksmithing into the core of art education. Students learn to understand variation in design and how art forms harmonize, compliment and conflict. The students also learn how to sketch ideas, build models, and make changes on their proposed wrought iron projects. They have a fully equipped shop where they are taught to practice metal working techniques. The school has a small, but very well stocked, museum of wrought iron work, armour, swords, fire place tools, and other objects. Students are expected to choose one of the pieces and reproduce it in the school shop. They also learn how to develop proposals and make presentations to government art committees. If a blacksmith achieves some success, he can apply to become an officially recognized artist and be entitled to certain state privileges.

After we spent a little more time rambling around Czechoslovakia, Lilo and I finally headed for home. We have already started researching our next adventure which will begin in Vienna then moving on to Prague, Dresden, Leipzig, and West and East Berlin.

Should you care to join us, please let us know. Write to us at Crompound New York, 10517 (914) 739-0343.

Leonard Masters is an ABANA Director.
Showcase

Randy McDaniel,
Fleetwood, PA.
"Celtic" post lamp.
Randy McDaniels, Fleetwood, PA. Stair railing for art gallery.

David Hess, Baltimore, MD. Bench. 16 1/2" h. x 23" w. x 17" d. Rebar and galvanized steel.
Miles Huffman, Topeka, KS. Window grill. Photo: Steve Gilbert.

Enrique Vega, Apex, NC. "In Search of Knowledge," sculpture.
Art Wolfe,
Cleveland Heights, OH.
Garden sculpture.
29" h. x 38" w.
Marcia McEachron and Paul Hubler, Minneapolis, MN. Coffee table. 18" h.
Will Stone, Coburn, PA. Occasional tables. 20", 25" and 30" h. x 9" w. at tops. Mild steel, brass and glass. Forged and fabricated.

Will Stone, Coburn, PA. Occasional table. 25" h. x 14" w. at top. Mild steel.
Edwin Grove,
Brownfield, ME.
Panel in stair rail.
Gary Ameling,
Elmore, OH.
Clock.
Ward Brinegar, Santa Fe, NM.
Baker's rack.
*Photo: Hal Maggiore.*

**Detail of baker's rack.**
Uncle Bud’s Bag of Tricks

BY BUD OGGIER

CHAPTER 15

Hi Jean! Haven’t seen you for a while. Thought you might have had enough of the Old Man. Nice to have you back again. What’s been going on at your place?

I’ve been at the forge pretty steadily, Bud, mostly making tools and equipment for the shop. I now have eighteen pairs of tongs and two bottom fullers that I made since I was here last. Also, I had my first paying job. One of the neighbors asked me to make a replacement piece for the hitch on his tractor. I got it made all right, but it took longer than I thought it would.

That brings up an idea that helped me a lot, Jean. When I started, I had the same problem you described. What I did to help resolve it was to set up this book. It’s a regular three ring binder and in it are the elements of a lot of different jobs: the time they took, the material I used, and how I thought I could improve on what I did. The way I use it is whenever I have a job that requires one of the elements in the book, I look it up and use the time as my estimate. When I finish the job, I note my new time and any improvement I make. It’s nice to have work when all you have to do is produce the piece and submit a bill, but in my experience most people want an estimate of the cost, if not a firm price. My book helps me to give good estimates. I think the important thing is that I not only keep time on the whole job, but also on each element of it. It takes a little effort, but I think it pays handsome dividends.

Jean, the last time you were here we talked about twists as a decoration. One other form that is quite pleasing to look at, and quite a conversation piece, is braided iron. Let’s do it. We’re not really going to braid, but the finished piece will look like it.

I have some 3/16” round wire here that will work just fine. Let’s make a braid we could use for the handle on a fireplace tool. To begin we need four pieces 18” long. Now bend each in the middle and bring the ends together. Close up the bend with a few licks of the hammer so the halves lay tight against each other.

Now we’re ready to start our braid. First we twist each bent rod counting the turns. We want a fairly tight twist, which is consistent throughout its length. Heat the first piece and try to get an even heat over its entire length. When it is hot, bright red, put the two ends 1” into the vise, grab the looped end in a pair of tongs and twist. You have to do this in a hurry before you lose too much heat. Be sure to count the twists, since all four pieces must have the same number. We need two pieces twisted to the right and two to the left. OK, let’s go for the rest of them.

Jean, notice I marked the vise jaw with chalk and when I put the pieces in, the ends matched the mark. I pushed the rod, as deep as it would go, into the tongs. That way my twisted rods will all be the same length, and if I count correctly, they should be very close to the same size.

That piece is hot, Jean, why don’t you twist it. The one I made has a right hand twist so why don’t you make your piece the same. OK, Jean, it looks good; now for the two left hand ones. Heat it up, put it in the vise, twist, count the turns, and it’s finished. You ready with yours? Now, let’s put a right and a left alongside one another and see how well the twists match.

There, this pair matches quite well. Now for the other two; these are not as good. Compare them with the first pair. See, one matches but the other needs about another half twist to tighten it up a little. Warm it up and correct it. There, all four now match.

The next step is to assemble the four twisted pairs into a bundle of alternating twists, one right and one left. The bundle will be roughly square and the twists must alternate on all sides.

One trick that helps to hold the rods while you line up the twists and assemble them is to use two common hose clamps, the kinds that have a screw to tighten them up. The twists need to line up so each side looks like a head of wheat. OK, on with the hose clamps, fairly loose, line up the twists, snug up the clamps. The next step is to weld the ends together.

I find it helps a lot, at this point, to arc weld the ends together just enough to hold them while we finish welding them up. If you don’t have access to a welder you can hold the bundle in a pair of bolt tongs while you forge weld the ends, but that is a little more difficult. OK, I’ve tack welded the ends together and now we can proceed to forge weld the ends. We have to weld the ends together back as far as the start of the twists so the twists all blend into a solid round bar.

OK, here we go. Heat up one end, flux, finish heat and weld. While you are welding, remember we want a solid round bar, so keep your blows even, and in finishing up, round the piece.

Well, that looks pretty good; now the other end. You try it, Jean, remember this is pretty light material so heat it slowly and watch carefully so it doesn’t get burned.

You’re going good, Jean. Watch that in the process of rounding up the welded ends you don’t get a twist in the twisted rod bundle. That looks great. Now we need to weld the unwelded twisted portion, lightly, into a square bundle.

In fluxing this, I’ll be a little light on the flux because in the finished piece we want all the flux to be gone. In welding this center portion use light hits and sort of pat the bars together. We only want a small flat on each
twist. Here we go, back in the fire. Heat slowly in order to get an even heat and not burn the piece. The piece is ready now. Remember, light pats; as soon as all four sides are stuck, wire brush well to get rid of all the flux and straighten it if necessary. If there is still a little flux left, we can soak it in hot water to loosen it up so it can be removed. It’s good that we used borax. A flux that has iron fillings in it would be more difficult to clean up.

Now that the piece is cooked, let’s take a look at it. Say, that turned out pretty nice. See how it no longer looks like four twisted bars, but now looks like it was braided together. Almost all braids are based on this principle.

Since we want this for a handle on a fireplace poker, let’s prepare one end to weld on the rest of the poker and draw out the other end to form a hook to hang it by. I normally scarf and weld on the shaft to make the rest of the poker and then use it as a handle while I make the hook and finish the piece up.

Another twist, which I call a cable twist, is made differently but also uses twisted bars to achieve the effect. This time we need to twist up three rods the same as before, but this time all twisted in the same direction. Again, keep the twists even and as close to the same as possible. Here we go, cut the pieces to length, double them, twist.

Assemble the three twisted bars into a bundle, same as before, and tack weld the ends. Now forge weld the ends together into a bar.

The next step is to heat the entire assembly and twist it in the opposite direction from the original twists. It doesn’t make any difference which direction you started with as long as the final twist is in the opposite direction. We twisted these individual rods clockwise so now the assembly has to be twisted counter-clockwise. While twisting keep your eye on the twist and when you have twisted enough to make the humps of the original twist line up in a straight line from one end to the other, stop. Since the first twist is in one direction, and the second twist is in the other direction, the initial twist will open up a little. This increases the illusion that it is braided.

OK, here we go, in the fire, move the piece back and forth to get an even heat, into the vise and twist. See those humps from the first twist starting to straighten up and get in an almost straight line? Just a little more now; there. Squeeze it in the vise gently on the twisted portion to straighten, turn, straighten again, and it is finished.

Jean, we have the makings of two real nice pokers here, why not finish them up.

Most often I make my poker shafts from 1/2" round stock. Unless you do some work on it, it feels tip heavy and cumbersome. If you forge it square and taper it from handle to tip, it feels and looks much better. Generally stove pokers should be about 30" long or less. Fireplace tools should be compatible with the size of the fireplace, anywhere from 32" to 48". I’m going to make mine for a friend who has a rather small fireplace so they will be about 34" to 36".

First, forge it down square and tapered from one end to the other. Now point the small end. My shaft tapers from about 7/16" down to about 3/8". Notice I put a small chamfer on all four sides. This is a tool that is going to be handled a lot and I don’t want any sharp edges for my friend to get cut on while he uses it. Next, bend about 5" of the small end back on itself, close up the end tight, and before it cools, open it up a little. We’re going to weld the end together and by opening it up you can get the flux to run down into the joint and weld up solid. Jean, I’ve got to make a phone call, so why don’t you get your shaft as far along as you can while I go over to the house.

Well, Jean, I see that you’ve been busy and have your piece as far along as mine, good. Now to weld the last inch of the folded end together. While doing this, remember the folded end of the piece makes the poker point and needs to be solidly welded, but the very end makes the barb and needs to be free so it can be bent.

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OK, in the fire, get it hot, flux, back in the fire, get it hot, and weld. After about 1" has been welded, I'll draw the end to a point. There, that looks good. Brush off the flux with a wire brush and back in the fire. When the piece is hot, I'll set it in the vise vertically, and as deep as I want the barb to start, and gently bend the barb down to a little more than a right angle. Using the vise insures that you won't get a large gap where the bend starts and because I've got my soft false jaws in place, the bend will have a radius and no jaw cut where it was bent. To finish the barb, I'll get it hot again and put a large radius bend over the horn and bend the tip towards the handle to act as a hook.

Here we go, poker under the large part of the horn, put in the large bend, now to the tip and bend the hook, a few licks on the anvil face to flatten and straighten and that end is finished. Your turn, Jean, remember to weld only about an inch back from the end or you'll have trouble making the barb. Don't forge the barb or the welded end too sharp on the point; remember this is a working tool, not a weapon.

Before you finish the barb, Jean, you should forge the tip down until it is about the same dimension as the shaft above the barb to keep it from looking tip heavy.

That's better, now bend the barb and straighten. Next we weld on the handle, so first scarf both ends and weld. I'm going to use the first braid we made. You use either one of yours, whichever pleases you the most. Here we go: scarf, heat, flux, heat, and weld. It pays to upset the ends a bit before welding to be sure there is enough stock to make a nice smooth transition from square to the round handle end. There, that came out pretty well. Straighten it up a bit and then we're ready to forge the hook end. Jean, I've noticed you have remembered the things we talked about in your past visits and that makes me feel good.

Now to draw out the hook end. Taper from the braid down to about 1/4" diameter and then a slow taper to the end; the end only needs to be about 1/8" round and the whole shank about six to seven inches long. There, that suits me; now to bend the hook.

Next, I'm going to put a twist in the middle of the shaft between the barb end and the center of the handle. I think the twist we made last time with the spring swage would be nice. Heat up the middle, put it into the swage. You strike and forge out the fins. I'll take a minute to even up the fins with a file and then finish the twist. Now twist and straighten. One more thing to do; sign and date it.

Jean, everything that I make, before it goes out the door, is either signed and dated or on the way to the dump. My sign tells the customer that I think enough of it to put my mark on it. The date, year only, keeps someone from selling it as a genuine antique. This is particularly important if it is a reproduction. There, I'm pleased with the way that came out. In fact, I think it is a rather elegant poker. It would be a little expensive for most people, but this is a gift from me to a good friend.

Hope you learned something today Jean, and come back!

---

**The Use of Weight Charts**

BY WARD BRINEGAR

A table of steel weights and a calculator can save you a lot of "experimental" forging. These tables are available from many steel distributors and are also found in some books. I use the table from *The Edge of the Anvil*, enlarged and laminated on poster board. I like this one because it gives the weights per inch of square and round stock.

Use the chart to determine how much of your original bar you need to lay off to forge a specific item. The basic formula to follow is unit weight of parent stock x length equals unit weight of desired stock x length.

One common use would be to lay off material to forge tenons. If you want a 1/2" round tenon 3 3/4" long on the end of a 3/4" square bar, the formula would be 1.75 x .056 (weight per inch of 1/2" round) equals A (unknown length) x .159 (weight per inch of 3/4" square). The result is .616, which I round up to 5/8. I prefer to trim a little off the end rather than come up short.

Another example: From a piece of 3/8" x 1 1/2" flat you need to forge a leaf with a 10" stem, which will be 3/8" round. How much of the parent bar do you need to forge this stem? 3/8" round weighs .031 pounds per inch. Therefore your finished stem will weigh .31 pounds. The weight of the flat stock is .159 pounds per inch. Divide the weight of the stem (.31), by the unit weight of the parent stock (.159), giving you 1.95. I would lay off 2" for the 10" stem. The formula would be written .031 x 10 = .159 x A, with A being the solution of 1.95."

Keep an inexpensive calculator in the shop and the use of these tables will become second nature to you, saving lots of time, steel and patience.
The exhibition, "Iron," can currently be seen at the State Museum of Pennsylvania in Harrisburg. On view through April 29th, the show focuses on the history of the State's once prolific charcoal iron industry.

Decades before the outbreak of the American Revolution, Pennsylvania had developed a network of blast furnaces and finishing mills located in an arc around Philadelphia in the southeastern portion of the colony. Once established, Pennsylvania's domination in the production of iron continued throughout the nineteenth and well into the twentieth century.

The exhibition is organized into several sections and highlights finished products as well as raw materials. One of the most interesting and educational sections deals with the various types of iron ore used to produce this vital metal and the area where each type originated.

By the beginning of the twentieth century, iron and steel making had become an established science but it had been much different in earlier days. During the eighteenth and early nineteenth centuries, it was a delicate process which relied heavily on the experience and intuition of the founder and his skilled workers. Charcoal making, for example, was a critical task which had to be performed regularly. With the help of a video tape of the process being recreated at Hopewell Village National Historic Site, this technique...
is revealed to the modern museum visitor. The use of video and interactive exhibits throughout the show do much to convey the history of this important industry, particularly to younger audiences.

Several thematic sections make up the main portion of the exhibition including how iron was made, the differences between cast and wrought iron, and patterns and pattern making. There is also a casting shed floor designed after the famous Cornwall Furnace, a large display of finished items from days gone by, and a recreated blacksmith’s shop. Unfortunately, the shop display is rather stylized and helps to perpetuate many of the misconceptions which the public already has concerning “ye olde smithy.”

The final section attempts to bridge the decades between historic processes and products and more recent applications of iron. Unfortunately, the space is too small and the number of topics too many. After all, in presenting the history of an industry as colorful, diverse and complicated as iron making, it is difficult, perhaps even impossible, to say it all in a few thousand square feet of exhibition space. Iron craftspersons will enjoy the small display of contemporary iron which includes Will Stone’s “Corn Gate,” a forged rose by John Tyler and a piece from the collection of the Samuel Yellin Metalworkers Company of Philadelphia.

In summary, the manufacture of iron was an important component of the early industrial development of Pennsylvania. Although iron and steel production still play an important role in the economy of the state, that role has been steadily decreasing over the past several decades. Accordingly, the time is right for a major exhibition which chronicles the proud early history of the industry and captures some of the renewed appreciation of the material’s decorative applications.

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Will Stone, Coburn, PA. “Corn Gate,” 72" h. x 20" w.

The museum is located on the corner of Forster and Third Streets in downtown Harrisburg. It is open from 9:00 a.m. to 5:00 p.m., Tuesday through Saturday, and Noon to 5:00 p.m. on Sunday. Admission is free. For information, contact the museum at (717) 787-4978.

Dan Perry is Director of the Pennsylvania Anthracite Heritage Museum and President of the Pennsylvania Artist-Blacksmiths’ Association.
Classes & Courses

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THE ARROWMONT SCHOOL OF ARTS AND CRAFTS
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PETERS VALLEY CRAFT CENTER
Layton, NJ. 20th annual Craft Fair. July 28-29, 10:00 a.m.-5:00 p.m. Admission, $5.00.

Conference

AMERICAN WELDING SOCIETY

MISSISSIPPI FORGE COUNCIL
April 28-29, 1990. For information contact Grady Holley, Jr., Rt. 5, Box 141, Vicksburg, MS 39180 (601) 634-8803.

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Competitions

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ABANA Board Nominations

Nominations to fill the five vacant positions on the 1991 ABANA Board of Directors are due July 1, 1990. The five positions are for three year terms. Candidates must be members of ABANA in good standing and be nominated by letter or petition by at least ten members of ABANA. Candidates should write a short statement about why they wish to serve on the Board and should include a small, portrait-type photograph which will be published with their statement. All nominations should be sent to ABANA, P.O. Box 1181, Nashville, IN 47488 by July 1, 1990. The schedule for the election is as follows:

July 1
Nominations Received

August 7
Ballots mailed to members

September 17
All ballots returned

September 30
President will notify new members

HANS G. PEOT
ABANA Secretary

SPRING 1990
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The Complete Metalsmith with Tim McCreight is a unique video curriculum of jewelry making skills for beginning students, teachers, and working jewelers alike. The 80 minute tape retails for $39.95. For more information contact: Brookfield Craft Center, Inc., P.O. Box 122, Brookfield, CT 06804. (203) 775-4526.

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The Yellin Foundation Memorial Workshop

This professional production covers the the 1983 workshop conducted at the Yellin Studio by Francis Whitaker in which a memorial gate was fabricated and dedicated to Harvey Yellin. Subject matter includes layout, assembly, tenons, large animal heads, and twisting, among other well documented procedures. This film is for all levels from beginning to advanced and is available through the generosity of the Samuel Yellin Foundation. (40 minutes, color, VHS.) Rental $15.00.

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This professionally produced film shows the working operation of a now retired water-powered Czechoslovakian blacksmith shop. The film documents the authentic working mechanism of the shop and the fabrication of various agricultural implements. The shop, equipment and venerable smith were filmed when the smithy still served local needs. (20 minutes, color, VHS.) Rental $15.00

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### Conner Prairie Blacksmith Classes

The “Conner Prairie Blacksmith Classes” are unedited tapes produced at the Conner Prairie Blacksmith Shop in Noblesville, Indiana, and were donated to the ABANA Audio Visual Library by William D. Manly. These tapes represent a wealth of information, although their unedited state requires patience on the viewer’s part.

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The Blacksmith’s Helper: A Guide to Food-smithing; by Dorothy Stiegler; 75 pp., illustrated, 8 1/2” x 11”, softbound.

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