Dimitri Gerakaris
Editor
Mary Gerakaris
Managing Editor
Design
James Fleming
Contributing Editor

2 Cyril Colnik . . .
his work lives on by Judith Simonsen

8 Basic Operations: Drawing Out . . .
by James Fleming

10 More on Power Hammer Techniques . . .
by Don Hawley

17 Work by O.L. Olson . . .
by Wallace Yater

18 ABANA Showcase . . .
photos of recent work by members of ABANA

21 Diderot Translation . . .
the fifth in a series by James L. Kirkland

24 Spiral Stairs . . .
contributed by Terry Steele

26 The Hand Forged Knife . . .
the fifth in a series of dealing with modern tool steel
by Karl Schroen

30 Repoussé Hammer Handles . . .
by Nahum G. Hersom

32 Tips and Techniques . . .
from the readers of The Anvil's Ring

38 Straightening "I" Beams and Other Hard Scrabble
by Wallace Yater

42 Books

44 Coming Events

48 Conference Preview

Cover: Window grille made in 1895 by Cyril Colnik. His story, reprinted courtesy of Lore magazine, begins on page 2 of this issue.
EDITORS’ FAREWELL

While The Anvil’s Ring and ABANA have been happily growing, so has our own family. With plans for even further expansion of our family, the obligations of editing this magazine as a sideline and raising a young family clearly run a collision course. Because we cherish the dialogue among smiths that has developed, we prefer to announce our decision to discontinue editing before that collision occurs. We do offer to edit another issue or two to help provide a transition to the next phase of The Anvil’s Ring.

Our feelings of respect and friendship for the members of ABANA run deep as does the feeling of responsibility to see that ABANA grows and prospers in good hands — in no small measure because this editor was the culprit who instigated ABANA into being and because of the resounding affirmation and participation which has ensued. An excellent opportunity for aspiring editors to present their credentials will soon occur at the upcoming conference at which there is to be a general meeting of the membership and, immediately following the conference, a meeting of ABANA’s Directors.

It is inevitable that a new editor will effect a great number of changes reflecting his or her experiences and attitudes (and this will most likely be a relief after 724 pages from the same editors), but there have been a few guiding principles we feel have served us well, so, for what they are worth, we pass them on to future readers and editors:

The sole purpose of The Anvil’s Ring is to provide a pipeline of communication for those who wish to share their questions, knowledge and love of blacksmithing. The tone should be one of cooperation, not its opposite — competition (it is for this reason that there have been no contests, no pictures of living smiths or their work on the cover, etc.) Equal access should be provided to all, regardless of level of proficiency, nationality, etc. — even ABANA affiliation is a moot point, as many excellent articles have been submitted by non-ABANA people. Differences of opinion regarding blacksmithing are bound to occur; healthy debate can only better reveal the truth. There is in this quest, however, absolutely no benefit from, not room for, personal attacks or politics. Even inordinate politics on behalf of ABANA is out of order if ABANA comes to be treated as an end in itself, rather than a straightforward instrument to provide access to information about blacksmithing. All blacksmithing related material must be presented with the greatest respect and visual and literary clarity on paper that will make long-term future reference possible. And this should always be done basically on a break-even basis with no profit being made off the membership (despite rumors to the contrary, this magazine has kept to its budget, providing a surplus this past year of over $7,000 which is now being used as seed money for the next conference).

We once again cannot say how much we respect and enjoy our association with the many smiths of North America and the rest of the World, who have so openly given their knowledge and love of the art. After all, if life on Earth began with just a handful of primordial ooze, just imagine what can come of 1700 blacksmiths working together.

Dimitri and Mary Gerezakaris

P.S. We eagerly look for others who will step forward to help maintain this great dialogue, but until you hear otherwise, keep sending your material to us for publication. (Aspiring editors are encouraged to contact us as soon as possible.)
Anvil, hammer and tongs — tools used for centuries at the forge — were the instruments for artistry with metal in the hands of Cyril Colnik. His creative talent and technical mastery transformed shapeless metal into works of beauty and permanence. Colnik took great pride in his work and signed one piece: He felt his design and craftsmanship spoke for itself. Colnik became nationally known and achieved his success in his adopted country and home, Milwaukee, Wisconsin.

Colnik, son of Dominic and Anna Rudmilla Colnik, was born September 20, 1871, on the family estate in Triebeln, Austria. His father, a prominent veterinarian, economist and politician, had a blacksmith’s shop on the estate, and at a very early age Colnik was exposed to the workings of the forge.

When Colnik was fourteen years old, he left home for a mechanics apprenticeship in Vienna. However, he found it lacking in creativity and chose to study architectural iron work, for a short time in Vienna, and then with master ironworker Franz Roth in Graz, Austria. After meeting the tests of the master, Colnik was determined to excel in his craft and pursued further training under various master craftsmen in Italy, Spain, France, Switzerland and Germany, traveling on foot.

Following this period, Colnik enrolled in the Industrial Art School in Munich. The faculty recognized his ability and recommended he assist in setting up the German government’s exhibit at the World Columbian Exposition in Chicago in 1893 and show his student works. Colnik was awarded a gold medal for his grille depicting Vulcan and a prize for his escutcheon. (Both are described below.) The Exposition suffered financial difficulties and Colnik never actually received the gold medal.

Colnik decided not to return to Europe, where he had no strong ties. He had received recognition and commissions for work, and was encouraged by fellow craftsmen. He sensed his opportunity lay in America. His activities in Chicago are unclear; he may have set up a shop only to find it difficult to obtain skilled help. It has been suggested that Captain Frederick Pabst may have influenced him to settle in Milwaukee. The Pabst pavilion was brought to its intended site, as part of the Captain’s new home at 200 West Wisconsin Avenue after the Exhibition closed. During 1894-1895 Colnik did extensive wrought iron work on the Pabst mansion.

Whatever the exact circumstances, Cyril Colnik came to Milwaukee in either 1893 or 1894. He was employed for a short period by the Reliance Wire and Iron Works, which experienced financial difficulties. In 1894 Colnik worked for Ernst Melaun at the Milwaukee Art Metal Works, 219-221 8th Street. The Wright’s Directory of Milwaukee indicated no business-related address in 1895-1896 and listed him only as “designer.” However, in 1894 this description changed to “artistic iron works” with a business address at 219 8th Street, the same address as the former Milwaukee Art Metal Works, which is said to have purchased from Melaun. The building that housed the business was rented. An 1898 advertisement read: “Iron work for Buildings, Brass and Bronze Ornamental Church Work, Etc., C. Colnik, Manufacturer of Ornamental Metal Goods, Antique Art Work A Specialty.” By 1900 he listed an associate, A. L. Gauckler, who remained with him until 1918.

The year 1908 marked a change in Colnik’s business associations. C. Colnik Mfg. Co. had a new address, 732-766 Greenbush Street, which was also the address of Bayley Mfg. Co. C. Colnik was listed as President, and A. L. Gauckler as Secretary-Treasurer for Bayley Mfg. Co. The dual business listings remained through 1912. In 1913 Bayley Mfg. Co. listed neither Colnik nor Gauckler, although the Colnik Mfg. Co. remained at the Greenbush address through 1917.

The early years were a struggle, but Colnik persisted. His reputation grew and potential clients increased. Many successful professional people, industrialists and merchants were emerging during this period in Milwaukee and they sought new residences suitable to their status in the community. These men required excellence in workmanship and had the means to pay for it. The Herman Uihlein home at 5270 North Lake Drive, for example, required three years of Colnik’s time to fulfill the commission.

The scope and growth of Colnik’s business, which eventually employed up to twenty-five men, can be seen in a 1914 advertisement:


During World War I, foundries and ironworkers were called upon for war material work. Colnik chose not to be part of war materials manufacture, but to create things of beauty and permanence with metal. He severed business ties at the Greenbush address and started over. In 1918 he established The Ornamental Iron Shop at 221 8th Street, near his original business location. He advertised himself as “designer and instructor.” His shop stood where the present Milwaukee Public Museum is today, on 8th Street between Wells Street and Kilbourn Avenue.

Colnik’s business prospered during the 1920s. Wrought iron and other metal work was very popular, and many were able to afford it. The Great Depression of the 1930s, however, changed that. During these years many in Milwaukee’s artistic community banded together for survival in an artist’s colony in the 900 block of Plankinton Avenue. They continued their creativity through the Public Works of Art Projects followed by the Works Progress Administration programs. A few artists and craftsmen continued to work independently, including Colnik, who relied on private commissions and contracts with architects. An important commission of this period was at Wisconsin Memorial Park. Through these years he made efforts to keep his workmen busy, sometimes at the expense of his own savings.

After conducting business at the 8th Street site for twenty-three years, The Ornamental Iron Shop was forced to move due to the development of the Civic Center. It was relocated in 1941, a time which coincided with the death of Colnik’s wife, Marie. He and his daughter, Gretchen, moved to his wife’s family home at 531 North 8th Street, which was vacant. He built a forge in the rear, and remodeled the first floor into business space and the second floor into living quarters. The business addition to the house is no longer standing. It was torn down for neighboring business expansion and a small park-like area replaced it. The Ornamental Iron Shop was formed into a Corporation on July 13, 1945, by Cyril Colnik and Robert Wellstein.

Colnik was in complete charge of his business — he designed all the work, though others might execute it and was the final judge and critic for whatever went out under his name. He kept

left: Detail from a grille in the Colnik Museum. Photo by Leon Weissgerber.
the books for the business, and had the philosophy of sending a customer a bill only once, expecting payment for services, but pursuing it no further if none came. He did all the ordering of materials, and even typed his own business letters. Colnik's business records covering the period 1936-1944, indicate a man who was very thorough, organized and articulate, with an artist's hand. Each carbon copy of a letter to a client or architect, on a 5½ × 8½ sheet of plain paper, was straight-pin to another paper on which Colnik listed, in pencil, the client, his address, complete description of materials, sizes and costs and labor expense. It also included a detailed sketch of the commission. One entry, dated March 14, 1944, to R. A. Sutherland, Architect, said:

"Dear Sir:

We have entered your order for the All Saints Church
the 4 candle holders inclusive the oak bases for the sum of
128 dollars. The Bases cost each 7 dollars and are made of
one block.

Very Truly Yours,

The Ornamental Iron Shop."

Another commission, for the W. T. Kyle residence, 3017 North
Marietta, dated February 24, 1942, for a fireplace frame and
screen in the amount of 56 dollars included Colnik's suggestions
that the fireplace would have a "better appearance" if done in a
different way. He closed the correspondence with, "If something
should not be clear to you, you better call me up in time."

Colnik's productivity spanned over sixty years. Although there
is no known record of his commissions, they were numerous.

The Wisconsin Architectural Archives, located in the
Milwaukee Public Library has a mounted, full-sized working
drawing of a front door grille for the William Watson Allis
residence, which once stood at the corner of North Marshall
Street and East Kilbourn Avenue. Colnik's pencil and charcoal
drawing was used at the forge to guide the craftsmen in adhering
to the design; burn marks indicate where the hot iron was laid
over the paper to check the work's progress. The Archives also
has other drawings not displayed at this time.

An old photograph of the Empire Building, still located at the
Northeast corner of Plankinton and Wisconsin Avenues, shows
an advertising sign, which is no longer extant, that had been
mounted within an ornate ironwork frame made by Colnik Mfg.
Co.

When the Schandein residence, which once stood at 24th
Street and Wisconsin Avenue, was razed, Colnik bought back a
chandelier, one of a pair which had hung in the dining room.
Mader's restaurant purchased it from Colnik and today it graces
the entrance to their dining rooms. The location of the matching
fixture is not known.

I made a photo tour of Milwaukee, Spring, 1980, to record
some known examples of Colnik's work, especially his well-
known gates and fences. A picture was taken of the home at 2640
North Terrace Avenue, because it had some ironwork on the
building, although notes indicated that it should have had a gate
and fence. Down the block there is a fence and gates, containing
designs frequently used by Colnik: flames, flowers and vines.
Notes did not indicate it to be his work, but a picture was taken.
A comparison of a research source with the photograph of 2640
North Terrace Avenue confirmed that it was the same residence,
and that the gate and fence were gone. My contact with the
Wisconsin Architectural Archives indicated that the ironwork
had been moved to the residence between the block, and it was
suggested I contact the former owner of both homes. He
confirmed the movement of the gate and fence from 2640 North
Terrace Avenue to 2690 North Lake Drive. Although the gate had
to be split at the site, it fits handsomely on the property. Further
conversation revealed that the wrought iron fence and gate had
been originally commissioned for the Michael Orth home at 2306
North Humboldt Avenue, and prior to demolition of that
residence, purchased and moved to the North Terrace address,
which explained why the ironwork on the house varied in style
from the gate and fence.

The Milwaukee Public Museum has a wrought iron window
grille by Cyril Colnik, from the Layton Art Dormitory, dated 1895.
It is 16" × 24" in a scroll design with cup-shaped blossoms.

The Charles D. Stewart Manuscript Collection, located in the
Local History Room of the Milwaukee Public Library includes a
presentation piece given to Stewart by the Milwaukee Journal
Company. It is a plain wooden box, made by the Journal's chief
carpenter, 17" × 11" × 12" in size. The only ornamentation is the
wrought iron latch and twisted metal side handles by Cyril Colnik.

There are many private collectors of Colnik's work in
Milwaukee and elsewhere. One collector has assembled a variety
of interior decorative pieces, mostly in the Art Nouveau style,
exhibiting Colnik trademarks: small rose buds, blooming roses
and branches with bark design. Collectors rely on these designs...
to identify pieces, as well as provenance of a piece, direct purchase records from the Colniks, and compare pieces with known and authentic pieces in the Colnik Museum Room. This same collector has a floor lamp identical to one in the Museum. It is a graceful piece; a vine forms the base, and it rises in an “S” curve culminating in a flower, which is the iridescent shade. This collection also includes a variety of wood casting molds; one is a wreath design, another a fleur-de-lis, signed on the back, “C. Colnik, 5 off. #220.”

While it was considered too expensive to ship heavy metal any distance, Colnik did do some out-of-state work. He fulfilled commissions for the Insul and Ryerson homes in Chicago, and the Ringling mansion in Sarasota, Florida.

Cyril Colnik established the Museum Room at his shop and home, 531 North 8th Street. His will stipulated: “I give and bequeath to the City of Milwaukee my Art Collection of Ornamental Metal Work in the Museum Room of my shop, including the literature, photographs, plans, tools and equipment used in making the objects comprising the collection to be placed on permanent display at either the Public Museum or Public Library as selected by my beloved daughter, Gretchen Colnik, at any time of her choosing.” Since his death on October 25, 1958, the collection has remained at the above site under Miss Colnik’s care.

All the pieces in the Museum Room are Colnik’s (excluding a bronze plate and several “white metal” figurines), according to Miss Colnik. The only piece of work which Colnik signed is displayed here. This is the escutcheon done in Repoussé, a technique widely used in Europe requiring great skill. It is executed on a bed of pitch, with tallow added to allow give to the bed, pounded out from the back and the front to form the design in a bas-relief. The piece is signed in the lower right-hand corner — Colnik. It is two feet wide and approximately three feet in height. The shield design is a plain convex oval, flanked in the upper half of the design by human figures and a crown and leaves centered at the top. The lowest section is surrounded by leaf motifs.

Among the many small items in the museum is a variety of candlesticks, another item for which Colnik was well known. There is a unique firescreen, table and floor ashrays, lamps, andirons, a chair, display boards with mounted samples of small cast and stamped decorative items, building hardware, and decorative building fragments.

Memorabilia are also displayed. Among the items are an advertising postcard and sign, a photo of the gate at Wisconsin Memorial Park and an etching of The Ornamental Iron Shop, by Dr. George New.

Dominating the exhibit, however, is the gold medal award-winning grille which depicts the Roman God of Fire, Vulcan. It was Colnik’s most difficult piece, taking two years to complete. It incorporates every type of scroll, intricate detail and artistic design that is perhaps possible to achieve in wrought iron. The piece has a balanced, yet asymmetrical design. Its focal point is the face of Vulcan. The detail is extraordinary — blazin eyes, tiny teeth, curled mustache and beard and clawed hands, surrounded by flowing flowers, leaves and scrolls. The piece measures 35½ by 48½ inches.

The Milwaukee Art Museum’s Villa Terrace Decorative Arts Museum at 2220 N. Terrace Avenue is entered through a gate wrought by Colnik. The building, former home of L. R. Smith, was designed by Chicago architect David Adler and built in 1922. It also contains a Colnik stair balustrade.

An outstanding example of the fanciful baroque architectural style is seen in the balcony and porch railings of the former Joseph B. Kelvage home, 2432 West Kilborn Avenue, designed by Otto Strack and completed in 1896. Clarence John Lauglin included this home as part of his photographic exhibit, “Old Milwaukee Re-Discovered,” which was held at the Milwaukee Public Museum in March, 1965. He said that the iron work expressed “exceptional richness of design . . . compare favorably with the best English and French wrought iron.”

Another residence incorporating scrolls, floral motifs and fanciful design is the former Gustave Trostel home, 2611 North Terrace Avenue, built in 1899 in the German New Renaissance style. The front door grille, which covers the upper half of the door, includes a “T” for Trostel in the design; the porch also has extensive wrought iron.

The Captain Frederick Pabst mansion, 2000 West Wisconsin Avenue, has much decorative ironwork by Colnik. There are grilles on basement, front and side entrance and second-floor windows. A particularly fine grille covers the window beyond the orchestra nook off the main floor foyer. The Captain’s initial, “P” is the focal point of the design. A wrought iron chandelier by
Colnik hangs in the Captain's paneled first floor study.

Colnik also worked with the prominent Milwaukee architect Richard Philipp, of Brust and Philipp. They collaborated on the former Gallun home, 3000 East Newberry; and the former Slocum residence at 2675 North Terrace Avenue. Another prominent local architect, Alexander Chadbourne Eschweiler, worked with Colnik on the Charles Allis Residence, 1630 Royall Place; the Nunnemacher home, 2409 North Wahl; and on Eschweiler's own home, at 2810 East Bradford Avenue.

Wisconsin Memorial Park, 13235 West Capitol Drive, is entered through impressive gates designed by Colnik in the style of great English wrought iron gates. He also designed the fence, and a stairway and balcony railing in the Memorial Building and grilles in the crypt area. Colnik is buried at Wisconsin Memorial Park.

Many factors contributed to the decline of the ornamental craftsman. The Depression was significant. Architectural design and tastes were changing as well, and demand fell. Other factors included the difficulty of obtaining materials and labor during World War II and the cost of hand-made ornamental work, which even the wealthy could no longer easily afford. Colnik resigned himself to these changes, retained good spirits, and continued at his forge until he retired at the age of eighty-four years, in 1955, culminating a business career that had flourished and survived for over sixty years.

Cyril Colnik was nationally recognized for his expert craftsman-
ship and creativity in metal. He is listed in the 1932 American Art Annual, "Directory of Craftsmen," and a brief biography describes him as "metalworker." He won the first prize at the Wisconsin Society of Applied Arts 16th Annual Show in 1934. Colnik was a member of this society and a member of the Art Institute of Milwaukee. Colnik also appeared in Who's Who In American Art, 1940. The Wisconsin Chapter of the American Institute of Architects, awarded Colnik a plaque which bestowed honorary membership in their organization. Lectures on his work were presented at the Art Institute of Chicago in 1963 by Dudley Crafts Watson. Colnik and his daughter attended and provided thirty pieces of his work for illustrative purposes; his candlesticks were featured. In the summer of 1977 his works were displayed as part of an exhibit at the Villa Terrace Decorative Museum.

Cyril Colnik became a naturalized citizen on May 24, 1905. He married Marie Charlotte Merz, daughter of a Milwaukee shoemaker the same year at the bride's home, 531 8th Street with evangelical rites. They had one child, daughter Gretchen, born in the Merz homestead. The family rented, living first at 101 8th Street, and when the downtown area became too commercial, moved in 1914 to 133 18th Street. In 1927 they moved to 5104 West Wisconsin Avenue, where the family remained until the return to the Merz family home in 1941.

Colnik was a devoted family man, and "a very patient man," said his daughter. Colnik derived great pleasure in making gifts expressly for his daughter. Among them is a four-candle bronze chandelier, approximately 18 inches in diameter which hangs in her parlor. The design incorporates leaves and flowers. An oil portrait of her father is another treasured possession. It was done by a Milwaukee artist and is signed, although the name is illegible. While not dated, a notation on the back of the painting reads, "300 Colnik, 101 8th St., Deluxe, C.O.D.," putting the date prior to 1914, at which time Colnik moved from that address. A painting of the Triebein estate where Colnik was born hangs in the front parlor.

Reverend Enssworth Reisner, Pastor to the Colnik family at First Methodist Church in Milwaukee, described Cyril Colnik in a televised eulogy which was aired in place of Miss Colnik's television program after her father's death, at the age of 87 years. Reverend Reisner saw Colnik as a man of quality and fine character, who knew "what was right, and true ... and had a quiet independence." He went on to say that he did not care for the material things of life; he had the soul of an artist. That artistry has left a legacy to us and generations to come.

Acknowledgments

A special thank you to Miss Gretchen Colnik and Dr. Russell H. Bartley, Associate Professor of History, University of Wisconsin-Milwaukee.

1Will of Cyril Colnik, Register in Probate, Milwaukee County Court House, MI 1894, November 6, 1958.
2Cyril Colnik, Death Certificate, Register of Deeds, Milwaukee County Court House.
3Naturalization Records, The Milwaukee County Historical Society Archives.

Suggested Reading


Long interested in history, Mrs. Simonsen is earning her degree at the University of Wisconsin-Milwaukee. In addition to her studies, which includes the museum methods course taught here, Mrs. Simonsen serves as a volunteer in the History Section.

This article was published in volume 31:2 of Lore magazine, a quarterly publication of the Milwaukee Public Museum and is reprinted with permission of the publisher. Special thanks to Miss Gretchen Colnik and Lore Editor, Mary Garity, for all their assistance and for the use of additional photos not used in the original article.

Winter '81/82
Drawing down or drawing out a bar of steel is one of the fundamental processes of the smith. In its simplest form the bar is placed upon the anvil and struck, its cross section being reduced between the hammer and anvil face with an accompanying and proportional increase in length and width.

If the heated piece is rotated quarter turns after each blow or series of blows, its width and depth can both be reduced and only the length of the bar increased. Since there is no way to reduce all three factors of length, width, and depth simultaneously without stock removal, it therefore becomes necessary to allow for the increase by calculating the volume of the shorter starting piece which will yield the finished piece of proper volume and size.

When a bar is to be reduced to a new uniform dimension, as in a tenon, it is struck evenly on all four sides with the stock held parallel to the anvil face. Portions not to be reduced are best kept off the anvil face where a stray blow will have little effect. If the final result is to be round, the bar should first be reduced into a square, (Figure 1) then octagonalized, and finally brought to round by light blows struck while the piece is rotated on the anvil face (Figure 2). If the bar were forged round from the start, the result would be less than perfect with a great likelihood that the center would be stressed and cracked.

Drawing out a point on the end of a bar is accomplished by holding the stock above the plane of the anvil with the end to be pointed resting on the anvil face near the far edge. The hammer blows are delivered at a corresponding angle to maintain a centered point. The piece is rotated quarter turns to produce a square point (Figure 3), and if the point is to be round, this square taper is then octagonalized and gently rounded, all in the same general position on the anvil face (Figure 4).

It is best when possible to first form the point on the bar when forging the taper and then extend the taper back into the stock rather than to begin with the taper in the body of the bar and then go for the point (Figure 5). The result is not only smoother but the overall increase in length is more easily controlled. The higher the initial stock angle from the anvil face, the steeper and shorter the resulting point will be.

When drawing out very large stock, or to speed up the reduction of small stock, it is possible to increase the efficiency of the blows by concentrating the force in smaller areas. This is accomplished most directly by striking the initial blows over the horn of the anvil, using it as a fuller, to impress deep indentations along one face, leaving a series of ridges in the stock (Figure 6), then turning the stock a quarter turn and repeating the process on the second face. The amount of fuller can be increased at the end if a point is desired, or spaced evenly if the result is to be even. The distorted pattern of ridges can be easily flattened out at the face of the anvil if the fuller has not penetrated too deep.

A further increase in localization of blows can be accomplished using a straight peen hammer at the horn, the blows on top effecting the same result as the horn beneath. For more control the same general procedure can be carried out using a top and bottom fuller with a striker, a spring fuller with a hardie attached without a striker, or a bottom fuller with a straight peen hammer.

Often it is necessary to reduce a bar in the middle, leaving the ends unaltered. If the section is large enough it can be worked over the face of the anvil, taking care to keep sections not to be worked off the face and away from stray blows. To produce a reduced portion of a specific length at a given dimension, stock calculation is necessary, the extremes being marked and all work done in between the marks. If the specifications are not critical, a close approximation can be achieved by working a portion of the reduction to the finish size, then extending the forged portion in
"Drawing Out"

by Jim Fleming,
Contributing Editor

When the portion in the middle to be worked is smaller than the face of the anvil, set tools are often employed with a striker to move the metal where desired. Usually a top fuller is used followed by a flatter to smooth out the surface. This same function can be accomplished without a striker and set tools with a narrow faced bick anvil which fits the hardie. By using narrower bick irons, shorter sections can be drawn down, just as they are when using the entire anvil face for larger work. A third alternative is to carefully forge the area with the straight peen, though there is a greater risk of messing up the margins with a foul blow.

Most of the discussion of drawing down has so far been directed at reducing the cross section of the stock by lengthening the bar; therefore, most of the blows have been across the bar, at right angles to it, thus forcing the spread primarily lengthwise. When an increase in width is called for, the same basic principles are applied. To spread a bar widthwise, blows are delivered lengthwise, that is parallel, to the stock, using a cross peen hand hammer or a top fuller and a striker (Figure 7). It is often awkward to use the horn for this process, both because of its gentle radius and its change in radius along its length. A bottom fuller is also difficult to use because it is difficult to center, the working portion of the fuller being hidden by the stock.

For work where both lengthening and spreading of the stock is desired when the thickness is reduced, a flat or gently rounded hammer is used. The blows thus delivered force the metal below to move equally in both directions.

The rough forging of drawing down is often followed by finishing operations to refine the surface, contours, and margins of the piece. For this, set tools are used with a striker. When the surface is uneven, a flatter can smooth out the high spots. Scale should first be removed by scraping, brushing, or by dipping the flatter in water just before placing it on the work (the steam generated by the strike blasters the surface of the work free of scale).

The margins of the drawn down portion are often very rough from the tools forming the original transition. If the margin is to be sharp and at a right angle, a side set should be used to start the cut. This tool cuts through the metal, spreading a notch which can be forged into the reduced portion using a set hammer (Figure 8). If the forging is round, the same type of tool can be used if it is modified to cut only the corners, leaving the stock uncut below the desired finished size. This tool is called a butcher. Care should be exercised not to cut too deeply into the stock or the nick will remain as a shut, a weakened portion which will tend to concentrate stress and may break in use. In this same vein, the transitions between reduced and unreduced portions should be left radiused whenever possible rather than sharply angled to avoid the stress concentrating effect that such sharp angles produce.

No discussion of drawing down would be complete without considering the heats of the work at the various stages. The initial rough forging should be started at the maximum temperature the metal will sustain without damage; for mild steel any temperature below sparking is safe if followed by forging through this range to a lower temperature. In subsequent heats the rough forging is worked at lower heats, lemon or below, to avoid unrefined grain growth. Finish work should be carried out at lower temperatures still, the final passes at or below a scaling heat at cherry. In this way the integrity of the metal is preserved and the finish is most refined.
More on Power Hammer Techniques

by Don Hawley

Don Hawley of Oroville, California has, since WWII, been doing industrial sized forgings that would seem gargantuan to most readers of this magazine. We take great pleasure in presenting his well-founded observations and experience with the belief that they will shed more light on the forging process not only to those who aspire to work on a larger scale, but to those who do all their work with a hand hammer as well.
I really look forward to each issue of The Anvil's Ring. It is related to a type of work of which I have done zilch. But new things to me are most interesting, and since there seems to be a meeting, or at least a crossing, of some areas of which I am very familiar, I submit the following for whatever it is worth.

I have great respect for the great craftsmen of yesteryear — their ability to move metal was fantastic. However, much of what they had to say cannot apply today. For example, the excellently researched articles in previous issues of The Anvil's Ring contained several misleading thoughts for today's work with today's alloys. If I had read and lived by some of those thoughts 35 years ago, I surely would have limited myself.

I have read several articles by those really fine individuals who are reviving the art of forging that say, "Mild steel is good material for tongs," or even for cutting tools at the hammer. Unless for a special purpose, such as doing work where it is necessary for your tongs to be consumed by the fire, I feel that making tongs out of mild steel is a waste of time. Not only is it waste of time, but it limits you. For example, the assertion that "flat jawed tongs should never be used" I have heard hundreds of pieces with flat jawed tongs with no problem (⅞" x 3" x 10", 1" x 3" x 14", ⅜" x 4" x 8", 2" x 6" x 3"). I admit you have to use caution when edging up, but if you will make your tongs out of 4140 and put some beef in them, they will do a much better job than mild steel. At the power hammer I have found that even 1040 tongs will not be satisfactory. Of course, use a link on the reins.

It is Time for Name Calling (of Steels)

Sometimes a direct answer, even if not 100% correct is better than no answer. At least it can be a starting point. Answers are needed for the questions "what steel should I use for making swages, or a punch, or new dies for my power hammer, or for cold shearing a leaf from thin material?"

The following is not presented as being the ultimate or only answer to any specific question. It is negotiable. In some cases we realize it may not be the absolute best answer for a specific tool. However, the best answer may be material that you can't buy, or because of your product size, you could not forge to shape on your hammer. An example would be D-Z. Of course, except for very small cross sections, a 50 lb. hammer isn't going to make many tools from any type material. A 250 lb. hammer isn't going to do much to a 2" cube of H-12 material. We won't consider H-21 or D-2, and we probably don't need it.

Trade names are given only for convenience. It is not meant for promotion of any particular material or manufacturer. If you have access to the back door of a commercial forge shop, sometimes trade names are more familiar to the forge man than AISI types in the O, S, H, etc. series.

Thought also has to be given as to how good the tool has to be. Is it a "one shot" deal? Also, material availability has a direct bearing on what can be used. For that reason a more or less "universal" one might be selected. Availability in small quantity doesn't seem to be near as good as it used to be. In many cases 4142 or 4340 can be used in place of tool steel.

Speaking from my experience and material that was available to me, I found that 4142, 4340 (never cooled by water), Solar, Atha Pneu, La Belle Silicon 2, Moil Point, Omega and Chro Mow, filled most of my needs. (Hope I haven't left any out.) However, my past needs may not be yours. Also, many fine steels other than those suggested in this article, are available — for example, the Graphite series. So this by no means is to be considered an exclusive list or presentation. Those who are uninitiated in making their own forging tools could do worse than follow this guide. Because a tool might be made out of 4142, 4340, 5160, 1095, or 1045, it cannot be referred to as "tool steel." These are "carbon" or "alloys," not tool steels.

Excellent information is contained in catalogs available from various steel producers. However, a working knowledge can be a help. For example, you will never see 4142 being recommended for swage dies. We are talking about spring handled swages. They are referring to a "swaging machine." The two applications are far apart. I found 4142 to be very good for what we are talking about, but would not be adequate for a swaging machine.

I can give an example to show why 4142 has proven to be a good material for swages. Over many years it has proven itself. In latter day forging I used it to hammer-swage space age material that, at 2400 F., was harder than C-1020 is when cold. I used a 10,000 lb. hammer to swage 8" round to 3" in 4142 swages. After considerable use, for example, a 3" swage became a 3½" swage due to the hardness of the forged material. The swages were actually "sunk lower" or deeper impressions forged cold. Normally, if a change of swage size occurs, it becomes a 2½" swage from a 2". This is due to the flat areas on either side of the impression being reduced in thickness due to the pounding. This of course brings the top and bottom radius of the swages closer together.

We should remember to warm all tools used at the hammer. Swages should be hot to the touch. Heat treatment of 4142 swages is a simple procedure. If you are familiar with it, I guess Chinese arithmetic is too.

BATTERING, PEENING, DIMPLING at hammer

S-1, S-2, S-5, S-7, H-12 for hot hardmess
BLACKSMITH HAND HELD TOOLS — FLATTERS, FULLERS, TOP SWAGES W-2 light duty; S-2, S-5 Better
BLACKSMITH PUNCHES, DRIFTS cold work W-1, medium use S-1, S-2, S-5, better; hot work S-1, H-12
CHISELS, HAND S-1, S-2, S-4, S-5
DIES, FORGING HAMMER AISI 4340
BLANKING, COLD UNDER HAMMER W-1 short run, thin, simple part; S-7 long run, heavier stock
TRIMMING, HOT AT FORGE HAMMER S-7 medium use; H-12 severe use; AISI 4142 is OK on many short run applications
PNEUMATIC TOOLS S-1, S-2, S-5
PUNCHES, CENTER W-2, S-2, S-5 better
SHEARS, COLD S-1, S-2, S-5
SHEARS, HOT S-1, H-12
SLEDGES S-2
SWAGES, BLACKSMITH USED AT FORGING HAMMER AISI 4142
TONGS AISI 4142
TOOLS USED AT FORGING HAMMER Swages, hand held taper tools (not for tool dressing), necking or shouldering down, hacks, round back flatters, heat treated forms to make swages. AISI 4142

Winter '81/'82
ALLEGHENY LUDLUM STEEL CO.
AL 602 (S-4) Seminole (S-1)
AL 619 (S-5)

BETHLEHEM STEEL CO.
Cromo-W (H-12) Omega (S-5) Bearcat (S-7)

Carpenter Steel CO.
Solar (S-2)

CRUCIBLE STEEL CO.
Atha Pneu (S-1) Alva Extra (W-2)
Chro-Mow (H-12) La Belle Silicon #2 (S-5)

And thanks to these fine companies that have made so much printed information available.

Do You Buy It?

In many things old is great! Especially so in the art of blacksmithing and the blacksmith. He did fantastic things without outside help. He had to work under difficult situations.

One of the more difficult situations the blacksmith had to contend with was the steel supplied him. He was lucky to get two shipments of the same type that actually had the same chemical content. Perhaps that is one reason that some of the information he expounded regarding steel and its treatment may be inaccurate for this place in time. He seldom got “clean” steel. When the mills started to alloy the steel, the blacksmith might get a bar with varying characteristics.

It is no wonder that a blacksmith of yesteryear said, “I don’t trust any bar of steel that doesn’t have a seam in it.” He knew that the seam in the rolled bar disappeared when manganese was added. He must have had a bad experience with a bar that never had that familiar seam. So he writes, “Don’t use steel that contains manganese.” A classic example of information that makes interesting reading, but for today is wrong.

To say that “spring steel means a hardenable low alloy structural steel of medium carbon content,” is not related to the truth at this time. Perhaps at any time. “Spring steel” meant C-1095. This material is not considered an alloy of any kind. It is a “straight carbon” steel. Structural steel does not contain close to .95 carbon.

A specialized steel that may be called “high strength structural steel” (certainly not common structural steel) can be and is composed of about .10-.40 carbon, .10-1.30 molybdenum, .20-.25 manganese, 0.05-.08 silicon, .05-1.00 copper, .05-1.00 chromium, .50-1.80 nickel. That is quite a range! Put in some tungsten and the kitchen sink and you have it all. Not a standard structural steel.

Spring steel of the old common type was C-1095. This steel contains .90-1.03 carbon, .30-50 manganese. However, alloy AISI 5160 is also used for springs. This steel contains .55-.65 carbon, 1.00 manganese, 20-35 silicon, 70-90 chromium. Perhaps good for many things around the shop.

In these times coil springs, flat springs, and torsion bars are made of 5160 by several auto and truck manufacturers. One reportedly uses 9261.

I might suggest to those that find good use for this material, that they be familiar with the spark off the grinding wheel. In a shadow area read and learn the spark. Look for how close to the wheel the sparks occur. Study the configuration of the sparks. Also the color as to white, yellow or deep orange. On high carbon, or 1095, there should be a dense, full and brilliant stream of sparks and lots of sprigs.

Check several samples of springs. With the lower carbon in 5160, the sparks will be somewhat less spectacular. I don’t think the small amount of chrome will change much of the color. Lots of chrome will deepen the color and suppress the sparks.

Some shops may consider W-1 a universal steel. This is the cheapest tool steel available. It can range from .60 to 1.40 in carbon. I sure would want to know which W-1 I was using. It is a straight carbon steel and the spark will definitely show a difference from the low to the high in carbon content. Don’t trust your life on an arc weld made on W-1 steel. Without testing, or knowing for sure, to just know it’s “W-1” leaves much to be desired.

If I produced items such as brackets for kitchen utensils or items that didn’t need good welds, I’d use anything that was forgeable. However, if I had to pick a “universal” steel for around "my" shop, it would be AISI 4140. But I’d sure hate to give up Solar (S-2), Atha Pneu (S-1), Chro Mow (H-12 with vanadium). Price not being any consideration. And besides, I no
longer have a shop!

"A little knowledge is dangerous." I feel I have just enough to realize I don't have very much. However, I do know there is no "universal" steel for "the" blacksmith shop. There is no "the" blacksmith shop today. There are many different kinds of blacksmith shops.

This publication, in general, points to one type of blacksmith, but services many different kinds of shops. The term "blacksmith" does not just refer to that fellow under the spreading chestnut tree. My experience in a blacksmith shop may be far different from yours. Of course I know ABANA, CBA, and the various groups deal with the more traditional blacksmithing. For economic and state of the art reasons, expansion and exposure through personal contact and the printed word can be a rewarding experience. It is for me.

Those who knew him will agree that the little Englishman, Sam Lister, was a fine and clever smith. Perhaps the very best on the vast class of work he did. I knew him when he was the smith for Matson Steamship Co. in San Francisco. Forge welding a 2" diameter chain link out of the gas fired forge was as easy and fast for him as any coal fire forge welding I've witnessed. I never learned his "secret." But thank goodness I didn't have to forges weld the stern frames of ships. However, I do wish I could have been there when my father and crew did that many years ago. To strike the iron shoulder high, might put a kink in the old neck.

In reply to my refusal to be Sam Lister's helper in 1942, he said, "Stay in one shop and what you learn will be very limited." Wish I had worked with him. However, through the "Anvil's Ring," we have a chance "to stay in one shop," but gain from the experience of many.

The Hack

With more smiths adding larger self-contained air hammers along with the "steam" hammer, additional tools can be put to use.

In the industrial forge shops the hack has been a common tool. It is used to hot cut material from 1" square or round to 36" ingots. Other sections such as 1" x 3" of course can easily be cut with the hack.

Sections smaller than 3/4" thick might better be "snapped" or sheared — also done at the hammer.

Let's assume we have need to cut to length 2" square mild or alloy steel. Tool steels such as D-2 should not be considered. However, steels such as W-1 can easily be cut in this manner. To cut our 2" square we could use a hack such as the size illustrated in Figure 1.

We should give the 4" long area an oil quench for toughness. Heat treating forge tools is another subject, but normalize it — heat it to 1600°F and if using a 600° flash point quenching oil, pull it out of the oil "somewhat" below the flash point. Really not according to the book, but it works well. But take the chill off of it before using it.

To hack, heat your 2" square to 1800°-1950° and put it lengthwise on the die (assume it's 8" long) and drive the hack about 3/4" deep, (see Figure 2) turn the forging over and, directly over the first cut, once again drive the hack 3/4" deep. Then give the forging a quarter turn, give a light tap to make it level and, directly in line with the cuts, drive the hack about 1 1/4" deep. Turn the piece over 180° and rotate the hack so the 3/4" wide section is on the forging directly over the last cut. Hit it one good blow to clean out the "rag." A clean cut should result.

If your heat is long enough and several pieces are to be cut from a long bar, make 3 or 4 cuts before turning for the second cut, etc. It is better to have a helper on this, but it can be done alone. A quick dip in the water will keep the hack from getting too hot. However, 4140 should be heat treated in oil.

You may prefer to make your last cut with a "stripper." This would be most desirable when using too high a hack. For example, when using your 1 1/2" high hack to cut 1" stock. On the third cut drive the hack to within about 1/8" of the die, then use a "stripper" with a cross-section of about 1/8". With the third cut on the die, use the "stripper" the high way and hit it a solid blow. The top die will bottom on the forging and keep things right.

No one should stand to the side of the smith, especially if the smith doesn't keep a firm grip on the hack. If no double blows all is well.

When cutting round stock, a total of 3 cuts are made (naturally about 120° turns). Rectangular stock is normally cut once with the hack at least three-quarters of the way through and then "stripped." You may want more than one size hack, or a "circle" hack. In that case the inside of the radius of the hack is at 90° to the struck (or top) surface and all the taper is on the outside. When cutting square stock, you may find the "rag" an interesting configuration.

Even if you shoot par golf, you can still be called a hacker.

The Long Taper

Some of the redwood lumber mills used a "peeling bar" to remove bark from the cut trees. Most mills use a high pressure water process. Those that purchased a peeling bar expected to get a fine tool. It could be dangerous if it would break when a man was hanging on the end of it. Proper forging and heat treating processes were followed.
The finished product is per illustration 3. They were a fine tool for many things.

The first procedure was to put the 1/4 oct. in a ball swage that gave us a 1/4" ball and about 1" of 13/16" round. Then the round taper was forged on flat dies. Hopefully this came about 45° to 46° long. It was then forged very smooth in a taper swage. Yes, a swage, about 8" long. (The flat dies were 5" front to back so the swage overhung the die.) Two or three passes in the swage finished that end of the bar.

Some days your eye may not be so good, and so it may take several passes to forge the rough taper. It then might be necessary to reheat the bar before finishing up in the swage.

Our swages were made from AISI 4142. Once in a while it might be necessary to reweld the mild steel "spring" handles, but the swages never broke. If the final forging was done on the cold side, straightening it after heat treatment was difficult. This was due, of course, to forging strains. A fast "sunshine" heat was worth the time.

A peek into my "little black book" reminds me that to complete an order for 25 bars took the following average forge time:

If 11/4 oct. was not available and I had to forge my own from 13/16" round, I forged approximately 16" of 11/4 oct. This averaged 2.5 minutes per bar. Then the other end was heated and balled, tapered and swaged smooth. This averaged 6 minutes per bar. When the bars were cooled down to handle by hand, the octagon end was heated. It was rough tapered, smooth tapered on a taper tool to about 3/8" thick at point. It was also back tapered on edge. It was finished on a fullering tool (the back of a "round back flattener") to bring the end to 0 thickness. The entire bar was straightened. This averaged 3.5 minutes. So to forge 25 bars averaged 12 minutes each.

The job wasn't over. Then it went to the heat treater. When back, they were preheated and straightened, if necessary. Then the scale removed on a belt sander and the cutting end ground square. Then they were laquered. A couple of them must have had legs. They walked right over to my house.

We are talking about blacksmitheing. Something you might apply to making a railing, hat stand or some other object the artist smith produces so well. I don't happen to feel it is wrong to use the tools of the trade. Of course, at times, it should be done on the anvil with or without a striker.

To produce a "spring" handled pair of swages to hammer forge this taper is not difficult. Since the taper here figures 1/4" per foot, we should have a piece of heat treated 4142 (or equal) about 12" long, to make our swage impression. We want a couple of inches for a long hold and 9" machined from 13/16" round down to whatever size it comes at the rate of 1/4 per ft taper. This should have a nice smooth finish if you want your taper smooth.

Forge a couples piece of 4142 to about 11/2 x 3/4 x 8". Use a piece of 3/4" or 1" round about 9" long and hit to forge a 1/4" deep mark in each block. Center this on the 3/4" surface. Reheat and when forging with the taper sample between the blocks, have equal heat in each piece. The one placed on the bottom die will lose some of its heat while positioning your sample and placing the other block on top, so that first block could come out of the fire at (for example) 2000° and the one to go on top at 1900°. Forge the blocks with the sample between only to the point that when the sample is removed, the blocks come together with the small end of the taper measuring between 3/4" and 13/16" when the blocks are hot.

If you aren't on the coast of northern California or Oregon, you probably will not be making a peeling bar. Being an artist smith, you may want hammer marks on your taper. You could grind "hammer" marks on your sample. That might be cheatin', but could mean eatin'. Or just finish forging your taper on an open taper tool.

If your forging is so long you need a helper to run the hammer for you, he (or she) can hold the taper tool. If you have a short enough forging, use a suitable method to keep the taper tool in position. Or, if you have enough tapers to forge that have the same rate of taper, you may wish to put that taper on a bottom die. It is not necessary to taper the top die.

If a separate taper tool is held on the die, make the front and back edges line up with the top die. Unless you are forging tool steel on the cold side, or lots of thin flat tapers, 4142 is a good material for your taper tool.

Using the peeling bar as an example, roughing down of the taper is done by forging the octagon to a square on flat dies. If you need 14" of the bar not tapered, start your hammer blows very light, about 18" from the end. Forge a square taper to a 3/4" stopper at the ball end. Knock off the corners. Blend in the unforged 4" with the swage, or on the taper tool if a smooth finish isn't desired.

The chisel end was finished on a combination taper tool. It had a standard taper of 11/4" in 7", and a narrower area to the right of that was a reverse taper of 3/8" in 7".

The Bob

"BOB" — An impression making, or forming tool to round the edges of a punched hole, to give, for example, a round edge for a wire or rope type eye (see illus. 4). If the proper site, a "poor man's" bob could be the ball on a ball peen hammer. An "eye bob" will do a nicer job.

At the other end of the shop we used another kind of bob. This is an "impression bob" used to make an impression into each side of a disc forging, for example, in the center of a forged piece of 24" dia. and 5" thick. After "bobbing," a pair of "bobbing" or "spinning tongs" were fitted. With a portion of the disc on the die, it was hammered as it was spun. After working down the edge area, it was moved ahead and another section of the 5" thick material was forged. When the disc was about 2" thick and 50" in dia., the spinning tongs were removed and the 5" thick bobbed hub was placed on the die and flattened down. Because of the shape of the bob, no forging laps occurred.

The finished forging was to be a cyclotron magnet, so the grain flow had to be from the center out like the spokes on a wagon wheel, otherwise the little electrons did not react properly crossing the grain flow. Or as we would say, "it's interstitially all screwed up."

Before forging down the hub, we would stand the forging on the die, and "shingle" it to be sure the disc was round and to make a square edge which was appreciated in the machine shop (easier to hold in the mill).

The Lance

In 1960 I had one of those "impossible" situations. I had purchased a small (by forge shop standards) single arch steam hammer. It had not been operated for several years. For a considerable time before it had been shut down, salt water had been used at the hammer to help the forging procedure on the items this hammer produced.

For several years without the key being knocked loose from the bottom die, heavy corrosion had taken place. A sledge would not do it. It was too close to a brick wall to swing a battering ram. The die was longer than the srow block and longer than the opening in the hammer frame that en-
circled the sow block.

While it may be possible to remove a hammer, die, sow and separate base (or anvils as it is called) as a unit from a low building without room for a crane, to say the least, it would be awkward. I could have used the cutting torch and cut off the ends of the die, but did not want to destroy it. The key had to come out sooner or later.

Several phone calls for help produced only, "That's a tough one." I knew that 42" dia. ingots were cut at Bethlehem Steel in San Francisco. I was advised they did it with a lance. I came up with the arrangement illustrated in figure 5.

The procedure is to get the end of the key hot enough to cut with a conventional oxygen-acetylene cutting torch, and then be ready to turn on straight oxygen. It was suggested I use 80 to 100 pounds pressure. I used 80#.

If the type of burning is necessary that produces "blow back," stand behind a plate. I tell you that this kind of burning is most "violent" if not done on an "outside" surface. I felt I was really making fast progress. Molten metal was blowing back "like crazy." However, the burn pipe was mostly being consumed. I really could not see much with the welding helmet on.

You have to be ready to flip up the hood, unscrew the burned pipe and get a new one working in a hurry. I burned in about 6" deep and never had enough pieces of pipe. So my job cooled down. When ready to go again, I couldn't use a heating tip to heat up the end of the key. Another welder was available, so I got the end of the key hot by burning welding rod on it. The "lance" got going again and I went through the remaining 16" in good shape.

You may not find it necessary to remove a 22" long key. However, this tool can be useful for many other things. In 1980 one very large engineering firm was doing some milar work and experimented some difficulty. They were trying to clean out old packed slag and scale from 8 blind holes 5" in dia. and 10" deep. This was in an 84 ton anvils block. One man had worked 7 days and only got one hole clean. The material was too hard for cutting tools.

I suggested the lance. They phoned a welding firm and the remaining 7 holes were cleaned in 2 hours, counting set up time. However, they now use a lance made out of magnesium.

It's fun — but be careful.

P.S. I must have had beginner's luck, as only the key was burned.

Air Hammer? It's a Steam Hammer Operated on Air

Between heats the properly adjusted hammer should hold the ram in the up position at least for the Stelz or Chambersburg self contained motor driven units and the air operated steam hammers as well (there may be some other opinion on that one). I have also observed "skull crusher" belt hammers come to rest with the ram raised.

I have seen only 3 steam hammers operating on air using the foot pedal method. All 3 were adjusted to have the top die sit on the bottom die when there was no foot pressure on the pedal.

To me, this is an unnecessary inconvenience. But then, I have never worked at a steam hammer that was operated with a foot pedal. It always had an operator that used the steam lever and the hammer lever — one in each hand.

After operating a steam hammer for some time and then having it operate on air some getting used to. It is somewhat more difficult to run the hammer on air. It responds quicker and so has more of a tendency to "run away."

Steam hammers have individual personalities. Depending on the hammer and the shop it is in effects the way it runs. Of course this may be due to several different reasons. Perhaps the piston rings are worn out, or the cylinder is worn to a barrel shape, (most wear in the middle of the stroke) or the maintenance has been poor and the steam or hammer valves are worn, or maybe the sword (or wiper arm, or monkey tail as some call it) has been worn flat or even been broken and not repaired correctly, or if the hammer is operating on steam perhaps one hammer is operating on dry steam and another one is sucking water, or wet steam. Or maybe the guides are too tight, or there is a variation in steam pressure.

I know of one shop that continued to run a hammer when the cylinder was so worn in the working area that upon occasion the piston ring would jump out of the piston groove and when the ram was "let up," the ring would jam and it would be necessary to drive wedges between the ram and the cylinder casting to get it down. Quite a sight.

Recently, "by accident," I purchased a cute little 500# (it weighs 1010#) Chambersburg steam hammer set up to operate with a foot pedal. It had been running on air as I also got the receiver tank. I'm "retired" and I told my wife, "I'll never get it, but I have to bid something."

(continued)

Volume and Weight of Steel Balls

Here is a table that has been useful to me. I used it to help me figure the forge weight of eye bolts, clevises, logging hooks and one, two or three ball ship storehouses.

If you are making an eye bolt or a flat round pad at the end of a bar or in the center of a bar, and it is to be a smooth O.D., it will pay you to use a ball swage. It is easy to figure the pad size; maybe it is 3" in diameter and 1" thick. Three inch round by one inch long weighs 2 pounds. You then allow for a rounded edge (like a doughnut) unless you flatten it in a tool to give a straight side or edge it up in another swage for that purpose. O.K., what size ball do you make? The chart says a little over 2¼.

<table>
<thead>
<tr>
<th>DIA.</th>
<th>CU. IN.</th>
<th>WT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>0.8236</td>
<td>0.1483#</td>
</tr>
<tr>
<td>1½</td>
<td>1.0227</td>
<td>0.2895</td>
</tr>
<tr>
<td>1¾</td>
<td>1.7671</td>
<td>0.5001</td>
</tr>
<tr>
<td>2</td>
<td>2.8062</td>
<td>0.7941</td>
</tr>
<tr>
<td>2½</td>
<td>4.1888</td>
<td>1.1655</td>
</tr>
<tr>
<td>2¾</td>
<td>5.9641</td>
<td>1.688</td>
</tr>
<tr>
<td>3</td>
<td>8.1813</td>
<td>2.315</td>
</tr>
<tr>
<td>3⅛</td>
<td>10.889</td>
<td>3.082</td>
</tr>
<tr>
<td>3½</td>
<td>14.137</td>
<td>4.001</td>
</tr>
<tr>
<td>3¾</td>
<td>17.974</td>
<td>5.087</td>
</tr>
<tr>
<td>4</td>
<td>22.449</td>
<td>6.353</td>
</tr>
<tr>
<td>4⅛</td>
<td>24.942</td>
<td>7.100</td>
</tr>
<tr>
<td>4½</td>
<td>27.611</td>
<td>7.814</td>
</tr>
<tr>
<td>4¾</td>
<td>30.466</td>
<td>8.680</td>
</tr>
<tr>
<td>5</td>
<td>33.510</td>
<td>9.483</td>
</tr>
<tr>
<td>5⅛</td>
<td>40.196</td>
<td>11.37</td>
</tr>
<tr>
<td>5½</td>
<td>47.713</td>
<td>13.50</td>
</tr>
<tr>
<td>6</td>
<td>56.116</td>
<td>15.88</td>
</tr>
<tr>
<td>6⅛</td>
<td>65.450</td>
<td>18.52</td>
</tr>
<tr>
<td>6½</td>
<td>75.767</td>
<td>21.44</td>
</tr>
<tr>
<td>7</td>
<td>87.113</td>
<td>24.65</td>
</tr>
<tr>
<td>7½</td>
<td>99.541</td>
<td>28.17</td>
</tr>
<tr>
<td>8</td>
<td>113.10</td>
<td>32.01</td>
</tr>
</tbody>
</table>

Winter '81/'82
The unit is stored in an equipment yard. Not ever having worked around one like this, I was anxious to see what it would do. I connected the tank and rented an air compressor. With a wood 2 x 4 in hand, I pushed on the pedal (the valve was set for the hammer to rest die to die). I "teased" the hammer to go, and go it did — like a sewing machine. I had done a no-no and bought it sight unseen — but this one looked like it had never made a forging. It took me 2 minutes and it was adjusted for the top die to be in the up position when my foot was off the pedal. The amount of air it took to hold the ram up was minimal.

To come out of the furnace or forge with a heavy or awkward piece (such as Simon Benetton did at Santa Cruz) and not be able to swing it right on to the die, to me, is a waste of heat, time, and energy. Even a very small piece that loses its heat fast is a penalty.

Not having worked in a shop that had a foot operated steam hammer, I admit ignorance. If there is a reason not to adjust the valve so the ram rests in the up position, I will appreciate your response. If you are going to be away from the hammer for an extended period of time, use a shut off valve.

You all know that the main difference between the foot operated steam hammer and running it with the levers, is that only one lever is normally connected to the foot pedal. This lever is connected to what is normally called "the steam lever." I guess the other lever is called the "hammer lever" because the hammer won't go unless that lever is used in a position that permits the hammer to go.

Perhaps all of you pounders know that when a hammer driver operates the hammer, many of them will pull on the steam lever to a desired position and almost exclusively operate the hammer lever. This can't be done safely under all conditions. It is more difficult when operating on air. When doing this it is necessary to "choke" the hammer.

Operating with the hammer lever, rather than the steam lever, has the great advantage of safely hitting one blow at a time, or hitting a "holding" blow (which can be dangerous if you do it under certain conditions) or "squeezing" with the hammer.

The steam hammer to squeeze or hold, is a very useful tool. Of course you can do it by putting the hammer lever down and opening the steam valve. With a 6" dia. piston (or whatever you have) and 100# pressure on the line, you have a nice bending tool. A stout "V" block for use on the bottom die is a must.

After I get the wallpaper hung, the new cabinets up in the kitchen, the rest of the boxes unpacked from our recent move, a garage sale or two completed (I'm afraid our rain will be here, and my hammer is outside) — but when I can, I am going to play with my "peanut cracker" and see if a "conversion" idea I have, will work. For if it does, it will give your air operated steam hammer a new dimension I am sure will please you very much.

I have read a few articles regards the forging hammer. Not one has mentioned pre-heating the piston rod, or dies, or tools before using them. This is mandatory in the commercial forge shops. When operated on steam, you can heat the rod by "raising the hammer." Perhaps doing small light work as ABANA does, it is felt this is not necessary. But at least in the cold climate, use a pre-heating procedure. Always warm any tool to be used under the hammer.
Work by O.L. Olson

by Wallace Yater

This incredible work was done by Danish immigrant O.L. Olson who was born in Randers, Denmark in 1864. He served his apprenticeship in Copenhagen where his first big job was the hardware for the box pews in the Church of Our Saviour in that city. In 1888 he came to Brooklyn, New York where, up until WWI, he had his own business making such things as window guards, railings, bank teller screens and the ornamental light fixtures on the Brooklyn Bridge. After the war he worked in Danville, Pennsylvania until his retirement in 1938. He lived another twenty-four years, reaching a venerable age of 98.

He made roses out of solid stock which he gave away as samples of his work. The little, six inch tall statue of Hephaestus at his forge is made from solid stock with the animal skin tunic added on. The one inch long tongs in his left hand work just like those of standard size. To the ancient Greeks, Hephaestus was the god of fire, metal working and, to a lesser extent, craftsmen of all sorts. He was an especially important god as metal working was highly advanced in the Greek world. Craftsmen were numerous and their work was exported far and wide.

The wolf’s head was also made from one piece of solid stock. It was first roughed into shape. The first detail work done on it was the teeth and tongue inside the mouth. After that, the exterior hair, ears and eyes were done.

The music table and fire place equipment are traditional subject matter for the smith, of which Mr. Olson’s are exceptionally fine examples.
1. “Organ of Corti” (to be included in the upcoming exhibition at the Victoria and Albert Museum of London) forged by Michael Spencer of Port Medway, Nova Scotia.

2. Clockcase by James Horrobin of Carhampton, Minehead, England. Made in 1974 using old longcase face and works (a gunsmith’s folly). Side pillars and crown plate are damascus barrels, 22k gold in ribbing. Side panel size about 6” X 10”; stock size to start was ¼” X ½”; all forge welded.


4. Miniature blacksmith shop by Thomas M. Latané of Annandale, Minnesota. Thomas stated in his letter, “Enclosed is a photograph taken by my wife, Catherine, of the interior of my latest miniature creation. The blacksmith shop is on a one inch to the foot scale. All the tools are forged mild steel and operate as their large counterparts. The leg vise has a tempered miniature leaf spring, and the post drill, which is not shown, advances by a small cam and ratchet mechanism.”
showcase

The shop was built for a customer in Baltimore, Maryland where I lived until this summer. I am now working in a building at the Minnesota Pioneer Park near Annandale. The park has built a shop to house the tools donated when the old Annandale blacksmith shop was torn down. I plan to get this shop in shape to operate for visitors next summer when the tourist season picks up. I enjoy the way working with larger iron forgings and with miniature houses balances the exciting heavy work with the fascinating, but often tedious, miniature carving. I plan to continue both the blacksmithing and the miniature model businesses.

5. Gate by Nol Putnam of Madison, Virginia. A 30” x 72” gate of mild steel commissioned for an entrance way to an early 19th century estate. One looks through the iron to old box bushes and a kitchen herb garden. The verticals are all mortise and tenon, and the leaves and branches are tacked and forge welded.

6. Candlestick by James Horrobin of Carhampton, Minehead, England. Made for the smallest complete church in England; bobeches was forged under the power hammer. Photographed by Andrew Priddy photography.

7. Hand Mirror (rear view) by Dale Wedig, Iowa State University. Made of mild steel, Damascus patterned weld, brass and copper in completion of Masters of Art Degree in the Department of Art and Design.

8. Hand Mirror (front view) by Dale Wedig, Iowa State University. Made of mild steel, Damascus patterned weld, brass and copper in completion of Masters of Art Degree in the Department of Art and Design.

9. Side entrance gate by Terry Clark, Hampton Court, Surrey, England. Forged from 20mm square bar and 40mm x 10mm flat stock; finished in eggshell black and dry brush silver.

10. Detail of entrance gate by Terry Clark (illustration 9).
1. Shop sign by Klahn & Sons Inc. Ornamental iron of Honolulu, Hawaii. Made for their own business in the old English tradition, it is a genie with a hammer who has harnessed fire (dragon) on an anvil, with leaves behind a trail of ornamental work. The dragon and genie were sculpted in microcrystalline wax and then cast in a bronze-brass alloy using the lost wax method. The upper dragon is aluminum and was cast onto the wrought iron bars and gold leafed. Repouse work is 1/16" sheet metal and all joints are rivet and collar type. A "good fun" project.


4. Spoon and fork set from the "Black Heart" series by William S. Rogers of the Dragon's Breath Forge, Alexandria, Tennessee. Each is 12" long with the scrolls being done by cold chisel on flat stock, tapered and twisted. The brass bowl is attached with copper rivets inlaid into the steel. Photograph by Pat Casey Daley.

5. "Wall Sconce II" a collaborative effort of blacksmith, William S. Rogers and ceramist, MaryAnn Fariello. "Collaboration affords the opportunity to solve aesthetic and technical problems in a new way. It's a symbiotic approach. We draw in the strengths of the individual media: the structural and linear quality of the iron balances the color and imagery of the clay." The piece measures 12" × 8" × 6" and is made of wrought iron, raised copper and brass. The tiles are porcelain with photoceramic decals. Photograph by Pat Casey Daley.
Plate XI from Diderot, No. 8 in the sequence published in the Anvil's Ring.

Title: Serrurerie, Large Work, Balustrades and Handrails.

Fig. 1 & 2. Balustrade and hand-rail with simple bars and without surrounding framework (chassis). AA, etc. the bars. BB, the points to be sunk in the stringers. CC, the base-plate for the stringers. DD, the plates-bandes of the balusters.

3 & 4. Balustrade and hand-rail with simple bars with chassis. AA, etc. the bars. BB, the squares of the stringer. CC, the squares of the balustrade. DD, the hand-rails.

5 & 6. Balustrade and hand-rail with arches with tenon. AA, the arches. BB, the collars. CC, the squares of the stringers. DD, the squares of the balustrade. EE, the hand-rails.

7 & 8. Balustrade with hand-rail, with arches top and bottom. BB, the collars. CC, the squares of the stringer. DD, the squares of the balustrade. EE, the hand-rails.

9 & 10. Balustrade and hand-rail with arches at the top and volutes at the bottom. AA, the arches. BB, the collars. CC, the volutes. DD, little collars of the volutes. EE, the squares of the stringers. FF, the squares of the balusters. GG, the hand-rails.

11 & 12. Balustrade and hand-rail with frames. AA, the frames. BB, the squares of the stringers. CC, the squares of the balusters. DD, the hand-rails.

13. Panel, curved and tambourined, that is to say, finished with curved plates, on which we give the contour to the volutes placed there.

14. Part of the balustrade with curved panels at the bottom.

15. Other panel with curved frame.

16. Part of a balustrade with framed panels.

("Notes" continued next page)
Kirkland’s notes for plate XI in Diderot Vol. 9 (No. 8 in the sequence of plates published in the Anvil’s Ring)

This plate depicts only railings for stairways including the horizontal railings for landings (Fig. 1) and the inclined railings for the steps (Fig. 2). Iron railings of this general type were used on stone, wood, and iron stairways. Note in Figures 1 and 2, which are the simplest designs, that points are provided for mounting this type of railing on steps made from any material. Diderot doesn’t mention how the other railings (Figures 3 through 16) were fastened to the stairways. These were presumably mounted using a variety of spikes, pins, brackets etc. most of which were pointed for driving directly into sockets or split and spread into a “Y-shape” for sealing into masonry, stone, plaster etc. Much of the building hardware and fasteners are shown in Plates VIII and IX of Diderot which were not included in the series published in the Anvil’s Ring.

Joints in Figures 1 through 4 were probably tenoned as shown in Plate XIII (number 10 in the series published) or riveted. Very little mention is made in Diderot of using bolts and nuts for this purpose.

Figure 5 introduces le lien à cordon, a form of collar both decorative and functional, finding extensive use in this type of ironwork particularly in the seventeenth century. These were sometimes made of molded lead but most frequently of wrought iron. Note that no holes are required to be made when a collar is used.

The text for Figure 13 implies that the curve in this work is created by forming the pieces on a curved panel; the finished work is shown in Figures 14 through 16.

The stairway railings — balustrades — were usually waist-high. The hand rail proper could be a simple flat-bar as shown in Figures 1 and 2 or with a more decorative section. Plate 50 of Diderot (Serrurier), not published in the Anvil’s Ring, illustrates 16 different styles of hand-rails ranging from the simple flat-bar to “half eagle’s-beak with concave quarter-rounds.” These decorative shapes were hand forged using swages similar to Figure 13, plate 31 in the series published in the Anvil’s Ring, titled “Serrurerie, Outils de Forge.” In the 1800’s and after, these shapes could also be factory-produced by rolling machinery thus sparing the blacksmith a tremendous amount of hand labor. Sometimes the flat-bar (bandelette or plate-bande) at the top of the balustrades was finished with a hand-rail (main courante) of walnut or mahogany wood fastened in place by screws.

Historical Notes

Stairways have been used since ancient times in Central America, Egypt and Greece. Stone, such as marble, was frequently used. The design was similar to modern stairways: on the inside of the building, one end of the steps was fixed to the wall and the other end was fixed to some type of enclosure or framework. The spiral staircase, an invention attributed to builders during the Middle Ages, existed also among the ancients, at least among the Greeks. In the pillars of a bridge built by Justinian on the Sangarius is found a perfectly helical staircase. The Arabs employed a spiral staircase in the mosque of Hassan. The Romans also used spiral staircases in their temples. However, we think of the spiral staircase as being used principally in the Middle Ages. These staircases were mounted on a massive newel and were popular in military construction, offering easy defense, could be conveniently built to considerable heights in a small space, and were easy to repair. They were also popular in churches, cathedrals and official buildings, for example, bell-towers, lighthouses and clock-towers. (The tower of the Great Clock in Rouen, France, is a popular tourist attraction today; the stone spiral staircase is still used daily). Spiral staircases were also used in the chateaux or mansions, usually in the circular or polygonal towers. This is one application we usually think of because this architecture provided some very ingenious combinations. For example, there were those staircases having a “double-screw” such that one party would be able to descend on one set of steps and another party could climb the other set of steps simultaneously without seeing or encountering each other.

One of the most intriguing spiral staircase designs (of wood, 17th century France) consisted of the steps mounted spirally inside of a vertical cylindrical shell. The entire staircase and shell could be rotated 90 degrees around the vertical axis. This design offered considerable security as one could climb to the top of the helix, enter his room, then turn the stairway such that the cylindrical wall formed the door to the room. Pursuers, thieves and the like could unwittingly “walk into space” when they reached the top!

During the Renaissance many beautiful spiral staircases were constructed in the abbeys. One remarkable spiral staircase, in which each step is a single slab of granite, was built in the Psallette at Nantes, France. Other famous spiral staircases are at the château of Blois (Francis I, 1515-24) and the double circular staircase at chateau Chambord (begun in 1519), both in France. A similar spiral staircase is at the abbey church of St. Gilles, of hewn stone, built around a circular newel and covered with a semicircular rising vault (the screw of St. Gilles). Remembering that these spiral stone staircases were designed and built before iron was sufficiently plentiful and available in pieces long and stout enough to play significant strength and structural roles, these stone staircases are a tribute to the ingenious mathematical design of the architect and the skill of the stonemason and stonemason.

In the 1800’s many private residences and public buildings in the United States contained spiral staircases. An excellent example is the staircase still in use in the offices of The Mathematical Association of America, 1529 Eighteenth St. N.W., Washington, D.C. This staircase is principally of wood with artistic vertical forged-iron braces supporting the hand-rail and balusters at intervals.

During the 17th and 18th centuries straight staircases were very popular in the “sumptuous homes” and public buildings. These staircases are the types depicted in the Anvil’s Ring, and we think of them as “modern.” Diderot concentrated on the design of the railings for stairways and omitted details of the steps. The design of the steps submits to certain general principles which apply to all stairways. Two of these will be discussed briefly in the following section. (A more detailed discussion will be included in my forthcoming book on “Ironwork, Woodwork and Stonework of Early France.”)

Staircase Design

Modern architectural design has been influenced considerably by the introduction of steel and concrete. Steel permitted simple plans of straight runs with delicate railings, a design that departs very little from Diderot’s designs of 1750. Reinforced concrete, conversely, permitted curves and sweeps which were structurally sound.
My design notes refer mostly to straight runs and I will furnish some information, principally on the dimensions of the steps, which Diderot omitted. Most of my data is from E.O. Lami (Paris, 1880) but is just as sound today as it was then. The decimal values are the result of conversion to English units from the original metric units.

The second design principle is that the height is the same for all of the steps in the same staircase. Also, based on experience, the maximum number of steps is 21, which a person can walk without fatigue, from one landing to the next, the landing being the 21st step. Therefore, the greatest number of steps in a flight is 21.

Today, elevators and escalators provide the principal transportation inside modern buildings but stairways, offering alternate and emergency routes, are apt to remain an architectural element for a long time.

Figure N-3 depicts the two general classes of balustrade: (1) open string-balusters mount directly on the stair tread; (2) closed string-balusters mount on a slanting stringer.

---

Blacksmithing Books
1. Artist-Blacksmithing Illustrated, Wolf, (German text), $23.75
2. Blacksmithing, Drew, $9.95
3. Blacksmiths' and Farriers' Tools at Shelburne Museum, Smith, $9.95
4. Catalog of Drawings for wrought ironwork, CorSRA, $14.00
5. Colonial and Early American Lighting, Hayward, $4.50
6. Decorative and Sculptural ironwork, Metall, $8.95
7. decorative antique ironwork, Alleman, $8.95
8. Decorative ironwork, CorSRA, $8.75
9. Decorative ironwork in wrought iron and other metals, Peln, $24.95
10. De Be Metallica, Agricola, $17.95
11. Designs of Contemporary Decorative Iron Work, Vol. II, (German text), $17.50
14. Direx Metal Sculptures, Mollich & Saldan, $12.95
15. Early American Ironware: Cast and Wrought, Kaufmann, $4.95
16. Early American wrought iron, Sower, $19.95
17. Edge of the Anvil, Andrews, $8.95
18. Metals for the Engineering Craftsman, CorSRA, $8.25
19. Methods of the Artist-Blacksmith, Wolf, (German text), $15.50
20. Gates and Screens, Schindler, (German text), $14.95
21. Practical Blacksmithing, Richardson, $7.98
22. Practical Projects for the Blacksmith, Tucker, $9.95
23. Professional Smithing, Streeter, $19.95
24. Southwestern Colonial ironwork, Simmons & Turley, $14.95
25. Staircases and Railings, di Michier & Klasemer, (German text), $18.95
26. Step-by-Step Furnituremaking, Boye, $9.95
27. The Art of the Blacksmith (Revised), Bozler, $16.05
28. The Art of the Wheelwright, DeWitt, $2.95
29. The Art of Wrought Metalwork for House and Garden, Schmier, $49.50
30. The Artist-Blacksmith Otto Schmier, Schmier, (German text), $39.50
31. The Blacksmith and His Art, Hawley, $12.50
32. The Blacksmith's Craft, CorSRA, $8.25
33. The Blacksmith's Source Book, Fleming, $17.50
34. The Making of Tools, Weygers, $9.95
35. The Modern Blacksmith, Weygers, $6.95
36. The Recycling, Use and Repair of Tools, Weygers, $6.95
37. The Shaping of Steel, Kuhn, (German text), $29.50
38. The Practical Handbook of Blacksmithing and Metalworking, Blondford, $11.95
39. The Work Methods and Tools of the Artist-Blacksmith, Schmier, $29.50
40. Wrought iron, (German text), $8.25
41. Wrought Iron, Kuhn, (German text), $22.00
42. Wrought iron, M. Bau-Herhold, (German text), $36.95
43. Wrought Ironwork, CorSRA, $8.25
44. Wrought Ironwork for House and Garden, Baticchi, (German text), $29.00

California residents add 6% sales tax; Add $1.35 for the first book plus 35¢ for each additional book to cover postage and handling; Money Back Guarantee — full refund when returned postage paid within 10 days; Priced are subject to change without notice; Send check or money order to: Norman A. Larson, 5426 Hwy. 246, Lompoc, Ca. 93436
The following article on spiral stairways first appeared in the 1899 edition of the International Library of Technology (credited to the Colliery Engineer Company). We thank ABANA member, Terry Steele of Bridgeton, Maine, for access to this material.

**SPIRAL STAIRS**

A type of circular stairway, similar to that described on drawing plate entitled, "Winding Stairs" in the section on Architectural Drawing, is shown in Fig. 1. This stair is suitable in some such position as an engine room, from a sidewalk to a subcellar, or from an attic to a dome or tower, or in any position where space is limited. The construction is of the simplest character, and consists of a central core or wrought-iron pipe \( a \) resting on a plate \( b \) at the bottom. The treads and risers \( c \) are of cast iron in one piece, with a collar to fit over the pipe \( a \), so that in erecting the stair the risers and treads are slipped on as shown at Fig. 2. In order to keep them in place, the upright bars of the railing \( d \), Fig. 1, are continued down through each tread near the front edge to a lug, or projection, \( e \) on the back of the tread immediately underneath, and secured with a nut. The top riser acts as a brace to hold the pipe in place, and is fastened to the beam with a wrought-iron strap of any suitable shape. There are no strings to be bent in this stair, but the hand rail \( f \) must be bent to the proper curve. This rail is composed of a small channel iron with a \( 1\frac{1}{2} \)-inch wrought-iron pipe on top. To bend any bar or pipe, the most
satisfactory results are obtained by the use of rollers, preferably run by power, as shown in Fig. 3, one of these rollers being capable of adjustment, so that the pipe or bar may be bent to any required radius. In this way, not only is it possible to give the hand rail the necessary curve, but, as the amount of rise per foot is known, it can be given this upward direction at the same time by setting the gauges, or guides, a and b to the proper angle. It is presumed the stair is erected before the hand rail is bent; and to determine if the rail has been bent to the proper curve, it is laid over the top of the steps, and corrected, if need be, by hand. It might, however, be required that the hand rail should be bent and set quite independently, and assuming that the rail were a flat bar, \(1\frac{1}{2}\) in. \(\times\) \(\frac{3}{4}\) in., it would be accomplished as follows: An end view of a tread and riser would be laid out in outline, the sizes being taken at the center line of the railing, as shown in Fig. 4 at b. A part plan of the stair, showing two treads, would then be drawn, as ce and af, with a dotted line ed, through the points e and f where the tread lines intersect the outline of the stair plan. Then, from a as a center, and with a radius equal to b (the true length of the rail over each step), arcs would be struck on the curve, the intersections of which, g and h, with the line cd would give points in the true curve of the rail. A circle described through the points g, a, h would give the curve to which the hand rail should be bent. The bar is then bent to this new radius and twisted evenly along the whole length of the stairs, in the manner and with the tools shown in Fig. 5. It will be found that the whole bar has now the form of a helix, and is of the required radius. Before being twisted, the positions of the balusters should be marked on the bar, and the holes for them bored or punched, as the case may be.

At (b) and (c), Fig. 1, are two plans, one showing the start at the cellar-floor level, and the other the finish of the stairs at the platform. The detail of the connection at the platform, and the method of securing the baluster through the tread, and details showing the corner of the platform and the pipe forming the rail, are shown at (d) and (e). The platform is strengthened by the ribs g cast on the under side.
The Finishing Room

In one corner of great granddad’s shop was a space with a wooden floor. In this area on long benches were various hand tools and hand powered machines for drilling and grinding. Others were run with a foot treadle like a sewing machine. On the bench a wide variety of jigs used to guide one tool in the making of another, e.g., files, were made from annealed tool steel by scribing in a jig that locked the bar in place while a hardened wedge-shaped cutter was pulled across it.

A long rack up near the ceiling held oak and hickory rods used for handle material. Occasionally cow bone, horn and deer antler were used for knife handles.

The work in this corner was very time consuming and required long hours of concentration in order to attain the necessary skills. This is the area where my father learned the value of filing a straight line in iron or steel. Here was a place where habits were developed at a young age that allowed the craftsman to develop his or her artistic talent. I have watched my father use hand operated or cranked machines with more precision than one run by electrical power.

A walk into my shop today provides a view similar to the shop that my father worked in. The large bench I use was his along with most of the hand tools. I also have some of his electrical equipment including two grinders, a drill press and sanders.

The tools that I use are not unusual and can be found in most garage type shops. I no longer make my own files or for that matter do I use hand cranked machines with the exception of the forge. But in spite of the use of some modern tools, most of the work is still done by hand.

My finishing room is an area where the jobs started on the forge are completed. The knife blades that have a crude shape are silhouetted, shaped, sanded smooth, drilled or threaded and sent back to be hardened and tempered. Afterwards, the blades are ground and sanded in preparation for the hilts.

The many woods in addition to hickory and oak are still end grain sealed and stored high in one corner near the ceiling. Antler and cow horn are cleaned, hollowed and stored in cans for curing. A wide variety of brass, bronze, and nickel silver is stored for shaping into guards and pommells.

Perhaps the items that have changed the most between then and now, besides the steel, are the abrasives. Previously, one used various abrasive powders of different grits sprinkled on leather coated with glue. The leather was then fastened to wooden wheels and used to smooth and polish the steel and wood. Now, the abrasive not only comes fixed to the paper or cloth, but new materials like silicon carbide have joined the list of traditional ones like corundum (alumina-alumina oxide) and crocus of iron. The use of buffing compounds has likewise expanded.

What follows is a list of the various tools and machines which I use in the construction of a knife with a brief description of how I use them: a ½ horsepower, high speed 1” X 7” grinder and wheel dresser. This tool is used twice in the operation, once to shape, i.e., silhouette, the knife and, after heat treating, to thin and shape the blade and tang; a ½ horsepower motor mounted with a 9” V-shaped wheel for hollow or concave grinding; a ½ horsepower motor mounted with buffer and cut-off wheel (steel); a ½ horsepower side wheel, 4” sanding disc used to flatten stock and wood; a ½ horsepower motor connected by a pulley to a soft 2½ × 18½” rubber wheel (Hy-Pol) available in lapidary and jewelry supply stores. This small, inexpensive wheel fitted with sleeve sanding belts is a most useful tool. With 36 grit belts I can grind; with finer grit belts (120-600 grit), I can smooth and polish; 3 electric hand drills: one is small and high speed. These tools are used to drill both steel and wood. The small drill is fitted with crane wheels for removing scratches. Cratex (trade name) is rubber that has

---

Karl Schroen of Sebastopol, California, is a professional cutter who has been making knives since 1949. He learned the trade from his father. A grandfather and two great-grandfathers were also smiths. In the March 1979 issue of The Anvil’s Ring, Karl explained how he was writing a book on knife making based on his over 10 years experience of developing the forging and heat-treating techniques for all categories of modern alloy tool steels.

That project now complete, Karl has decided it would reach the largest audience and have the greatest impact by appearing in serialized form in The Anvil’s Ring. We now take great pleasure in presenting you the fifth installment of that work and on behalf of the readers, thank Karl Schroen for his great generosity.

© 1980, Karl Schroen (no part of this may be reproduced without permission of the author).
been impregnated with abrasives; an oxy-acetylene (or oxypropane) torch fitted with microsize tips. I use this apparatus for soldering on the guards with low melt, All-State stainless steel solder (paste and wire type) No. 430 (Note: Read instructions for use carefully before using oxy-acetylene); several steel block heat sinks plus clamps. Heat sinks absorb and dissipate heat in this case, away from the knife blade and tang. Note: Propane is cheaper than acetylene and burns cleaner. Duzall flux is very important with no. 430 solder. I even used it with the paste solder that already has a flux with it. Yellow ochre powder is mixed with water to control the flow of the solder (produced by Dixon Co. and available at craft supply stores); flat, precision ground steel plates — 1" thick 12" X 12" for flattening wood to bone, brass to steel, etc.; files — 4"-6" open cut, engineering type; fine, smooth precision files have a tendency to clog and are unsatisfactory for my work; Buffing wheels and buffing compound, i.e., stainless, emery, tripol — it is important to keep the wheels separate for each compound; Nu-Life abrasive belt cleaner, an art gum type of material that is excellent for cleaning sandpaper and abrasive belts which helps prevent overheating of the material (available from local distributors of the Abrasive Service Co., Inc., P.O. Box 128, 56 New Britain Ave., Unionville, Conn. 06085); three step finish for use on bone, wood, antler, ivory. I have used this material with very good results on a variety of materials. It helps waterproof the handle and prevents expansion and contraction of the tight fitting joints. It includes sealer, wax, and finish (made by General Finishes, 1580 S. 81st, Milwaukee, Wis. 53214); assorted hammers, punches, feeler gauges, scribes (for metal); glues — Epoxy, household type, rubber cement, cement for gluing sandpaper discs to side wheel sander (Feathering Disc Adhesive); sandpapers — I use a wide variety of aluminum oxide and silicon carbide type papers available in most hardware stores; hardwoods — (see USDA Forest Service Research paper FPL 125 Mar. 1970 Material for leather and sharpening are listed in these sections); Safety Equipment and Practice, Forest Products Lab, Madison, Wis. Goggles and a safety shield are very important for eye protection as are ear plugs (frequently sold in hardware stores and tool stores) and disposable masks and cartridge-type safety masks. My work area is small and easy to control with plenty of windows for venting fumes and cleaning. Modern chemicals and electricity are the source of most hazardous conditions in my shop. Aside from electrical machines with moving parts, other unexpected dangers arise in the shop. Steel particles accumulating in electrical plugs can cause fires.

The forged blade blank is silhouetted to the shape of the finished knife. The blade is then sanded on either side to the desired thickness. Any filing, drilling or threading is done before the blade is hardened and tempered. After the blade is heat treated, the final shaping and polishing is done. Next, the guard material is selected, measured, tapped and/or drilled. The guard is slipped over the tang and made flush with the blade. The guard is soldered in place and the excess solder is scraped and sanded off. The handle material is measured, sanded flat, drilled and slipped over the tang. If the knife has a metal pommel, the brass or bronze etc. is measured, flattened, tapped and threaded. All of the pieces are assembled, shaped, glued, and put into a press to set. When dry, the hilt is sanded to the final shape and the last step is to put on the three finishing coats.

Along with the mechanical steps, I will include both my design and aesthetic approach to this art form. I would also like to emphasize that the methods, tools, etc. that I employ, may not exactly fit someone else; this description fits my style and perhaps may be employed by anyone with the desire to try the techniques.

My idea of a knife is that it is an extension of the hand; as such it should be comfortable to hold. I draw many of the shapes that I use from forms such as birds and fish which display to me both balance and grace. It is one thing to visualize these shapes but quite another to combine them into a durable art object that will stand up under everyday use.

I prefer, in most cases, to look for the simplest solutions to knife making that

Knife Finishing Procedures

What follows is a description of the steps that I take to convert a relatively shapeless blade blank into a finished knife. I will first give the general procedures used so that the reader will have a preview of the steps before the necessary details are supplied.

press for a glued knife

1" thick steel plate that has been precision ground

wood, brass, etc.

establish tip of blade on a line

1/8" X 6"

inlet with grinder

widen as knife increases in length and weight

weak spot in knife

round off square edges to prevent "notch" effect or stress points from developing

C

D

E

F

B

cut off wheel

establish tip of blade on a line

inlet with grinder

thread tip of tang

cut off wheel

C

D

E

F

B

press for a glued knife

1/8" X 6"

wood, brass, etc.

1" thick steel plate that has been precision ground

C

D

E

F

B

summer '81/'82
satisfy me. For example, knife balance is comfort in use. The hilt should be so constructed that you feel that your hand has an extension which is cutting. Therefore, the shape of the knife is the most important thing to me. Each blade shape is contoured for ease of function. Any sharp blade will cut, but some shapes cut with less effort. By the same token, for every blade shape, there is an ideal handle to match. The trick is to be able to find that combination.

I believe there are no hard and fast rules for the construction of a knife. Whatever works is what is best for any particular situation. Through long experience, I have learned to follow certain patterns.

Regardless of the blade length, the tang must be at least as long as the palm of the hand is wide, and preferably longer. This usually means from 3½" to over 4" long. The only exceptions that I encounter are short-bladed knives with blades 2½" and smaller. The hilt must have support throughout its length. My hilts run from 4½" to 5" long and the tanges vary from 4"-4½" long.

The junction of the blade and tang is a weak spot in a knife (Diag. C). I widen and thicken this area to protect it against the stress of a lifetime of use. Square corner filings are to be avoided when possible because they are stress points. Thus, round off sharp edges when encountered in shaping the tang. As the knife design calls for a wider or longer blade, so, also, the junction of blade to tang must widen and thicken to accommodate this change.

Of the many other details to be discussed, the most important concerns the fitting of the many joints. Where one piece of material meets another, that area must show the closest possible fitting. The time spent in achieving this tight fit is sometimes great. I spend much time on this both to strengthen the piece and preserve the flow patterns.

I start the blade design by sketching the silhouette on the forged blank (Diag. D). I use the grinder and cut-off wheel to do the shaping. Even though the blade has not been heat treated, it can be damaged by grinding too hard. Now the sides can be smoothed to a uniform thickness (½" or thinner). Once the scale has been removed on the sides, I determine what style of blade contour that I want. This varies from flat sided to concave with many contours in between (Note: the blade has enough metal along the edge to thin down after it has been hardened). Regardless of whether or not the blade is flat or concave, it should ultimately be thin near the edge, as thin blades cut far more efficiently than thick ones.

Adjust the side thickness so that the area where the guard will be has flat parallel sides. This area will be the thickest part of the knife. The guard slips over the tang and fits evenly to the blade. I use the guard size and shape to balance the whole knife. For small, light knives, the guard may be ⅜" thick. At the other extreme, the guard may reach ¾" thickness. I also use thin guards to accentuate the handle material. Heavy guards bring added weight to a heavy knife that may be used for chopping.

The design possibilities for the handle have been drastically altered with the advent of modern glues. This material is not perfect however. I have found that epoxy loses its strength when exposed over a long period of time to the air. To minimize the exposure of the glue, I try to eliminate it from all joints. In this way the epoxy will serve the purpose for which it is designed — to hold — without shrieking away from the tang. Do not use epoxy to secure the guard because, after much experimenting, I have found that solder is stronger and longer lasting.

Threaded and Drilling the Tang

In addition to epoxy, I use two methods for attaching the handle. The simplest involves drilling one or more holes in the tang and the handle material which is in turn held in place by a pin made of stainless steel or brass.

The other method is to thread a piece of brass, bronze, or nickel silver to the end of the tang (Diag. D). I first thread the tang tip using a threading tool while the tang is soft (annealed). Frequently, the tip of the tang is too hard to thread and requires re-annealing. A matching threaded hole is put into the pommel.

If this style handle is used, I make the guard and pommel first and then fit the handle material in between the two.

Handle Material

I have found that there is a wide variety of acceptable natural materials that can be used for making handles. I select materials that by their nature will not shrink to any great degree. All natural materials, e.g. wood, antler, bone, ivory, and even very dense equatorial hardwoods, contain small amounts of water. I therefore use kiln-dried wood and aged antler, bone, etc. I generally keep newly acquired material one year or more before using.

The next requirement is wear resistance and toughness. Many hardwoods fit these requirements very well, e.g. cocobolo, pau (Brazilian ironwood), wenge, Brazilian rosewood and many more.

I have learned to stay away from less dense woods like maple, walnut and zebra wood, etc., because they are not as wear resistant as the ones listed above. If you can press your fingernail into the wood, then it is too soft, regardless of its looks. It may also be more porous and expand and contract on becoming wet and consequently dry out.

I enjoy combining various woods so they will be both pleasing and durable. For example, I select one to two inches of a dense wood, like cocobolo, and secure it adjacent to the guard. Then I fit the remainder of the handle with goncalo halves. Or instead of a wood near the guard, I sometimes substitute another material. I try to butt the most dense material near the guard where the fingers squeeze and wear the handle. Even ebony, which has a tendency to crack in large sections, may be safely used in this area.

The ANVIL'S RING
When working with these materials, work them slowly so that they will not overheat. I sand with an open cutting sandpaper. I usually start with a 36 grit paper and work to 80 grit. When the crude shape is established, I concentrate on assembling all of the parts making sure that they fit perfectly together. Having a large flat surface upon which to sand makes all the difference in the world (Dia. E). Note: The most important skills to develop with wood in making handles is learning to drill straight, narrowly defined holes that match the tang shape, and proper holding positions for the wood when pushing it across the sandpaper in order to make it perfectly flat.

Woods that have open grain types like oak, wenge, hickory etc., require special handling because of their tendency to splinter. I rasp or sand across the grain very slowly when shaping and after the finishing sanding, apply generous sealers to the surface to seal the wide open pores.

Antler is an excellent handle material. It is a connective tissue outgrowth of the skull which subsequently becomes calcified bone. The core of the antler is spongy material with blood vessels which furnish calcium and nutrients to the antler.

The bone of the antler is thicker near the skull and is thus more desirable for handles. I judge antlers on both the length toward the tip of this thick portion and how well this material has been preserved. The most desirable racks that I have used have been stored inside for long periods of time and have dried out slowly. I avoid antlers that have been outside too long and have either cracked or decalcified.

Hollowing out the dry spongy material must be done with great care so that the hard bone does not become too thin. The most difficult place to hollow is the area adjacent to the button. I start hollowing the cavity with the electric drill and finish with a series of gouges and long, thin wood chisels. I remove as much of the spongy material as I can, so that the space may be taken with epoxy glue.

If the antler is thick, it gives you the chance to mold and sculpture the material in many ways. If impatiently sanded, the finish is like marble.

I sometimes drill the tang and antler or wood in order to put a retaining pin in place. This operation requires lots of practice. I have tested knives with and without the pin and found no difference as far as durability is concerned. The determining factor of handle longevity, I feel, is the preciseness of the fittings and the quality of the glue (Dia. F).

Another material that is somewhat similar to antler is ivory. Ivory is much denser and harder than antler and bone. I occasionally use ivory in the place of antler. It is very hard but can be brittle, so I only use it in small sections. I sand ivory with great care since it has a tendency to surface check if overheated. In fact, heat or direct sunlight can cause this material to crack.

Very old ivory, or fossil ivory, is also used to some extent for handle material. Fossil ivory is very hard material that has, through the ages, been changed by the continued deposition of minerals into the ivory. I treat this material in the same manner that I do modern ivory.

Up to this point, I have described the construction of knives with narrow tangs that are surrounded by the hilt. Since I prefer this style, I have emphasized it. The full-tang knife handle design has a tang that is a silhouette of its final shape in steel. The handle consists of slabs of material attached to either side of the tang. The handle is attached with pins that pass through the tang and handle.

When I forge this type of knife, I cut the steel to the desired length, silhouette the tang and forge out the blade.* I next grind the blade shape that I desire and drill holes in the tang for the guard and handle. Never use an oxyacetylene torch to cut out the steel, as it will completely destroy the steel for an unknown distance from the cut.

I secure the guard with two pins which are clamped tightly and soldered in place. Next, the wood or antler is fitted. An easy method of securing the slabs is to first glue one side, drill through the handle material and tang when dry and glue on the other side. Put the pins in last, being very careful not to injure the wood. Be sure the pins (brass welding rod) are the same size as the holes that you drill.

Whatever type of natural material I use, the requirements are the same; a combina-

*(Note: stock lengthening depends on the original width, i.e., \( \frac{3}{16} \) goes to \( \frac{1}{8} \) width, with an increase of about 2" in length.)

In the future, we shall deal with two subjects that are related to knives — sharpening and sheathing. □
hammer handles for

REPOUSSÉ
TECHNIQUES

by Nahum G. Hersom

In the Fall 1981 issue we presented an informative article by Mr. Hersom relating the basics of repoussé techniques. We are pleased now to present the second half dealing with the important matter of a comfortable hammer handle.
Hammer Handles

Much has been written on the subject of hammer handles, and, like other tools, many craftsmen have their preferences as to size and shape. There is a formula which has been passed down to me by my master. The eye of the hammer should be in proportion to the mass and the front taper of the eye goes two-thirds of the way through the metal. The front side of the eye is approximately one-quarter larger than the back side or handle side of the eye.

I saw my handles out of straight, fine grain hickory, ash, white oak or elm. The dimension "A" in the side view of figure 8, is wide enough to fit the smith's hand. This is important to have the necessary control. To make a pattern, use a handle that will fit loosely in the hand. At no time must any hammer from a repoussé hammer to the largest sledge, be gripped tightly. A properly held hammer could conceivably be pulled out of your hand by someone. (Placing the thumb on top of the hammer may in some cases give better control, but experience has proven that in the long run, constant use this way will injure the upper thumb joint at the wrist and the associated tendon. As my old friend used to say, "Thumb off the top if you don't want a broken wrist. Keep it wrapped by the fingers.") The dimension "B" should be a slight swell so the loosely held hammer will not work forward in the hand and to shape the handle so it more nearly fits the smith's hand. Smiths who have thin hands such as I, need a different shape than those who have fat, thick hands. Finger length also makes quite a difference.

The throat must be made thin and narrow to act like a spring. The weight and size of the hammer head determines the throat size. The other lines on the drawings are where the corners of the sawed shape have been ground or filed off, using a coarse file and smooth sanding. This octagonal handle has more hammer control than most commercial handles, which are not usually deep enough and have a tendency to turn in the hand when the head strikes the metal. Most people who use my hammers really like the feel of the handle and the hammer's balance. I usually make my handles and mount them in the head. I then strike the hammer on a fairly solid object. The spring in the handle and the resultant bounce can be felt. Experience will tell you when it seems right. Continue to shape the throat until the hammer feels right to use. This includes all hammers from sledges down. True, you may break a few more handles, but the shock damage on the hand and arms will be lessened. Oil the wood thoroughly with whatever kind of oil you prefer.

The chart accompanying this article is only approximate, as I have handles whose dimensions I have varied to fit the application. No matter what the final hammer handle shape, experience and experimenting will determine a handle which will be just right for you.

When doing repoussé work, since the hammers are doubleheaded (each end the same shape, but different sizes), it is often necessary to flip the hammer over. This is done with the thumb, rolling the top head toward yourself as the hammer is lifted. The octagonal shape facilitates this action much better than the commercial shapes.

I have contacted and received some of the metal Serge Pascal called black plate 1005, from Armco Steel Co. (see A.R. Dec. '80, page 36). However, in my contacts with their research division, they said that the proper name for this low carbon sheet is "Univet .003% carbon." As yet, I have not hammered a complete leaf, but what pieces I have tried sure work beautifully, and deep drawing is possible. Their research department is willing to help with problems which arise, and to make material recommendations for future work.
Tips and Techniques

Steeling Iron
Lloyd Johnston
Beaverton, Ontario

I've been going through The Anvil's Ring for about the fourth time digesting all the little parts I missed on the last trips through. I came across a comment in the Diderot translation section, which I'm very thankful for, on page 36, note 3, regarding the barbs on applied steel facings. "Its exact function is not clear." Perhaps there is some question about the usefulness of these little barbs.

Throughout the 18th, 19th and early 20th centuries this was a very common practice, and, even earlier I would guess, not only in France but other parts of Europe and N. America. I first encountered this technique a few years ago when an old fellow (one of my resource people — he's now 80) says to me, "Boy, did you ever draw up a Kirby?" was in my head. "What the hell is that, Jack," says me. He explained that the little barb, Kirby, tit, serre, I call it what you want, was very helpful in steeling a piece of iron. Around here horse rasps were used because they had these things ready made and it was a good source of scarce and expensive tool steel.

If you have ever tried to weld tool steel to iron, you soon realize that the steel and the iron reach a welding heat at different times. In the case of the hammer face the reason they reach a welding heat at different times is partly because of a difference in chemical composition. If you're going to try this, heat the piece of steel you're going to use as a facing and draw up the Kirby with a diamond point chisel like this:

Do about 4 or 5 of them. Allow this to cool slowly until you can pick it up in your hand. Next, take the piece to which you're going to apply the steel and forge and shape it up. Take a good cherry red heat on it and, while it's heating, set the steel piece on top of your anvil ready for the other. When the iron is hot slam it down onto the steel and they'll stack together until you can get the two of them back in the fire to get them to a welding heat. At welding heat bring them out and weld them on the anvil. This may take a bit of rehearsing for somebody trying it for the first time, but you get the hang of it after awhile. I've found it to be a satisfactory technique for use in reproducing 18th and 19th century tools and kitchen gadgets. It's also a good way to add a hardenable surface to the frizzen for a flintlock gun.

Instead of welding the steel piece on, sometimes the piece was brazed or copper soldered. Sometimes a rivet was substituted for a Kirby as a method of joining before welding or brazing.

Undoubtedly some of the older smiths will remember welding toe caulis on horseshoes. The store-bought caulis had a Kirby to help you get the caulk on. My dad tells me that when he was a boy working with my grandfather they made "toe corks" out of old shoes. Evidently this was a common practice of the time, since other smiths who practiced at that time around 1930 did the same. One old guy I talked to — he's now 94 or 95 and quit just 6 years ago — said, "Makin' toe corks was the first job I did. Made 3 barrels (45 gallons) of them," then decided it was time to do something else so he went to another shop to learn the trade with somebody else. Can you imagine making 3 barrels of those things? I'd go nuts.

I hope this has shed a little light on this business. This practice of steeling iron is not a recommended practice today obviously because of the time involved. A superior tool or whatever can be produced by using tool steel throughout, unless a museum client is willing to pay extra for this authenticity. With this authenticity game you can have a little extra fun and get paid for it.

Hickory's Handle
John Dittmeier
Dover, Delaware

Hickory refers to Beau who, at Santa Cruz, revealed to his audience a hammer handle having a saw cut through its top third in the same plane as the face. This allows flexing of the handle and gives soft hands which, according to Beau, can be an embarrassment. To make the handle more pliable, soak it in linseed oil for a week, keeping the head portion above the oil — a suggestion from the Quinell fellows. Then there's Jim Fleming's idea of drilling a deep hole into the base of the handle, filling with oil and plugging with a wood pin. All these allow the handle, not your arm, to absorb the shock of your hammer blows.
Spring Fuller Use
Carol Sakowski
Barneveld, Wisconsin

I have found more uses for Francis Whitaker’s fullering tool (see illus.) . . . The one made from a piece of round stock with a flattened area in the middle to provide spring action . . . Remember it? (Vol. 7, No. 4, p. 36, Dec. ’79) It is truly a handy tool. My favorite use for it is in tapering pipe for any number of uses, from the ends of thills for driving carts (not terribly artistic, but lucrative). I purify the cart with some scrolls or for making flowers and birds from pipe. I had just started experimenting with making birds and other critters from pipe before I went to Tipp City this year. I saw George Katai there, and he made 2 birds from pipe that almost moved by themselves. I like to find out I keep good company, mentally . . . Anyway, Francis strikes again with his spring fuller, and underscores Dimitri’s observation that “you don’t need elegant tools to make elegant things — just an elegant thought and some simple tools.” Thank you both.

Welding Tips
Woodson Gannaway
Ozark, Arkansas

Found my anvil buildup rod, haven’t squeezed preheat into out of them so I haven’t run any yet. Guess if I was desperate I’d guess, calling the anvil 1070 and preheating accordingly — that would be 500-800 degrees F. I’d certainly run some tests on RR rail (1070 if it’s not turnout rail) before approaching an anvil. McKay Hardalloy 58 is the rod, typical deposit analysis % C-0.6, Mn 1.3, Si 0.6, Cr 2.5, Mo 0.5. Typical hardness, RC on 1020, one layer 45-55, two layers 55-60. Ac or DC+. “A martensitic alloy for hard, tough deposits on carbon and alloy steel parts. Proper preheat is required for crack free deposits. Applications include machine components, tools, sliding metal parts, etc.” Price I got was about $2.50 a pound. I assume their hardness figures are as deposited.

Here’s a quote from our welding book. “A perfectly dry electrode is the first requirement for a perfect welding job, especially when the job requires low hydrogen or other moisture-prone electrodes.”

So get an old frig with a good door seal, put a socket and light bulb in the bottom, racks above for your rod, and keep them dry.

Riveting
James Fleming
Bonanza, Oregon
taken from Elementary Wrought Iron by J.W. Bollinger (an out-of-print and copyright-free publication).

Rivets are made of soft iron, and can be had in a variety of sizes and lengths, and with various shapes of heads. Round-head rivets are perhaps the most common.

1. Select the right diameter rivet. Do not use a rivet so large as to weaken the pieces being joined, nor so small as not to be strong enough.

2. Use a rivet long enough to project beyond the pieces being joined for a distance equal to the diameter of the rivet. If too little projects, the head will not shape up large enough; if too much, the end of the rivet will bend over out of shape.

3. Lay off the holes accurately. Drill them 1/64 or 1/32 in. larger in diameter than the size of the stem of the rivet. The tighter the rivets fit, the less upsetting will be needed to make the rivets hold; if the holes are too large, the rivets will bend over out of shape.

4. Place the rivet in position. To protect the head of the rivet, place it over another rivet set clamped in the vise, or over a metal block with specially prepared hollows in it to receive the rivet head. (See A, Fig. 43.)

5. Occasionally it will be found convenient to have a very short-stemmed rivet set, to set on the anvil, and another set with an off-set or shoulder in it, to get at otherwise inaccessible rivets.

6. Upset the stem of the rivet until the rivet fills up the hole. Shape the head (a) with a rivet set and hammer, as at A in illustration, or B with the ball of the machinist’s hammer, as at B, Figure 43.

7. Test the joint to make sure that it will hold.

To Remove a Rivet. 1. Chisel off the head of the rivet and drive the rivet out with a long tapered punch, or 2. chisel or saw the two pieces apart and punch out the parts of the rivet. 3. When the rivet will not punch out, run a smaller size drill into the rivet until it works loose.
Conference Iron Pour
Dwight Irish
Hammond, Oregon

Iron Pour — UCSC —
ABANA, CBA Joint Blacksmiths Conference, Friday,
Aug. 22, 1980

Guest Artists:
Jim Schwartz
Tony Hoffman
Organized by:
Dwight W. Irish
Thomas D. Gipe
Wayne E. Potratz
Special thanks to Doyle Freedman instructor of sculpture
UCSC.

Fire Lit: 9:10am
Well burned: 10:10am
Burning at tuyers: 11:15am
Burned in: 12:30
Back burned: 12:36
1st charge: 12:37
1st drops: 12:40
Fast drops: 12:42
Bottled up: 12:41

# tap out: 100
Total wt. Poured: 600#
Each charge: 40# iron
7% coke
12oz. Limestone
8oz. copper
8oz. ferrosilicon

Windbox pressure: 9-11"
Bed ht.: 15"

<table>
<thead>
<tr>
<th>Charge</th>
<th>Time</th>
<th>Taps</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12:37</td>
<td>1</td>
<td>1:02</td>
</tr>
<tr>
<td>2</td>
<td>12:40</td>
<td>2</td>
<td>1:22</td>
</tr>
<tr>
<td>3</td>
<td>12:44</td>
<td>3</td>
<td>1:40</td>
</tr>
<tr>
<td>4</td>
<td>12:47</td>
<td>4</td>
<td>2:04</td>
</tr>
<tr>
<td>5</td>
<td>12:57</td>
<td>5</td>
<td>2:22</td>
</tr>
<tr>
<td>6</td>
<td>1:10</td>
<td>6</td>
<td>2:40</td>
</tr>
<tr>
<td>7</td>
<td>1:14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1:21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1:37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>1:46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1:48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2:07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2:15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3¼" refractory (90% magnesia, 10% calcium aluminate cement)

½" steel stock preheat zone

Pressure read-out

2" pipe union with Pyrex watch glass

Steel windbox melt zone

Air valve

Air supply connection

1" tapered slag hole

1½" steel well

1¼" tapered tap hole

Sand

Steel stand

Hinged drop bottom

Approximately 100 lb. Tap Out Capacity

Editor's Note: The past conference at Santa Cruz included a demonstration of the allied art of ironcasting. Here, courtesy of Dwight Irish, is an illustration of the cupola used and relative data from the iron pour in Santa Cruz. We would like to know if there is interest for more information about foundry techniques.
Coke Over Coal

John Dittmeier
Dover, Delaware

Bill Gichner and I have purchased six and a half tons of industrial coke from a Philadelphia plant. Delivery was by dump truck which daily hauled Delaware chicken manure (our finest) to lower PA and, except for this run, returns home empty.

For coke's outstanding qualities, we prefer its use over coal. Coke burns hotter and cleaner. There is no visible smoke (should I say, fumes) and the flames are blue. Clinkers are infrequent and small. For its lower density, the smith receives more volume per ton of coke at a price comparable to coal ($67 per ton FOB from Philadelphia Coke as of August, 1981) plus ease of handling for its lightness. The most important benefit, though, is the elimination of fire management—no wet packing, no sprinkling, no delicate maneuvering of workpieces between green coal and new coke. The outcome is greater production.

The smallest size available from Philadelphia Coke is 'Range P,' equivalent to a golf ball. That's large for a smith's forge. The English coke breeze has the effective size of a marble (cat-eye) and as such is much better suited for a quick return of the workpieces to the fire. If you do approach a coking plant, please be courteous and grateful. Our small purchase orders are not that profitable for the firms and could be stopped by set minimums.

(Note: keep your coke dry. Moist coke may 'pop' when heated.)

Selected Streeter Tidbits

William D. Young
Montclair, New Jersey

This past Spring, I attended a very informative and enjoyable one day workshop given by Donald Streeter. I just recently got my notes organized into readable form, and Mr. Streeter kindly checked them for accuracy. The enclosed material is the result, which I believe our fellow smiths will find as valuable as I have personally. Step-by-step procedures used by Mr. Streeter for latches, hinges, and other pieces can be found in his book, Professional Smithing, W.D.Y.

Notes from the Donald Streeter Workshop of May 16, 1981, Held at Woodbury, Connecticut:

Time is your biggest investment. Make every blow count. Use the position of your thumb on the hammer handle for control (as illustrated in P.S. book and Anvil's Ring, Dec. 1980, p. 45) and don't twist your wrist.

When forging decorative cusps, etc., keep the edges thick until almost done, so they won't overheat and burn.

For complex pieces which will be made repeatedly, make "forging templates"—sample pieces forged to one or more intermediate stages between start and completion. These serve as a visual guide to the proper size and shape of the work as it progresses, and help to assure uniform results (also have a sample of the finished piece, of course).

Don't put too much water on the fire — the excess steam will throw up more fly ash and "blow the fire apart."

Soften (bevel) corners next to fullering, to avoid hot shunts.

A short grip on a heavy (about 4 lb.) hammer gives more accurate blows than a bigger swing with a lighter hammer.

To draw or spread stock, as for thumb latch cusps, without having a lot of chop-marks which must be removed afterward, use a crospeen with a very blunt profile and finish up with the hammer face and anvil horn.

A "butcher block" wire brush has flat strips of steel for bristles instead of wires. It is much stiffer than the usual wire brushes and much better for removing scale from hot work.

Keep work straight and symmetrical as you go along — work right and left sides equally.

Look at both sides—left and right or front and back—to determine if a piece is symmetrical. It is much easier to observe this way than by looking at only one side.

It goes without saying — work it on the bar as long as possible, to avoid use of tongs.

In the 18th century, iron was expensive and labor very cheap. Thus the hardware of the period is graceful and tapering, with no more metal than is needed in any part.

Always insist that dimensions of your forge work are nominal — no two pieces will be exactly alike, just as the old ones weren't. What counts is the unity of each piece.

Don't hit too hard working little corners.

Iron is a plastic material — think of it that way.

Keep thumb on top of file handle for better control.

"There are no flats in a curve and no curves in a straight line. As long as you keep them separate, you're OK."

There should be a clear demarcation between straight and curved lines. Similarly, door handles should have a sharp angle where the curved handle meets the straight cusps.

Mix borax and E-Z weld (powdered soapstone) for a welding flux. Borax melts at a low heat and keeps the other stuff from falling off.

(continued on next page)
“Streeter Tips” continued

Barbs are not needed on latch-keep shanks if they will be driven into an oak frame but are desirable for pine. Butt hinges couldn’t be used before the development of machine-cut woodscrews.

Foliated H-hinges, also called “Queen Anne,” were sometimes tinned on the face (exposed) side — especially so for casement windows.

German and French style hinges were customarily made with rolled eyes — English ones with welded eyes.

Parts may often be “Leveled” (aligned) even if the anvil or workbench is not exactly level. Sight from the workpiece to some convenient reference line (such as a windowframe). If the angle (or parallelism) of the work and the reference remains the same, whichever way the work is turned (right to left, etc.), then the work is properly aligned.

Rolled hinge-eyes:
1. Cut the end of the stock off on the hardie to start the taper. Thin down more on horn and face of anvil and trim end straight across.
2. Make a shallow, troughlike, lengthwise curve in the stock before rolling, to pre-compensate for the tendency of the edges to curl outward.
3. Roll the eye a little undersize, and drive a pin (drift) through to adjust it. It is much easier to open up an undersize eye than to close up an oversize one.

Use a 1/64 oversize diameter pin to establish clearance for moving parts — for example: 3/64” for a hinge with a 1/8” pin.

Conversely, when sizing a hole which will have a pin welded into it, use a 1/64” undersize drift pin, to ensure a tight fit.

The shank of the hinge pintle which will be installed at the TOP of a door must be either barbed or drawn out to a length which will allow it to be driven through the door frame and clinched on the other side. There is a lot of tension exerted on the top-pintle when a door is in use.

Barbs may be quickly cut by striking the edges of the stock with a hot set having a very sharp edge (i.e., it is used like a hatchet).

Mild steel is the preferred material for a cooking fork, as it is less likely to split than wrought iron.

Descaling: light scale can be removed by immersing a piece in muriatic acid for a few minutes, then wash thoroughly in hot water and bury in hydrated lime to neutralize the surface. (Note — muriatic acid is a commercial grade of hydrochloric acid — accidents with this stuff are bad news. Use safety equipment and be careful.)

“There is no place for purists except in museum smith shops.” (Regarding the use of jigs, presses, and other aids to speed the work.)

Staple bending jig: This consists of a pivot-pin which is clamped vertically in the vise, and two bending-arms (levers) which hinge on it and bend the staple around the pin. (See illustration in P.S. book & AR Vol. 6, No. 3, p. 8.) Note especially that with both arms free to swing around the pin, the legs of the staple can be quickly equalized in length. Just pull on the arm with the longer leg, and it will shorten up as it bends around the pin.

Fireplace Brooms

Don Morelock
Brownwood, Texas

After taking up blacksmithing, my wife became as interested in the work as I and wanted to help anyway she could. Her most valuable asset was learning to make the traditional handmade broom.

The two techniques I use are having the broom made on a prepared iron handle or attaching to a ready made broom.

In making the iron handle I have found 1/2” to 3/4” stock gives the best appearance. About 7 1/2 inches are needed below the grip to attach the broom corn. This allows an inch of iron showing below the grip. From the bottom measure up one inch, center punch, go up another inch but turn 90°, center punch and drill both holes 3/16”. Set a metal pin through and protruding 1/2 inch on either side. A few light blows to either side and it is securely fastened. After your preferred finish it is ready for a broom maker.

If a broom maker is not available and you have a supply of brooms you can do this. Depending on your handle design, cut the wood handle off two inches above the broom corn. Round the wood off smooth with a rasp and sand paper. Attach the iron handle; I use three simple leaf designs. Once a snug fit is obtained it is fastened with rivets and epoxy.
A Safer Cold Cutter
Don Hawley
Oroville, California

On page 8, figure 5A of Vol. 9, No. 2 is a dangerous type of tool to use for cutting cold stock under a power hammer—even on C-1018. A low profile of about 45 degrees would be much safer.

A New Twist
Carol Sakowski
Barneveld, Wisconsin

Lately I have seen “so many” handles which appear to have been braided that it isn’t even funny. Bruce Daniels was just here for a week, teaching, and he brought me a poker with such a handle. Not only is it a truly pretty tool, but it feels good to hold, as well. He taught us how to make his version of the “braided” handle, and I pass it on to you.

1. Take 30” of \( \frac{1}{4} \) OD or \( \frac{3}{8} \) OD and fold it in half. Heat it and twist it the whole length.
2. Fold into thirds.
3. Forge-weld the ends, trying not to draw the stock out too much.
4. Forge-weld one end onto the stock of your poker. \( \frac{1}{4} \) OD works very well.
5. Make a collar for each end of the braided handle and forge-weld it on.
6. Form the end of the poker. Bruce’s looks like the enclosed diagram.
7. Take a red heat on the braided part and untwist it slightly.
8. I had a time trying to get my collars to weld on, so I “cheated” and it came out looking pretty neat. I took some \( \frac{1}{4} \) OD and wrapped it around the two ends of the braided section in a spiral and forge-welded it in place. You lose the roundness of the \( \frac{1}{4} \) OD, but you still have a pretty pattern on your “collar.”

90° bend at transition between flattened areas

flattened 90° to flattened part above bend
straightening “I” beams and other hard scrabble

by Wallace M. Yater

So far the so-called “energy crisis” has been more worried talk than reality. Most people simply complain and go ahead and pay more for the comforts and conveniences they have grown accustomed to. However, as expanding population and diminishing resources further collide more people will be forced to reuse, rather than recycle. Such old Yankee adages as “waste not, want not” and “use it up, wear it out, make it do or do without” will acquire new meaning. This will reopen and enlarge a whole field of work for the blacksmith as straightening, repair and re-use become more a matter of economic necessity than choice.

Most of us, myself included, much prefer ornamental work where we have a chance to be creative and develop new techniques and designs. However, to our frustration, we find that most of our customers want repair work instead and if we are going to be able to afford a little variety now and then in a diet of road kill rabbits and ground hog casserole, we had better spend most of our time trying to give them some satisfaction. For every ornamental bird feeder, piece of furniture or screen I make, I probably get ten bent or broken machine parts and tools. This does not mean that from time to time one should not go into the shop and make something for one’s own self or “just for fun” — as this is essential to skill development and keeping a fresh interest and enthusiasm in the craft.

I had one neighbor wrap his wheel rake around a tree and bend it up so badly that I’ve had to cut it apart, straighten the parts and weld it back together. To add insult to injury, he went out the next summer, hit the same tree again and bent it up worse than before. Fortunately, I had help then, as this new tractor drawn equipment is so much heavier than the old horse-drawn variety.

There is a lot of useful stock available from dumps, wrecking sites, scrap yards, etc. Some of it is available for free or quite reasonably if one is willing to straighten it for re-use. If the bends are not too many or sharp enough to damage the strength of the material this can be quite worthwhile. Much of the stock I use is of this reclaimed variety and as long as you have more and bigger pieces on hand than a particular job calls for, it will not compromise your work and may even improve it by permitting the use of more and heavier, or better grade, pieces for the same price.

With persistence, many things that do not at first appear practical or even possible can be mastered and done economically. Straightening “I” beams is one of these. The legs are taken off a forge which is placed in a pit in the ground so that the work does not have to be lifted up more than about a foot. Only one flange can be heated at a time. Start with the sharpest kink first. Chain or clamp the hot beam over a cold one with the belly of the bend up with a steel protected block directly under it. Jack the beam a little past straight, allow to cool for a few minutes, let down, sight and jack again if necessary. Residual blue heat will allow it to creep some. In order to work quickly, all clamps, jacks, blocks, etc., are set up and adjusted before the heat is made. Help on this job is just about a necessity in order to move quickly and keep hands away from the hot area.

Three or four smaller beams can be straightened in a day depending on how much has to be done to them. The one pictured is 4” × 8” and twelve feet long. The fuel used was three trash barrels of charcoal per day made from burning brush piles gathered up after cleaning fence rows. One well-sited brush pile
A hydraulic jack is used to straighten the hot beam against a cold one on the bottom. All blocks, clamps, etc., are arranged before heat is made.

Most old beams have a twist that must be removed toward the end of the straightening operation. Scattered buckets were used to haul fuel to the forge.

Ready for painting and re-use. Straightness is important in any beam, as the more severe any bend left in is, the more easily they will buckle under a load. Rocks and other debris in the area are from a five-year effort to build a new shop. Lack of manpower is the cause of unduly long construction time.

Left: Heating the flange of "T" beam at the kink or bend. A charcoal (flat bottomed) forge is let into a pit in the ground. A long stick is used to turn the handle and protect the operator from heat and toxic fumes. Fuel is (used wood) charcoal made from burning brush piles gathered up during fence row cleaning and stove wood cutting.

makes enough coal to do this kind of work for four days.

The largest beam I have straightened this way was a 6\%21/4" × 8" × 1\%21/2" and twenty-four feet long. This is about as large as two of us can handle. I have seen house movers straighten some of the very largest sizes made using a slight variation of this method. The bent beam is chained near the kink about a foot above a straight one. Under the kink, but on top of the lower beam, a 4 × 8 foot steel plate with bricks and sand on it is set level. Half a cord of stove wood on top of this plate burning around the kink heats it sufficiently that a jack can effect straightening. This is most impressive to watch as the beams I saw were one foot square, forty feet long "H" columns with one inch thick flanges. I was told they once supported an office building in New York City. This beam had been bent when a house being moved onto a barge caused the barge to tip over. The house could not be salvaged intact. However, the straightened beams were used to move a stone house out of the way of a highway. This job went without mishap.

Bar stock, which most ornamental smiths use, has no mill marks so that the maker is difficult or impossible to identify. However, old "T" beams and reclaimed concrete reinforcing rods have a bewildering variety of names and markings like a collection of old barbed wire or farm implement seats. On a dozen old beams that I've straightened, we found the more familiar name "Bethlehem," as well as "Pennv feud," "Phoenix" and "Carnegie." Phoenix is a most appropriate name on steel products of mass manufacture. The Phoenix was a mythical bird of the ancient world. Old descriptions vary somewhat, but there was only one; a male that lived a very long time. When the urge to nest hit him he would fly to a far distant land where, on his nest, he would be consumed by fire. Out of the ashes of this fire the new Phoenix arose. The Phoenix was known to the ancient Greeks and Egyptians, but is perhaps more familiar to us through Chinese art, where it was the symbol of the Empress. When I look at a piece of steel with this name on it, I wonder at all the old things that were melted down to make it and how many times this recycling was done in the past. (The fiery feathers of the Phoenix make it an excellent subject to be represented in wrought iron. Bright, glossy colors in paint or enamel are often used.)

Another word about stock — and this time the weather, too. Most of us have more stock than we can adequately keep out of the weather and this is a waste. It pits fast, especially when in contact with the ground. It can make our new work look like something that has been lying around on a junk pile. The more traditional we try to keep our work, the slower we use stock and the greater the rust losses can be. When you get used stock to straighten, there is a premium on doing this promptly so it can be put away. Old or new stock should preferably be kept in a building. Lacking space, it can be stored outside on pallets on cinder blocks with a covering of old roof tin and/or plywood. Be sure the sides are covered, too, as many blowing, misty rains will also cause it to rust.

Regardless of what the future holds for us in the way of depression, war, famine and death, as long as there are men around who know how to work iron, and others around to use and appreciate that work, there will be opportunities for the blacksmith.
Greetings from the Southwest

by John Seaver
photos by Kari Rasmussen

The birth of the South West Artist-Blacksmiths' Association was celebrated last July in Santa Fe by a workshop given by Francis Whitaker. Francis, a guest of Russ Swider of By Hammer and Hand, was induced to amaze and enlighten a group of Association members by his dedication to the craft and by Russ's clever obtaining of tickets to the Santa Fe Opera.

After 58 years of blacksmithing, Francis Whitaker swings a hammer like it is part of his arm, and in front of a small group, he was able to wield his magic on every application the group could think of. His usual answer to a question is to do it, and his usual question is, “Is there anything else you’d like to see?”

During the course of the day, ostensibly designed to cover railing bannisters, tenons and tenon tools, “go-no-go” gauges for baluster uniformity, slitting, drilling, and punching full dimension holes, accurate layout with a punch, stair rail returns, stair riser layout, bevols, levels, and assorted tooling, he also had time to demonstrate drilling tool steel, bending angle iron, bending a bar to make a truncated cone, several interesting twists using his own twisting and bending inventions, and a work-up of a Yellin carved bar, with time left for a slide show of his work.

While Francis was numbed by several portions of a six-foot, 40 pound sandwich and a bottle of imported beer, he was formally asked to become the first president of SWABA, which he accepted, and was presented with an honorary miniature anvil (photo enclosed) crafted by Robb Gunter of Albuquerque. Mrs. Whitaker was presented with a silver broach depicting a Pueblo Indian home made by Lief Gomsen, also of Albuquerque.

The September meeting of SWABA was a weekend workshop in Santa Fe, first at Tom Joyce's shop with Ray Rantanen of Castle Rock, Colorado, demonstrating ornamental iron techniques, and proving that a PhD in Physics cannot keep a man from his roots. Then on Sunday at Rolando DeLeón's shop, Jay Burnham Kidwell of Kingman, Arizona demonstrated Damascus pattern welding. Rolando had an extra half-dozen forges set up where the members were able to try their hands at making a blank of Damascus steel.

SWABA was recently incorporated in New Mexico as a non-profit organization, and its Board of Directors is: Francis Whitaker, Aspen, Colorado, President; Rolando DeLeón, Santa Fe, N. Mex., Vice-President; Woody West, Los Alamos, N. Mex., Secretary-Treasurer; Jay Burnham Kidwell, Kingman, Arizona; Robb Gunter, Albuquerque, New Mexico; Lief Gomsen, Albuquerque, New Mexico; Jess Hawley, Phoenix, Arizona; Tom Joyce, Santa Fe, New Mexico; Ray Rantanen, Castle Rock, Colorado; Russ Swider, Santa Fe, New Mexico. The Association is the brain-child of Russ Swider, and is a great help to, and greatly appreciated by, the blacksmiths in the Southwest who have had the opportunity to join in its activities.

The SWABA Spring Workshop, or First Annual Conference, is tentatively scheduled for May 28-June 7, and is planned to be an outstanding affair. Demonstrations by nationally recognized blacksmiths will include architectural ironwork tricks, toolsmithing, team smithing, animal heads, repousse, power hammers, and a cupola building-casting workshop.

Information about membership or activities may be obtained by writing to C.R. West, 10 Kachina, Los Alamos, New Mexico, 87544 (tel: 505-662-7374) or by contacting any of the Board members. The meetings are the second Saturday of each month, and travellers planning to be in the Southwest at any time are encouraged to get in touch and come enjoy our monthly workshops, as always, replete with good food and beverages.

Crafts Tour to Visit South Pacific Region

A Crafts Report release

A journey that will combine the best in craft contacts with the stunning excitement of the South Pacific will visit Australia, New Zealand and Tahiti next summer, conducted by Michael Scott, Editor of THE CRAFTS REPORT.

Participants in the South Pacific Crafts Adventure will get to know a wide range of crafts and craftspeople — from the traditional Maori culture in Rotorua to ultra-contemporary innovations in Sydney. The group will also explore museums and other institutions, as well as the “sights and sounds” of the area — the koala bears in Brisbane, the elegance of Melbourne, the top of the Mount Cook glacier, the fjords of Milford Sound, the Sydney Opera house, the beaches of Tahiti, and much more.

The four-week Crafts Tour leaves from Los Angeles on Sunday, August 1st, and returns on Saturday, August 29th, with stops in Papeete (Tahiti); Sydney, Melbourne, and Brisbane (Australia); Christchurch, Queenstown, Wellington, Rotorua and Auckland (New Zealand). The total tour cost, including air travel, all hotels, and sightseeing highlights, is $3280 (double occupancy).

Scott has been leading tours like this to remote places for several years, with special emphasis on the craft contacts he has established around the world. For professional craftspeople, some of the costs may be tax-deductible. Plans are being made
to set up meetings with craftspeople at the various stops, and perhaps to have members of the tour group give slide talks or demonstrations of their craft at such meetings in Australia and New Zealand.

Details and an application form are available by sending a self-addressed stamped business envelope to Michael Scott, 3632 Ashworth North, Seattle, WA 98103.

---

**Work by British Smiths: Hector Cole and Alan Evans**

by Amina Chatwin
Cheltenham, England

Two major ironwork commissions have gone to west country smiths this year. Gates to the Treasury in St. Paul’s Cathedral and gates to the Prince of Wales’ new home in Gloucestershire.

It was decided in the Spring, that the wedding present to be given to the Prince and Princess of Wales, by the people of Tetbury, should be new gates for nearby Highgrove House. Five local craftsmen were asked to provide designs, and the royal couple selected the work of Hector Cole of Great Somerford, Wiltshire. Highgrove is an 18th century building, and Hector Cole is a smith who works in the tradition of the past; much of the inspiration for the gates has come from forms used by the great smiths of the late 17th and early 18th centuries. The ribbon scroll, blown over leaf, and now rarely used, seed pod, all find a place in the elegantly restrained crestings of the gates. Equally, the clear cut simplicity of the design places it very much in our own time; while unusual textured surfaces on ball forms, produced by integral forging of the shape, are essentially a modern element.

Finding his own forge too small to facilitate work on the long bars needed for the gates, Hector brought new life to a corner of the Radcliffe Ironworks in Malmsbury; bringing into use a hearth that had lain idle for some years.

The forge has two holes in its thick walls, each about 12 to 14 inches square; one is opposite the side of the hearth, the other behind the anvil. This enables especially long rods of iron to be worked, as the end of the length can be pushed through the opening, and completely outside the forge building, while the other end is heated or worked. One of the holes is neatly covered with a small sliding wooden door when not in use.

He enjoyed working in the old forge and said everything about it felt “right”; certainly when I called the shadowy corner of the works, with the glow from the flames, the low roar of the air blast and the sound of the hammer, was very much alive again.

The gates were completed in November. That is also the month when the new museum and treasury in the crypt of St. Paul’s Cathedral was officially opened by the Duchess of Kent.

With the help and encouragement of the Crafts Council, four craftsmen were invited, by the Dean and Chapter of St. Paul’s Cathedral, to submit designs for gates to guard the Treasury; James Horrobin, David Watkins, Stuart Hill, and Alan Evans. It was the design of Alan Evans of Whiteway, near Stroud, Glos., that was chosen. He has produced a brilliantly conceived strong barrier, with all the natural grace of a web hung across a cave mouth. That the gates are not suspended from hinges, or in any way attached to the walls, but pivot each on its own single axis, from floor to ceiling, adds to the magical quality of the structure. An important element in the inspiration of the design were the curves of the vaulted ceiling above; which now find a reflection in the arcing steel bars below. Made from mild steel plate and bar which has been cut, forged, welded and riveted, the surface was then shot blasted, wire brushed, and finished with lacquer, producing a surface as softly mellow as old silver. □
The Blacksmith's Source Book:  
An Annotated Bibliography

By James Fleming
P.O. Box 3697 Carbondale, Ill.
216 pp., $19.95

James Fleming, practicing blacksmith and bladesmith from Yonna Valley Forge in Bonanza, Oregon, has created a unique book — an annotated bibliography on the art of blacksmithing.

The Blacksmith's Source Book: An Annotated Bibliography (216 pages, $19.95) lists and describes nearly 300 books that deal with all aspects of the craft and labor of the smith.

Fleming describes his bibliography as a book "written by a blacksmith for blacksmiths and others to provide a permanent record of existing literature and to facilitate the recovery and application of that information." He has personally examined each book in the bibliography. For each entry, Fleming provides a thorough description of the contents of the book, evaluates it and tells who might find it interesting (beginner, professional, student, historian). He has slanted his book toward blacksmiths, metalworkers, and craftsmen in all areas.

The book is divided into four main categories: Practical Blacksmithing; Specialized Areas of Blacksmithing; Historical Background of the Profession; and Products of the Forge. Entries under these four descriptive headings are further divided into chapters.

Practical Blacksmithing presents the technical side of the profession: texts, manuals, and courses aimed at teaching basic processes.

Specialized Areas of Blacksmithing concentrates on advanced processes, ornamental ironwork, bladesmithing, pattern welded steel, farm blacksmithing, wheelwrighting, and industrial forging.

Historical Background of the Profession treats blacksmithing as a literary and historical subject, focusing on traditions and lore.

Products of the Forge ranges from tools and utensils to architectural works, lighting fixtures, hardware and tools, religious ironwork, European, British, and American architectural work, exhibition catalogues, and works of the masters, emphasizing individual smiths and their work.

James Fleming not only practices blacksmithing, but also teaches and demonstrates his art, writes articles, and researches and redevelops lost techniques.

The Complete Guide to Blacksmithing
Horseshoeing, Carriage and Wagon Building and Painting

by Professor A. Lungwitz & Charles F. Adams
with a new foreword by Dona Z. Meallach, author of Decorative and Sculptural Ironwork
50 illus.
Bonanza Books
distributed by Crown Publishers, Inc.
One Park Avenue
New York, N.Y. 10016

"Many old crafts, with intrinsic techniques that were handed down from father to son, died with the men who practiced them. As society industrialized and specialists emerged, it was no longer necessary for a person to be a Renaissance man. Only lately have we begun to unwind the threads leading back in time to tap the experience and knowledge of our parents and grandparents. . . .

"Ironworking . . . is a craft that almost fell into oblivion, but its rescue has been accomplished. Blacksmith societies are flourishing throughout the world. The people who are responsible are digging into, studying, and treasuring the infinite range and styles of objects made by the unsung creators of the past. They are almost legendary people who laboriously pumped the bellows that fanned the fires to heat the forges and who have left a rich heritage, despite their anonymity."

Part one describes in detail the various tools and equipment used in blacksmithing, and the operations involved in forging.

The second section covers the complete spectrum of horseshoeing: the anatomy of the horse's foot, growth and condition of the hoof, shoeing healthy and defective hoofs, forging and interfering, various defects of the hoof, and shoeing mules and oxen.

Part three deals with the methods of carriage and wagon building, which can also be applied to constructing other innumerable metal objects. Also included are methods of wagon and buggy painting, varnishing, and ornamenting.

The Complete Guide to Blacksmithing was first published in 1902, when smithing was a flowering craft used to create essentials of everyday life. Whether you want to restore an old wagon or to create a modern gate or chandelier, you will discover hundreds of hints for working with metals.
This book, loosely translated as “The Work Methods and Tools of the Artist-Blacksmith,” is possibly the most beautifully illustrated book on the subject. The ABC’s — not to mention some XYZ’s — are vividly illustrated, often with the use of color to indicate the correct working heat for various operations. The entire text of this single volume is in German, English and French and can be readily understood by beginner or layman. That is not to say there are not gems to be found by the experienced smith, nor scintillating images to entice the prospective client. But Otto Schmirler, the Viennese Master, has majestically presented that part of blacksmithing which is most difficult to present in a truly responsible manner — basics. (This book is obtainable from Norman A. Larson — see the “Blacksmithing Books” ad in this issue.)

These illustrations, reprinted from Werk und Werkzeug des Kunstschmieds by Otto Schmirler, have to be seen in color and full size to be fully appreciated — this is a superb book.

Art Nouveau Decorative Ironwork

137 Photographic reproductions
128 pp. 8.4 X 11.3
$5.95 plus handling and postage

As it to supplement its 1977 anthology, The Art Nouveau Style, Dover brings forth this collection of photographs, a fine resource for today’s artisan. Yet Dover may have too hastily reproduced the plates of the two French portfolios referenced in the credits. Under the title Art Nouveau Decorative Ironwork, we discover twenty percent of the work to be in the classical style. While the contrast between the decorative periods can be considered opportune in a scholarly way, a greater gain for us, there would have been, for a show for Art Nouveau furniture and furnishings — lighting fixtures, stands, hardware. Like the two source portfolios, the book is limited to two dimensional architectural applications from Paris and Brussels. We are without a text to inform us of the maker, the date of execution and the context of the installation, or to enhance our understanding of this notable period. Is ‘E. Robert’ a designer or an artisan? The photographs reveal the recurring motifs of Art Nouveau found in the two cities — the whiplash, the tendril, the play of line, and the flora, both natural and stylized. Plate 86, a door grille, is a marvel of the whiplash, executed in flat stock on edge. The interior gate of Plate 36 shows unique forgework at the bends, with the lighting achieving the desired effect of greater depth and motion. Throughout the ironwork samples we see use of the torch weld, especially to connect flower stems to stalk, as in Robert’s elevator gate of Plate 63. Turn the page and we find evidence of Art Nouveau’s undoing — wanton decoration.

While we should be appreciative of the low price, quality paper, and availability, Dover should know that its easy profits do not reflect complete customer satisfaction. For me and, maybe, for you, the artisan and his times are as important as the artwork.
Coming Events


February

1-15 . . . The annual Program in Artisanry Student Exhibition at the Boston University Art Gallery, 885 Commonwealth Ave., Boston. Opening Reception will be February 1 from 5 to 7 P.M. Both are open and free to the public.

5 . . . Deadline for slides and entry forms for “Windtoys, Weathervanes and Whirligigs,” the second annual national juried exhibition of contemporary craft objects moved by wind (April 4-May 21) at the Kentuck Center. Purchase and merit awards; entry fee $10 for a maximum of 3 entries. For details and entry forms: Kentuck Center, P.O. Box 127, Northport, Alabama 35476.

8-March 19 . . . Blacksmithing course at Turley Forge, Rte. 4, Box 88C, Santa Fe, New Mexico 87501, 505-471-8515.

11 . . . Slide or photo deadline for Contemporary Forged Decorative Ironwork to be shown in the Northview Gallery of Portland Community College from March 3 to April 2, 1982. For a prospectus or other information, contact: Russell Swain, Art Dept., Portland Community College, 12000 S.W. 49th Ave., Portland, Oregon 97219.

18-20 . . . National Ornamental & Miscellaneous Metals Association (NOMMA) has its 24th Annual Trade Show and Convention at the Hyatt Regency in Kansas City. Booths will be reserved on a first-come, first-served basis. Additional information may be obtained from NOMMA, Suite 109, 2996 Grandview Ave., N.E., Atlanta, Georgia 30305, 404-237-5334.


March

3-April 2 . . . Contemporary Forged Decorative Ironwork to be shown in the Northview Gallery of Portland Community College. For deadline information, see entry for February 11.

4-6 . . . Dorothy Steigler demonstrates at various campuses of Portland Community College, 12000 S.W. 49th Ave., Portland, Oregon 97219.


15-19 . . . Charlie Fuller, resident Silver Dollar City blacksmith, will teach basic forging techniques at the Arrowmont School, Box 567, Gatlinburg, Tennessee 37738, (615)436-5860.

19 . . . Deadline for receipt of applications and 5 slides for the 5th Annual Great Hudson River Revival to be held at Croton Point Park, Fishkill, New York, on June 19th and 20th. Interested craftspersons write to: GHRR Craft Committee, c/o Bielenberg, 9-2 Loudon Drive, Fishkill, New York 12524. See entry for June 19-20 for more details.


29-April 7 . . . Blacksmithing course at Turley Forge, Rte. 4, Box 88C, Santa Fe, New Mexico 87501, (505)471-8515.

April

5-30 . . . “Contemporary Metals” an exhibit of southeastern jewelry, holloware and sculpture will be at the Arts Assembly of Jacksonville, Florida.


22-25 . . . The third annual Dallas Craft Market at Market Hall, Dallas Market Center, 2100 Stemmons Freeway. Application deadline for participation is past.
May

17-June 11... “Contemporary Metals” an exhibit of southeastern jewelry, holloware and sculpture will be at the Dulin Gallery of Art in Knoxville, Tennessee.

17-June 25... Blacksmithing course at Turley Forge, Rte. 4, Box 88C, Santa Fe, New Mexico 87501, (505)471-8515.

22-June 26... The Beginning Blacksmithing course is scheduled for six Saturdays, May 22-June 26, 1982. Topics included in the program will be: use and care of tools, fire building and tending, control of hammer, basic heats and work of steel, tempering, finishing, basic artistic designs, and more. Materials & equipment will be provided as a part of the fee. For more information contact: The Office of Continuing Education, Middle Tennessee State University, Murfreesboro, TN 37132, (615) 898-2462.

23-29... David Brewin teaches blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.

28-June 7... SWABA Spring workshop with demonstrations to include architectural ironwork, toolsmithing, repoussé, power hammers, team smithing, animal heads and a cupola building/casting workshop. For information, contact: C.R. West, 10 Kachina, Los Alamos, New Mexico 87544, (505) 662-7324.

30-June 5... David Brewin teaches blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.

June

19 & 20... The 5th Annual Great Hudson River Revival at Crotone Point Park, Fishkill, New York. Sponsored each year by the Hudson River Sloop Clearwater, it is a festival of rich diversity in music, dance, food and craft, with emphasis on environmental and human concerns. Craftspersons will exhibit and sell their work. Demonstrators of ethnic, traditional crafts are also being sought. For entry details, see June 19-20.

22-27... The NORTHEAST CRAFT FAIR (17th Annual). Open to the Trade June 22 & 23, 1982, open to the Public June 25, 26, & 27, 1982. 10 A.M. to 6 P.M. each day at Duchess County Fairgrounds, Rhinebeck, New York.

27-July 23... “Contemporary Metals” an exhibit of southeastern jewelry, holloware and sculpture will be at the Hunter Museum of Art in Chattanooga, Tennessee.

July

3-5... The Chamber of Commerce will co-sponsor a Blacksmith Fair along with the John C. Campbell Folk School of Brasstown, N.C., located just eight miles east of Murphy, N. Carolina.

The discovery of a blacksmith named John Turnbull (circa 1830) as one of the very first residents of the mountain village of Murphy, North Carolina (current population 2,055), has prompted the town’s civic leaders to plan for an annual Blacksmith Fair, commemorating Murphy’s early roots.

“We plan to invite blacksmiths from all over the country and have them demonstrate their craft and sell their wares right here in town,” said Mrs. Mason, executive director of the Cherokee County Chamber of Commerce.

The first annual Fair will be a nationally advertised event and blacksmiths will be accepted for the fair on a juried basis, and, collectively, their work will range in style from traditional to contemporary. Most blacksmiths will be asked to demonstrate as well as exhibit. For further information, please contact Mrs. Dot Mason, Cherokee County Chamber of Commerce, Murphy, N.C. 28906.

4-17... Robert Timberlake teaches blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.

(continued)
July

12-31 . . . Advanced Farrier Science is scheduled on a residence basis Monday through Saturday, July 12-31, 1982. The fee includes materials and equipment. Individuals will be given the opportunity to reside in University housing. Subjects include: level and balance, making shoes (all breeds) and tools, quarter horses, thoroughbreds, saddles, reining horses, standard breeds, Arabs, Tennessee walking horses, diseases, anatomy — dissection, tendons & ligaments, hoof structures, upper leg muscles, and more. For more information contact The Office of Continuing Education, Middle Tennessee State Univ., Murfreesboro, Tenn. 37132, (615) 898-2462.


August

9-September 3 . . . "Contemporary Metals" an exhibit of southeastern jewelry, holloware and sculpture will be at the Louisville Art Gallery in Louisville, Kentucky.

12-15 . . . The 7th Annual PACIFIC STATES CRAFT FAIR. Open to the Trade August 12, 1982, open to the Public August 13, 14, & 15, 1982. 9 A.M. to 6 P.M. Wholesale Trade Day, 10 A.M. to 6 P.M. All Public Days at the Fort Mason Center, San Francisco, California. Application deadline March 10, 1982. Five slides must be submitted with official application packet and $10 screening fee. Applications accepted in all craft media from craftspersons living anywhere in the United States. No painting, photography, graphics, kits or sales reps accepted. The Pacific States Craft Fair, sponsored by American Craft Enterprises, Inc., a subsidiary of the American Craft Council, annually attracts over 1,600 wholesale buyers and 24,000 visitors. It recorded sales of almost $2,000,000 in 1981. Quality craftsmanship is ensured as a result of the unique selection procedure used to jury the work submitted by hundreds of artists from across the nation. American Craft Enterprises, Inc., P.O. Box 10, New Paltz, New York 12561, (914) 255-0039.


22-28 . . . Daryl Meier gives a course in Damascus steel at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.

September

5-18 . . . David Brewin teaches blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.


13-October 22 . . . Blacksmithing course at Turley Forge, Rte. 4, Box 88C, Santa Fe, New Mexico 87501, (505)471-8515.

October


17-23 . . . Paul Lundquist teaches blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.


31-November 13 . . . Francis Whitaker teaches advanced blacksmithing at the John C. Campbell Folk School, Brasstown, N. Carolina 28902.

November

1-December 10 . . . Blacksmithing course at Turley Forge, Rte. 4, Box 88C, Santa Fe, New Mexico 87501, (505)471-8515.
Two Year Degree Program: Students who wish to learn to design, produce and sell quality crafts may work toward an Associate in Applied Science Degree in Crafts Management. They may devote 42 credits directly related to the making and selling of crafts. Art Courses include Weaving I and II, Pottery I and II, Woodcarving, Wood Craft, Quiltmaking, Blacksmithing, Jewelry Making, Silk Screen Printmaking, Drawing, Design I and II, and Crafts Survey.

Recommended business courses include Small Business Management, Small Business Accounting and Marketing. Additional business courses are available.

If a student becomes especially interested in one craft, with the guidance of a teacher, he may develop a "Personal Study" in that field, and explore certain aspects of a craft for college credit.

Twenty credit hours are devoted to academic and physical education classes.

The Crafts Management Program, while flexible enough to fit a student's needs, is structured so that it provides a good background in design, craft and business. For more information contact: NORTH COUNTRY COMMUNITY COLLEGE, Crafts Management Program, Ballard Mill Center for the Arts, Malone, N.Y. 12953.

For Sale: Power hammers — 25# Little Giant, $1,200; two 50# Molochs, $1,150 and $1,250. Write to: R. Huber, Layton, New Jersey 07851, or phone (201) 948-4565 for details.

For Sale: Beaudry #5 150 lb. trip hammer in very good condition. $2850.00. Call Thom LaBrie 207-784-4244.

For Sale: Nice 50 lb. Little Giant trip hammer; three 25 lb. Little Giant hammers; one metal 6” cutter; one Johnson gas forge; one ring mandrel. Contact: Maurice V. LePage, Box 67, Waverly, Minnesota 56390, (612)658-4121.

For Sale: Blacksmith shop in beautiful Texas hill country. Continuous operation since 1922 doing custom work, tool sharpening, branding irons. Excellent opportunity. Includes all tools and equipment. Contact: Smitty, Box 947, Ingram, Texas 78025, (512) 896-0507.

For Sale: 25 lb. Little Giant power hammer; 175 lb. horseshoer’s anvil; line shaft. Contact: R.N. Brown, Rte. #5, Decatur, Indiana 46733, phone after 6 P.M. (219)724-7554.

Faculty Position: Beginning in Fall 1982 in Sculpture; Master’s degree in Sculpture required; rank and salary open. Send resume to Professor John C. Marshall, Chairman, Search Committee, Sculpture, School of Art, DM-10, University of Washington, Seattle, Washington 98195.

For Sale: Arc welder, 250 ampere, AC-DC. Compact commercial type, little use — have bought Heliarc — $250.00. Ray Sobel, Windrow Forge, Lebanon, New Hampshire 03766, (603)448-4246.

For Sale: Public auction of old blacksmith and wagon shop items. Anvil, blower, cone mandrel, trip hammer, tools, wagon & buggy parts, and lots and lots of miscellaneous. To be held in March 1982. Call or write for sale bill or for more information. Jack R. Shuler, Auctioneer, P.O. Box 315B, Breese, Illinois 62230, (618)526-4210.

Important Opportunity: The authors of The Popular Mechanics Decorative Hardware Handbook (which will be published this coming fall by Hearst Books) want to hear a.s.a.p. from artisan metalworkers who are interested in reaching a national audience and are able to fill orders by mail. If you make doors or drawer pulls, latches, handles, hinges, cranes, hooks, or any other common or unusual items of decorative hardware and would like to have them considered for inclusion in this book, send slides or photos of same to: Mark Dittrick & Diane Kendez Dittlick, 23 West 89th Street, New York, NY 10024. This will be a quality hardcover book; since we are having all original photography done from actual pieces, slides and photos received will be used only for considering items for the book, and the work of individual makers will be featured alongside the products of major top-quality decorative hardware manufacturers. Popular Mechanics, by the way, has a circulation of 1.6 million.

Dick, Jinny, Peter and Lucy Quinnell wish all their American friends a lovely 1982.
Site: Cedar Lakes Conference Center: Scenic West Virginia hills punctuated by dark green cedars provide a Van Gogh landscape for the 1982 ABANA Conference. A professional center, Cedar Lakes provides an exclusive site for a blacksmithing conference. Facilities include lodging, dining, exhibit, auditorium, classroom, and workshop areas — all of exceptional quality and within easy walking distance from each other. Leisure facilities are provided at no extra cost — swimming pool, bath house, softball, tennis, volleyball, and basketball courts. Prices will be very affordable.

More complete details, including all registration information, will be mailed separately to all ABANA members — but we thought you might enjoy this little "teaser" of the rich and varied program in store. Here is some program information and samples of work from some of the demonstrators already lined up — and there will even be more in store for what should be a dynamite gathering. See you there!

1982 ABANA Conference Demonstrators: — these are but some of the demonstrators and their topics:

Jack Andrews, Paoli, Pennsylvania ... on the life and work of Samuel Yellin. Ivan Bailey, Savannah, Georgia ... forge brazing with copper, steel carving, inlaying glass, forging human figures. Manfred Bredohl, Aachen, Germany ... contemporary design, power hammer techniques. Jack Brubaker, Indiana ... topic to be announced. Dimitri Gerakaris, Canaan, New Hampshire ... forging: using the clay-like nature of steel. Alfred Habermann, Jihlava, Czechoslovakia ... on his approach to ironwork. Stuart Hill, Suffolks, England ... on his approach to ironwork. Jim Horrobin, Carhampton, England ... his gates for the Victoria & Albert Museum. L. Brent Kington, Makanda, Illinois ... lectures on ironwork at the Victoria & Albert Museum and his own work. Aachim Kühn, East Berlin ... on his approach to ironwork. Helgard Kühn, East Berlin ... on the work of Fritz Kühn. Tom Markusen, Rochester, New York ... hot forming and forging of non-ferrous metals, repousse, chasing and air tooling. Eric Moebius, Plain, Wisconsin ... mortise and tenon joinery and punching techniques. Jud Nelson, Sugar Creek, Georgia ... forge welding. Gary Noffke ... surface work, carving and etching. Peter Ross, Williamsburg, Virginia ... 18th Century hardware and domestic utensils. Joel Schwartz, Deansboro, New York ... topic to be announced.
Joe-Sepp Volz, Mahopac, New York ... animal and figure forms.
Jim Wallace, Memphis, Tennessee ... wood and steel constructions.

ABANA CONFERENCE COMMITTEE


Winter '81/'82