

The Natural Angle

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FORGE WELDING

By Russell Colvin, CJF

Forge welding is a combination of heat, timing and surface preparation. The heat sources we will discuss in this article are gas (propane or natural gas) and coal/coke. Welding is a little more difficult in gas fires because of temperature limitations and the fact that gas fires tend to be oxidizing (excess oxygen).

When welding in a gas fire I preheat the material to a bright red heat and brush. Flux is then applied (if flux does not melt then heat is insufficient) and the piece is returned to the fire. I allow the piece to remain in the fire until a full welding heat with lemon/yellow color is reached. The piece is removed and immediately welded on the anvil with quick light blows. As the material cools force of the blows is increased. A second finishing heat may be necessary to blend weld seams and reduce material to desired dimensions.

Welding in a coal forge is similar, although easier because of the high, fast heat and the fact that a reducing fire (no oxygen) is obtainable and sustainable. The timing aspect

of forge welding is to forge while you have a welding heat, that is, strike while the iron is hot. I may seem to be stating the obvious but insufficient heat, a cold anvil and disorganization of the smith are the leading causes for missed welds. To be sure you can recognize a

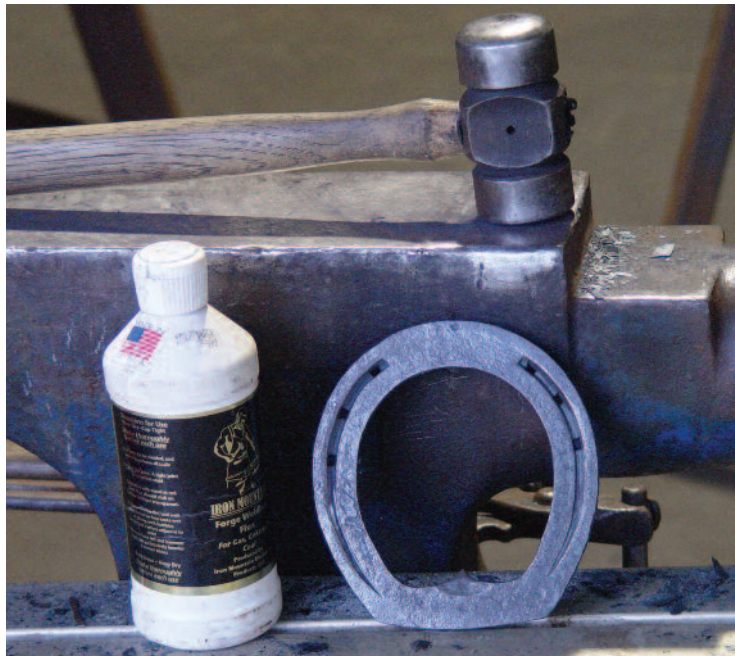
welding heat take two long pieces of steel, 'apply flux' and hold one end of each piece in the fire. When the two pieces will stick together firmly, they are at a welding heat.

Our anvils are a heat sink. They will effectively pull the heat from the material being welded. The size of the anvil and the ambient temperature both affect the length of time an anvil must be preheated in order to achieve consistent forge welds.

Disorganization of the smith is the hardest obstacle to overcome.

This will take time and

practice. While your material is in the fire, locate your hammer and organize your thoughts on what you wish to accomplish in this heat. A moment's hesitation between forge and anvil can be enough to rob you of your welding heat.



By using proper techniques you can be assured of a high quality forge weld almost every time

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Surface preparation consists of scarfing, cleaning and fluxing. The scarf is the preparation of forging the material so that it fits tightly together and allows for stock reduction while forge welding. There are a number of different scarfs and variations of each. The chain link scarf has the ends of the material forged to fit together with overlapping tapers. The step scarf has a set down slightly less than half the thickness of the material. These steps are fit tightly

together so that the joint before welding is one and a half times thicker than the parent material. Regardless of the type of scarf used the ends of the material should fit together tightly enough that scale does not form in the joint.

The final surface preparation is to apply flux. The job of the flux is to keep the material clean while it reaches a welding heat. Apply enough flux to cover the entire joint.

Flux is like snuff; a pinch is all it takes and drips are a waste.

Forge welding has long been thought to be a mysterious and fickle technique with a high rate of failure. Forge welding however is simply a combination of heat, timing and surface preparation. When all three of these elements are present you can be assured of a high quality forge weld almost every time. n



Above: Chain link scarf
Below: Step scarf



1



3



2



4

1. Prepare scarf of your choice.
2. Sprinkle enough compound on scarf to seal joint.
3. With light hammer blows, finish the weld.
4. Use a second heat and weld if you want to dress up the weld.

GENERAL PRODUCTION PROCESSES FOR HORSESHOE NAILS

BY BILL KLEIST

A book could be written about the history of horseshoe nails, but the intent here is to clarify some aspects and characteristics about today's horseshoe nails and the way they are produced.

Short Background

Iron nails for holding horseshoes are found as early as 500 B.C. by the Celts in Britain. In the 1700's horseshoe nails were hand-made by Journeyman Nailers. From the mid 1700's to early 1800's nails were produced in a variety of machinery. Typically all these machines used heated iron or steel in their production process. The development of better steel wire in the late 1800's eventually allowed the development of cold forging processes where the horseshoe nail could be produced without having to heat the base material before forming the nail.

Current Processes & Nail Brands

Today, horseshoe nails sold in the North American market are produced by three distinct methods:

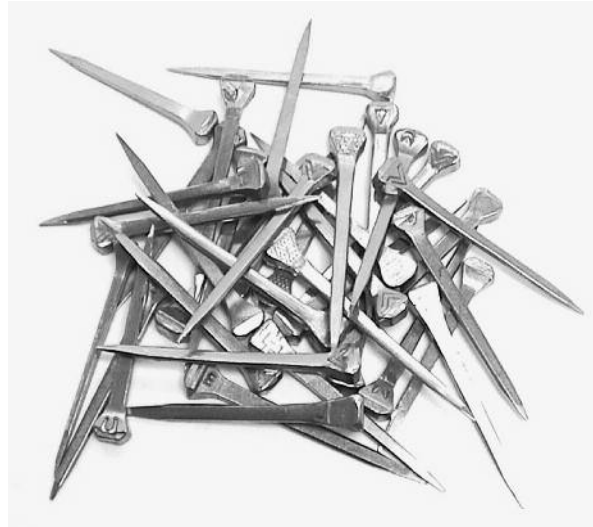
Rolling Process: Capewell, Cooper, Vector, Izumi, Delta (yellow box), Save-Edge

Forging Process: Mustad, Equiclavo, Naula, Mondial, Delta (gray box) March & Max (same manufacturer)

Stamping Process: Australian Nails

Rolling Process:

Rolling machines were first developed in the late 1800's. The process to form the nails consists of a wire of a specific cross section being fed to a machine that has



eight consecutive sets of roller dies that form the shank of the nail from that blank piece of wire. The process is very gradual in forming the shank of the nail. Subsequent steps in the same machine will form the bevel and the point of the nail. The head of the nail is the last step before exiting the machine.

Forging Process:

In the forging process the nail blank is formed in a machine called a swedging machine. In this machine, wire of a specific cross section is fed through one set of swedging hammers that work simultaneously on all four sides of the wire while the wire is advanced through the striking point. Three or two distinct simultaneous die blows, depending on the machine design, form the shank of the nail. The process in this machine to form the shank and also the displacement of the material is much faster than rolling. The blanks out of this machine are then fed into a different machine to finish the heads and to make points of the nail.

Stamping Process:

In the stamping process the nails are made from sheet metal in large stamping presses with a progressive stamping die. In this process a strip of sheet metal advances in timed steps through a complex die that gradually forms the entire nail. In the ending step the nail is cut out of the sheet of metal. This process also requires the finished product to be heat treated so that the end product has the necessary metallurgical properties to perform correctly and to homogenize the material and release the inherent stress of this process. One can notice the shear marks left on the sides of these nails by the cutting dies.

Conclusions:

The final product produced by these three different methods produce a product that is very similar in appearance, but field results and lab results show that the products are very distinct in their physical properties.

From the metallurgical point of view the rolling process produces the strongest nail of these three processes. The reason for this is the shank of the nail is gradually drawn resulting in a much more uniform granular microstructure. This gradual drawing of the shank increases the tensile strength of the final product. This can also be attested by the practical fact that rolled nails can be produced in very narrow shank sections and the resulting nail is still capable of holding the shoe to the horse's feet. n

NAIL COMPARISON BY PROCESS

	ROLLED	FORGED	STAMPED
BRANDS	Capewell & Cooper Vector Izumi Delta (yellow box) Save-Edge	Mustad March, Max (same mfg) Delta (gray box) Equiclavo Naula Mondial	Australian Nails
PROS	Good mechanical properties. Allows the production of very slim nail design, with the highest tensile strength.	Very good dimensional properties, product has typically no slivers or flash. Tools are relatively inexpensive. Machinery is less expensive. Productivity is higher. Production costs are the lowest of the three processes.	Very good dimensional characteristics and nails are very consistent if tools are well maintained. Product has similar mechanical properties as a good forged nail. Good Productivity of equipment . No slivers.
CONS	Flash and slivers are more common. Dimensional variance can be higher. Expensive tooling and machinery. Low machine productivity. Production requires very well trained operator. Process control is intense in order to produce quality product.	Thinner nails do not have the same strength as rolled nails. Process requires more production space and more machinery. Productivity depends on good management.	Very expensive tooling and equipment. Process requires good heat treatment to produce good nails. Raw material is more expensive. Production of scrap is high.




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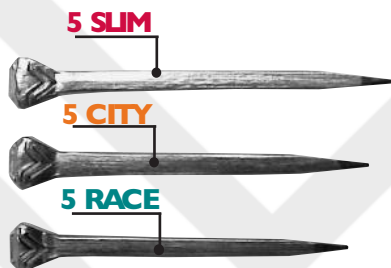
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UPCOMING EDUCATIONAL OPPORTUNITIES

"The Super Clinic"

The inaugural event of the World Championship Blacksmiths will be held January 11-13, 2007 near Houston, Texas. Clinicians will be a who's who of the competition and shoeing world. Shayne Carter, CJF, Austin Edens, CJF, Craig Trnka, CJF, and Mark Milster, CJF and a number of other former AFA team members will combine their efforts to present one of the most intense practical clinics ever.

For info, call 402-944-2242 or visit www.worldchampionshipblacksmiths.com.

"The Symposium"

The 18th Bluegrass Laminitis Symposium continues the activity in January. The dates for the 2007 Symposium are January 25-28 and it will be held in Louisville, Kentucky's Galt House.

The program always goes way beyond the Laminitis name and this year is no exception. The speakers will explore topics like Venograms, Crushed Heels, White Line Disease, and Foal Deformities as well as Laminitis. Speakers include Ric Redden, DVM, farrier Alan Bailey, AWCF, and Richard Mansmann, VMD, PHD along with a number of other presenters. In addition to the program, there will be a trade show of leading vendors to the industry.

Contact information for the Symposium: 877-462-6742 or 502-839-6766 or visit the www.nanric.com website for all the details of the program.

"The Summit"

The 4th Annual International Hoof-Care Summit follows closely on the heels of the Symposium. Held in Cincinnati, Ohio's Duke Energy Center, the dates for the 2007 show are January 30 to February 1.

This program is organized by The American Farriers Journal and brings farriers and veterinarians together in a unique program format. Offering a wide variety of topics, often simultaneously, the program has proven itself to be a significant educational opportunity. Speakers at this year's summit include Bob Pethick, CJF, Lee & Portor Green, Tracy Turner, DVM, Mitch Taylor, CJF, and Doyle Blagg. These presentations lean heavily to the practical side and offer a lot of opportunities to engage the speakers and other attendees. The show also has a large trade show with many of the industries manufacturers and suppliers in attendance.

For information contact the AFJ at 262-782-4480 or visit their website at www.lesspub.com.

"The Convention"

The granddaddy of them all, the AFA's 36th Annual Convention will be held in Albuquerque, New Mexico on February 28 to March 3, 2007. The AFA's focus on education has long been considered the stimulus for many improvements in the farrier industry.

The Albuquerque program will have the many facets that have made it a favorite for many years. A diverse speaker program, live forging and shoeing and the largest trade show in the industry all combine to attract farriers from all over the world. Farrier speakers this year include Michael Savoldi, Jim Quick, CJF, John Voight, CJF and Steve Teichman, CJF. Bob Racich, DVM will present as well, offering a perspective from a vet who is also a farrier.

Call the AFA at 859-233-7411 or visit their website at www.americanfarriers.org to get all the information.

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