Looking for a Blacksmith at Colvin Run: Earn a Night's Repose


"Under a spreading chestnut tree/ The village smithy stands; /The Smith, a mighty man is he," BUT he or she is missing from Colvin Run Mill. Apologies to Longfellow, but our smithy has been quiet and cool since our regular volunteer blacksmith retired. We are looking for volunteers. The basic equipment is in place: forge, bellows (a forge fan), and anvil, waiting to get hot, breezy, and hammered.

The smithy was an essential part of the Colvin Run community. Together with the mill and General Store, it formed a social focal point for the community. The blacksmith would make and repair horseshoes and wagons wheels, fix farm implements, and mend kitchen utensils. The first half of the 1800's, when Colvin Run was flourishing, is considered the "golden age" of American blacksmithing.

The basic blacksmith's tools have remained the same through centuries: forge, bellows, anvil, hammer, and tongs. In the forge the blacksmith heats charcoal to generate a fire; the bellows blows air to superheat and concentrate the fire. The common anvil, known as the London Pattern, has a flat face for hammering, a round front for shaping items like horseshoes, and a hole to punch holes. Hammers shape the metal, and tongs are used to move pieces in, out, and around the fire.

Charcoal, pure carbon, was used because it makes a hotter (1,150C) fire than wood (800-900C). Coal came into use in the 19th century but can contain sulphur which causes iron to crumble (not good). A practiced blacksmith limits the number of "heats" to make an object to reduce stress on and waste of the iron and to conserve fuel.

*Smiths as gods and guilds*

The smith was a valued member of the community, practicing a trade that required hard, physical labor, but also a deft touch and keen eye. The Greek's blacksmith god was Hephaestus. He fashioned armor for Achilles and Heracles and had several forges, including one in still Sicily's smoking Mt. Etna where remains of the 430 BC Temple of Hephaestus grace Agrigento's extraordinary Valley of the Temples.

Hephaestus was one a clever smith. Homer recounts that Hephestus built self-driving vehicles (fastening "gold wheels beneath the base of every tripod so they could roll to councils of the gods and then come home again all by themselves") and AI workers ("They were made of

gold but looked like living women. They had a consciousness inside their hearts, and strength and voices." Emily Wilson's translation). Waymo and Klara are late comers!

Smithing guilds of the Middle Ages protected trade secrets and developed specializations. Whitesmiths worked with lead/tin/pewter, silversmiths, goldsmiths, chain smiths, and nail smiths. The term "smith" is derived from Proto-Germanic smithaz "skilled worker" and the Old English word "smythe," meaning "to strike." Since iron turns black when exposed to air and heat, the term blacksmith stuck to those who worked with iron.

*From Men with Iron to Men with Steel*

The basic technique using fire, tongs, hammer, and anvil remained the same for centuries. This is not to say it was simple, easy work. Quite the contrary. Consider the sword. The Hittites of 1500 B.C. are thought to have been the first to forge iron into swords. For a brief, shining moment, their advanced technology rendered successes on the battlefield. But iron bends under stress. The Celts had to step on their iron swords to straighten them after a few blows against the Romans' sturdy steel swords.

Through trial and error, blacksmiths in Greece and Rome as well as China, South Asia, and Persia deduced that adding a small amount of carbon to iron yielded a much, much harder metal, aka, steel. Adding 0.6% to 1.25% carbon to the iron produces high carbon steel, perfect for weapons and tools. As early as 200 B.C. Roman blacksmiths incorporated varying carbon content in different parts of the sword so the shaft could absorb shock but the edge, with more carbon, would retain its sharpness. How could they do that?

*Iron & Steel Making 101*

Back to the basics. Iron ore is a dense, hard solid (think rock) that contains oxides – which determine its color (red, brown, yellow) - and impurities, such as silica and alumina. Blast furnaces melt the iron out of the oar. But before they became widely used (the hot blast furnace was patented in 1828), "bloom" furnaces would melt the ore out of the iron.

Iron ore rocks would be roasted over a wood fire to extract moisture and sulphur then placed in an oxygen deprived furnace with heated charcoal which released carbon monoxide. The CO would attach to the oxides in the iron creating carbon dioxide ($CO_2$) that floated away into the atmosphere (yes, not good). Silica and alumina, which have lower melting temperatures than iron, melted away (slag). The remaining small pieces of iron would drop into a pit and form a spongy mass called a "bloom" (hence the furnace's name). A bloomsmith heated and hammered the bloom to express any molten slag and make a compact billet of wrought (worked) iron.

To produce steel, thin pieces of the wrought iron were packed in charcoal, encased in an airtight ceramic container, and heated for an extended period, resulting in "blister steel." To make a sword, smiths used pattern welding, drawing (hammering to create a longer, thinner shape) and piling (folding over itself) the iron with blister steel repeatedly to form a rod. Blister steel pieces were forge welded to the rod to make hard edges that would retain their sharpness.

To outfit a Roman legion of 5,000 soldiers took much work. The 49 tons of iron weapons they carried into battle required 80,000-man hours to manufacture, from felling trees, making charcoal, rendering bloom, hammering out iron billets, and forging the weapons.

Make no mistake. This is a delicate and exacting process. The wrought iron and steel must be just at the right temperature to create the sword's necessary characteristics. Iron remains solid at 425 degrees C but over the next 815 degrees C becomes more malleable, taffy-like as the metal's atoms vibrate more rapidly. The iron turns red, then orange, yellow, and then white. Orange-yellow iron is the best for forging – bending and shaping the iron. White heat is best for forge wielding. Smithies are often dark so the blacksmith can ascertain the colors better. As blacksmiths learned to control the heat and duration of fires they were able to forge better and fashion more intricate work.

Once the metal has been shaped it can be hardened by quenching – cooling the metal by dipping it in water (quickly) or oil (slower). But watch out: too rapid cooling of high carbon steel can result in cracking. Quenching fixes the metal's shape, but creates a hard, brittle martensite covering. Tempering, that is heating the metal to a moderate temperature, dissolves the martensite.

At Colvin Run no one expects a Hephaestus or a sword or knife maker. But why not a nail? Heat an iron bar, "draw" it to the desired thickness (this explains why nails were square), continue drawing to make a taper, use a set (a chisel with handles) and hammer to cut the shaped nail from the bar, then "upset" the head (thicken it) by pounding it flat holding the nail in a vice or in a board with holes the size of the nail. Done!

In the July 22 *Washington Post*, local blacksmith Caitlin Morris recounts how moving from her IT job to blacksmithing was "a gateway to creativity, self-development and community… …an entry point to understanding humanity." While we cannot promise such an epiphany and certainly would not advise giving up one's day job to blacksmith at Colvin Run, we can safely attest that demonstrating and explaining the art and history of blacksmithing to visitors would be a satisfying experience, recalling the closing verses of Longfellow's poem:

> Each morning sees some task begin, /Each evening sees it close
> Something attempted, something done, /Has earned a night's repose.

Volunteer as a blacksmith at Colvin Run Mill. Earn a night's repose!