Charcoal's Role in the Iron Industry

I have noticed that the one question that gets asked the most and the one that is the hardest to comprehend is what became of the original forest, and how can it be possible that we are accurate when we say that all these hills and valleys were totally denuded of trees not once, but multiple times.

The year 1732 is the year that Colebrook was named. At least that is the first time the name appears in the pages of the Colonial Legislature's documents. It is also the year that the major iron deposit located in Salisbury was discovered. The iron industry was to dominate almost every nuance of Litchfield County life for the next several generations.

Great Britain held tight reins on the economics of their North American colonies, and wanted whatever marketable commodities made here to be shipped back to England, where they could then remarket them with British taxes applied. When the large deposit of iron ore was discovered in Salisbury, a new set of factors came into play. Iron is heavy, and transporting it takes a great deal of planning and effort. It did not make sense to have American iron products brought all the way across the Atlantic just to be trans-shipped elsewhere. More importantly, the growing American Colonies were in desperate need of all sorts of iron products such as shovels, rakes, axes, hammers, hinges, door latches, nails, horse and oxen shoes and countless other items. Therefore a special decree was issued stating that American iron goods could legally be manufactured and sold here in North America.

For several decades, the facilities in Salisbury produced iron products, but the owners suffered from a lack of management skills. Boston merchant Richard Smith, realizing this, set about acquiring this and all other major iron deposits throughout New England, and in 1768 he began buying existing forges and blast furnaces in the area. Smith was a true entrepreneur and soon had profitable and well-run facilities turning out a broad spectrum of iron products. This provided boom times throughout the region in the form of jobs for woodsmen to fell trees to be converted into charcoal for fuel for the forges and blast furnaces and teamsters to transport this wood. Men were needed with the skills in making this into charcoal; initially, local Indians as well as a man named Kellogg, who established the first road to the forge to bring in the needed wood, supplied Smith's forge. In 1773, there were supposed to have been 1,800 cords of wood stacked at the Robertsville forge.

French and German "burners" were imported at a later date to fill the need in the nineteenth century. Two of the family names that are still to be found in this area that came here with this special skill are Chapin and Rebillard, both of whom learned their skill in France.

Charcoal was initially produced by creating "charcoal pits". These consisted of wood cut four feet long and of basically the same diameter. Each pit consisted of about 30 cords of wood 10 to 14 feet high and about 40 feet in diameter. A cord of wood consists of 128 cubic feet, so a typical burn consisted of some 3,840 cubic feet. This carefully constructed pile of wood was then covered with soil several inches deep. One long pole was allowed to protrude from the top, and several holes, or portals, were built around the base. The holes provided air that could be regulated, and the long pole would be extracted and a burning mass of embers dumped down the hole. The soil cover trapped the heat, and the small holes provided just enough air the keep the process smoldering, but not enough to actually burst into flames. Open flames had to be avoided at all costs, as that would consume the charcoal, leaving nothing but useless ash.

Each burn averaged two weeks in duration, at which time an average yield of some 21 bushels of charcoal could be expected. Your first impression here is that there must be something wrong with my math; we started with 3,840 cubic feet and now we are expected to believe there is only 21 bushels of product. Sadly, this was a fact of life for the makers of charcoal in the eighteenth and much of the nineteenth centuries. Brick kilns, introduced in these parts in the 1870s produced an average of 42 bushels of usable charcoal, nearly doubling the efficiency of the process, but of course by the time this technology became available, the trees had all (and I mean that almost literally) been cut. Kiln, or retort charcoal was cleaner, had less waste and was more efficient in making iron. The demand for a constant supply of charcoal fuel was so great that by the 1840s charcoal was being brought to our furnaces and forges from as far away as southern Vermont and New Hampshire.

Not many of these brick kilns were built in Litchfield, because by the time of their availability, our forests were but a fading memory, and other areas assumed the role of iron producing centers. By 1880 Connecticut had lost its prestige in the iron industry, and the Salisbury district, once the national leader, now produced only about 9.5 % of all charcoal iron and about 1.5 % of pig iron made with all types of fuel.

Returning to the furnaces and forges, the average blast furnace produced 40 tons of iron per week. It required from 200-250 bushels of charcoal to produce one ton of iron. Taking the lower figure of 200 bushels, it required a quarter acre of forest to supply the charcoal for one ton of iron. This equates to 8,000 bushels per week for one furnace. Another way of looking at the picture is to think of every 2,500 tons of iron equaling one square mile of forest.

There were 17 blast furnaces by the early years of the nineteenth century in Litchfield County, in addition to 60 forges. A forge took the pig iron from the blast furnace and by re-heating and hammering, converted the cast iron into usable wrought iron at a rate of about 8 tons per week. Thus these 60 forges required 9 square miles of forest per year, making a grand total of 23 square miles of forest each and every year.

Care has to be taken to ensure that the statistics and terminology employed here are accurate up to and during the time iron and steel was important to this area's economy. Structures such as blast furnaces, while never having been built in Colebrook, never the less exerted much influence because of the charcoal needed. The evolving efficiency, as well as the eventual demise of the industry in Litchfield County, all had immediate and lasting results here.

The following is a glossary of terminology employed in the early iron industry.

<u>Charcoal</u> All charcoal was made in the forest and transported where needed. The reason for this is that the charcoal represented about 15% of the weight of the wood as cut from the tree, while the volume was reduced by 25%, making it much more economic to transport charcoal than wood.

<u>Charcoal pit</u> The earliest European methods involved a pit dug in the ground. This method was replaced by an earth-covered heap, called a meiler on the continent, but

referred to as a pitshead in England. In North America the term "pit" appears to have been in universal use.

Pig iron is the molten cast iron as it issues from the blast furnace, or the pigs into which it is cast. These are so named because of the shape of the form dug in the sand floor at the base of the blast furnace. One long straight trench (the sow) had several perpendicular smaller side trenches (the pigs). It was reminiscent of a sow lying down nursing her young ones. (Like this: ++++++)

Wrought Iron Slag-bearing malleable iron containing so little carbon (0.3% or less) that does not harden greatly when cooled suddenly.

Cast Iron Generally contains more than 2.2% carbon and as such is not malleable at any temperature. Specifically, it is cast iron in the form of castings other than pigs, or re-melted cast iron suitable for such castings as distinguished from pig iron.

Steel Iron Iron that is malleable and is either cast into an initially malleable mass or is capable of hardening greatly by sudden cooling. Normal, or carbon steel contains between 0.3 and 2.2% of carbon, enough to make it harden greatly when cooled suddenly, but not enough to prevent it from being malleable when hot.

Alloy Steels and Cast Irons Those that owe their properties to one or more elements other than carbon.

Ingot Iron Slagless steel with less than 0.30% carbon.

Ingot Steel Slagless steel with more than 0.30% carbon.

Weld steel Slag-bearing iron, malleable at least at some temperature and containing more than 0.30% carbon.

Direct method Ore is worked in such a way as to produce iron or steel and a finished, marketable commodity as the end result.

Indirect Method A blast furnace product is taken to a second facility such as a finery forge where it is altered into a marketable product.

Finery Forge This contained a simple reverberatory furnace in which the pigs from the blast furnace were re-heated and worked to burn out the carbon and impurities, producing wrought iron.

Bloomery Forge An example of the direct method, used to smelt iron before the development of the blast furnace. Chunks of ore were heated until a small mass of pasty iron was formed, then it was hammered and worked to remove the slag. The end product was wrought iron, known as merchant bar.

Blast Furnace An enclosed furnace of sufficient height that a fire fed by fuel from the top and forced air from the bottom could raise the internal temperature high enough to melt the iron ore from its matrix, thus producing liquid iron of very high carbon content that was cast into pigs.

Reverberatory Furnace A furnace or kiln in which fuel is not in direct contact with the metal being heated, but rather furnishes a flame that plays over the metal, especially by being reflected downward from the sloping roof.