

The Zoarite Iron Industry

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Freedom seeking German Separatists arrived in the Tuscarawas River Valley November 1817. Being a "refuge", their village was named Zoar after the Biblical town where Lot sought refuge from the wickedness of Sodom. For economic survival, the Separatists formed a "community of common goods" in 1819. Their communal society was called The Society of Separatists of Zoar.

Zoar lands possessed iron ore that, coupled with ready transportation offered by the canal, created business. Reportedly, one of their four canal boats was named "Economy" and was dedicated to hauling iron ore to blast furnaces up and down the canal. One such furnace was the Tuscarawas Steam Furnace built about 1828 by industrialists from Canton and located at the base of the hill in Zoarville along Boy Scout Road. Interestingly, this road was once the main route from Massillon to New Philadelphia.

Seeing an economic advantage and having community needs, the Zoarites started construction of their own "Zoar Furnace" in 1834. They then purchased the Tuscarawas Steam Furnace along with 1,716 acres of land in 1835 for \$20,000 and changed the name to Airfield Furnace. It is thought that they had been leasing the facility since 1831. The furnace stack was 29' square at the base, 19' square at the top and 27' high. It operated until about 1854 and was sold for scrap in 1864.

The making of pig iron from ore was their most ambitious industrial endeavor. At the peak, as many as 300 men worked as colliers (charcoal makers) in the mines at the two blast furnaces and foundries. These people worked by contract for the Zoarites and were paid with a combination of Society goods and cash. The goods generally were 1/2 to 3/4 of the total

compensation.

The 1716 acres of purchased land essentially encompassed what is today Camp Tuscazoar and possessed all necessary ingredients for a successful iron making operation: Black Band and Kidney variety iron ore with 28% to 34% iron content; trees for charcoal; and limestone for flux. Again, the canal offered ready transport and ore continued to go to Massillon until 1881. There were four mines within the camp area, of which the one with a massive sandstone retaining wall is believed to be the oldest. This particular mine contained up to 8' thick stratum of Black Band ore. Black Band ore is black iron carbonate shale, whereas Kidney ore is a shell of red iron oxide surrounding a clay nodule core. Ore was hauled by wagon to the old stage coach road, then down to the furnace.

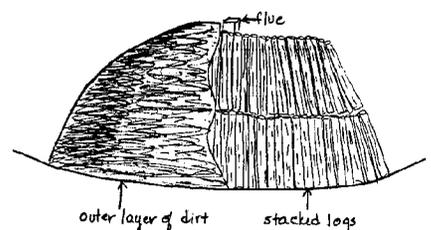
Nineteenth century blast furnaces (see sketch) were generally built at the bottom of a bank so that the "charges" of ore, limestone and charcoal could be loaded in layers from the top. The Airfield Furnace required 36 charges to produce 3 tons of iron per day. Furnaces ran 24 hours per day, 7 days a week and were only shut down for annual maintenance and liner replacement. The blast of air produced by bellows entered the furnace through a "Tuyere". The Airfield Furnace was rather atypical for the time in that a steam engine was apparently used in lieu of water power, thus the name "Steam" furnace. This also allowed for conversion to a "hot blast" system where air was preheated by flue gas in a boiler-like box prior to entering the furnace. Hot blasting increased both furnace efficiency and productivity, and permitted coal to be used as fuel. It is not known if the Airfield Furnace made such a conversion, but coal was used after 1838 in addition to charcoal.

Charcoal was made by stacking oak logs on end in a shallow pit, covering

them with dirt, then setting them to "roast" for up to two weeks. Many of today's camp trails were originally roads for removing iron ore and charcoal to the furnace.

Iron ore is iron oxide (Fe_3O_4 or Fe_2O_3) or iron carbonate ($FeCO_3$). The ore is converted to metallic "pig iron", not by melting but through a "reduction" process where oxygen is chemically removed. This is accomplished by burning charcoal at 3,000°F with a continuous blast of air to form carbon monoxide (CO) as a reducing agent for stripping away the unwanted oxygen. The normal product of open air

Charcoal Mound



combustion, carbon dioxide (CO_2) will not accomplish this desired reduction.

Limestone was used as a "flux" to lower the melting point of silica (sand and clay) impurities in the ore to form a glass-like slag with colors varying from blacks and grays to dark greens and turquoise. The slag floats on top of the molten iron in the furnace's crucible and is removed just prior to "tapping" the furnace. A clay plug is removed from the furnace's hearth and the molten iron runs out into a series of gutters formed into the sand floor of the Foundry House. The general appearance is of pigs while feeding, and thus the name pig iron. Each pig would weigh about 100 pounds. After removal, the sand floor would again be readied for the next tapping of the continuous process.

Pig iron was the basis for all ferrous objects, but was very brittle and not very strong. It could be remelted and cast into "hollow ware" at the foundry. These objects, such as pots, kettles and stoves, were not intended for forceful applications. The pig iron could also be sent to a "Finery" where it would be reheated, worked with slag and forged into "wrought iron". Wrought iron is used for applications where stress will be applied, such as for axes, horse-shoes, hinges, and other hardware. Wrought iron could then be further processed into "steel" for such things as knife blades.

