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# **The Delmarva Bog Iron Industry**

**Edward F. Heite**

## *INTRODUCTION*

The iron industry in Sussex County, Delaware, and adjacent counties of Maryland passed through three distinct phases. Each phase reflected the same mixture of factors that combined to encourage and to defeat in turn each generation of ironmakers.

The first phase began in the 1760's, when three well-financed iron companies bought up all the potential iron-making land in the region. There is evidence that these three companies acted in concert to monopolize the resources of the region by controlling large blocs of unsurveyed warrant land. Each company erected a large plant and required sizable quantities of resources, both human and natural. All three companies had closed before the Revolutionary War began.

Ghosts of these three companies continued to haunt the region for a quarter-century after the ironmaking stopped. Because the companies' land-holdings were tied up in partnerships and could not be sold, the region's economic growth was virtually frozen.

After the companies' holdings were finally broken up, a new iron industry developed. This time, independent bloomery operators restricted their activities to small, manageable plants that could be worked by the entrepreneur and his neighbors. A bloomery does not require the large capital outlay that a furnace needs, and it need not be operated continuously, as does a furnace. Because a bloomery requires very little capital, the operator is not bound to take partners whose disordered affairs could hamstring the operation. The bloomery men, adopting a simpler technology and a simpler business organization,

avoided the pitfalls that had destroyed their predecessors. Furthermore, bloomeries were well adapted by virtue of their small size for the exploitation of the small but rich deposits of bog iron that characterize the geology of lower Delaware (Booth 1841).

A new generation, buoyed no doubt by the bloomeries' success, again attempted to build large blast furnaces in the region during the second and third decades of the 19th century. These blast furnaces were doomed to suffer the same fatal flaws that had destroyed their pre-Revolutionary predecessors. Yet even after the furnaces failed, small operators continued to make a handsome profit from bog iron mining for export to New Jersey, and from an occasional batch of bloomery iron.

The distinctions between a forge and a furnace are sometimes quite technical, but they are central to an understanding of iron manufacture. Sometimes the terms are used interchangeably, especially by people outside the iron industry.

A forge is simply an open hearth, blown by a bellows, in which unrefined iron or crude ore is heated. The simplest forges are one-man or two-man operations, with hand-powered bellows; nearly every farmer once had such a forge in his shop. Larger forges have powered bellows, turned by water power or by steam and later by electricity. Bloomery forges are not unlike the forges used by blacksmiths. Iron is placed on the hearth in a nest of charcoal or other fuel. The fire is lighted, and air is forced in. When the fire reaches melting heat, the iron in the ore settles to the bottom of the hearth. This mass of iron is known as bloom; it hardly looks like refined metal, for it is full of slag and ash, which are removed by hammering. The product of a bloomery is wrought iron, which is capable of being bent and hammered into useful tools.

Furnaces, or "high furnaces", are much more complicated than bloomeries. The furnace is a continuous melting operation that requires large numbers of workmen around the clock for eight or nine months. Because a blast of air is required all the time to keep the furnace hot, a steady power source is essential. In a furnace, the ore, the fuel and a flux are poured into the top of an enclosed stack. At the bottom of this stack is a blower, or tuyere, which admits a blast of air to the lower parts of the stack. Melted iron and slag run out the bottom when the furnace is tapped, into a sandy floor where the iron is cast into utensils or into pig iron. Such pig iron or cast iron is brittle. In order to convert the pig iron into usable wrought iron, the user must reheat the

pig in a forge or air furnace.

Charcoal-fired iron furnaces and forges require a specific set of natural resources and topographical conditions that are immutable prerequisites for success. If any of these resources should fail, the furnace will fail. Since the balance of available resources was vitally important in the history of the Sussex County iron industry, it is useful to examine these requirements in detail.

*Ore:* The most important resource was iron ore convenient to the furnace site. William Byrd in 1732 observed that the cost of transporting ore more than a mile by land carriage could prove unprofitable (Byrd 1732). Ore could, however, be carried great distances by water; the Principio Company, before the Revolution, carried Maryland ore to its furnace in Stafford County, Virginia (Hudson 1961:1-13). A century later, the ironmasters of Cecil County, Maryland, were advertising for ore to be dug in Somerset County (Bratton 1837). During the middle years of the 19th century, considerable quantities of Delaware ore were shipped to New Jersey (Booth 1841:105).

*Charcoal:* Charcoal is a very efficient fuel, that burns quite hot and leaves very little residue, but it is very wasteful of timber (Round 1964:4-9). A charcoal furnace would consume quantities of timberland that would be considered huge by today's standards. One furnace in Sussex County owned 5,000 acres of virgin timber at the outset, and added to its holdings (Proprietary Warrant M2#85, 1765). The Frederickville Company, in Virginia, owned 15,000 acres of woodland (Heite 1970:61-96). In order to acquire such huge tracts, ironmasters needed money or political influence, or both. It was therefore no surprise that three colonial governors (Gooch and Spotswood of Virginia, and Keith of Pennsylvania) were among the earliest projectors of iron manufacture in the middle colonies.

*Power:* Blast Furnaces required eight or nine months' unfailling supply of water to turn the wheels that pumped the bellows and tripped the hammers. If the water supply failed for only a few hours, the furnace was shut down for the season (Heite 1970:62). Bloomeries required less water, but they could not be operated without it (Chard 1971:25-31). The streams of lower Delaware and the eastern shore of Maryland are remarkable for their strong year-round supply of water power that can be controlled by relatively low impoundments (R. R. Jordan, personal communication).

*Flux:* Limestone is added to the charge of a blast furnace in order to speed the melting process. The Nassawango Furnace in Maryland used oyster shells (personal observation) but Byrd (1732) states that Frederickville imported stone from Bristol, England. Other undoubtedly used local limestone.

*Transport:* Iron is a very heavy commodity that damages the roads over which it is hauled, even today. The legislatures of the Virginia and Maryland colonies provided for public subsidies to finance road-building connected with furnaces. Maryland went so far as to allow ironmasters the right of condemnation of right-of-way, thereby setting interesting precedents that later were enjoyed by other public utilities (Whitely 1887:64).

*Labor:* Charcoal making, transportation, and the manufacture of iron itself, require great human effort. The coaling process is described by Round (1964) as a wintertime activity for farmers. In 1833, Nassawango Furnace advertised for fifty good steady hands to cut wood at 40 cents per cord (*Snow Hill Messenger*, May 20, 1833). To accommodate all the necessary workers, ironmaking villages, or iron plantations, developed. Bloomeries, since they did not need constant attention, could use part-time help to a greater advantage.

It should be apparent from the above outline that iron furnaces were slaves to a number of variables, any of which could fail and destroy the entire operation. In lower Delaware and the eastern shore of Maryland, timber and water power were virtually inexhaustible. Labor, free and slave, was available, and water carriage was everywhere close at hand. Oyster shells could be used as flux. None of these factors can reasonably be expected to fail. The fatal flaw seems to have been the nature of the ore beds. Bog ore in Sussex County is found in shallow pockets along stream-banks where it has leached out of the soil. These small scattered beds could be worked successfully by the bloomeries, but they proved insufficient to support large blast furnaces which required reliable large-scale supplies of raw material.

### THE EARLIEST FURNACES

Philadelphia merchants began to promote the iron industry in this region during the last five years of the Seven Years War. Perhaps the wartime need for iron stimulated the enterprise. Another stimulus could have been the tentative agreement between the Penns and the Calverts concerning the north-south line between their colonies. By this time, people close to the seat of power in Philadelphia had a fair

idea of how the territorial conflict would be resolved; they could be more self-assured in seeking a fairly safe warrant for land in the disputed district. The suspicion of such inside information is further borne out by the fact that one ironmaking family -- the Shanklands -- included the Sussex County surveyor and they patented iron-making sites quite close to the line that later became the boundary.

### *Pine Grove*

The first hint of an impending adventure is an otherwise unremarkable advertisement of Thomas and William Lightfoot in the *Pennsylvania Gazette* for November 19, 1761. The brothers announced that they were considering discontinuing their partnership at Philadelphia. We have no way of knowing if they were thinking about iron manufacture; seven years later, they were merchants in Worcester County and had been involved for some time in iron furnace operations (Sussex Deed Book, Nov. 9, 1768, L-11 p. 37).

By a warrant dated August 29, 1764, the Proprietor granted 200 acres to Thomas Lightfoot and Abraham Mitchel of Philadelphia, merchants, and Lewis Walker, a yeoman of Sussex County. The warrant recited that the three partners were to receive 200 acres adjacent to an iron mine they had discovered on a stream known as Iron Mine Branch. In addition to the mine tract, the partners were to be granted 2,000 acres of other, unspecified, vacant land in the vicinity (Sussex Warrants & Surveys M1#29).

During the winter of 1764 - 1765, William Lightfoot replaced Walker in the firm. By April, 1765, the company had built a dam on Deep Creek, two miles above its confluence with the Nanticoke. The furnace had not yet been built, but construction was about to begin when a crisis arose. A neighboring landowner threatened to divert the company's impounded water for his own use; the partners applied for, and obtained, a grant of vacant land to serve as a buffer against such covetous neighbors (Sussex Warrants & Surveys M2#87). By August, the furnace was under construction and Isaac Cox was admitted to the company, now known as Abraham Mitchel and Company. A warrant dated August 16, 1765, entitled the company to take up 5,000 acres of "Barren Sandy Land, unfit for Cultivation and the rest poor and Light Timbered..." (Sussex Warrants & Surveys M2#85). The assembling of the company's land holdings was completed in a most curious manner. A warrant of November 25, 1768, granted 500 acres on Green Branch jointly to the Mitchel Company and Joseph Shankland and Company, one of the other ironmaking combinations (Sussex Warrants & Surveys

M2#84). This warrant appears on the surface to be evidence that two of the companies were attempting to thwart competition by controlling the ore beds.

The Mitchel furnace, now known as Pine Grove, was built by the time the partners admitted Walter and Samuel Franklin to the company in November, 1768.

The long deed of partnership recites the extent of the company's holdings, together with the improvements on each. The evidence of this deed indicates that a number of enterprises were being undertaken at once, with surprising speed. We do not know, of course, which facilities were actually in operation. On the 390-acre "Partnership" tract stood a sawmill, gristmill and furnace. The two-acre "Adams Folly" tract contained a millpond which actually is considerably larger than two acres today. The "New Ireland" tract, acreage not given, had been bought by Thomas Lightfoot from James Hurst, "Cook's Chance", 250 acres, had been bought by Thomas Lightfoot from Samuel Painter and another tract, 859 acres on Gravelly Branch, had been bought by Thomas Lightfoot from William Darter. The deed also mentioned mining rights on 300 acres of "Mile's End" and a 100-acre concession to mine on "Pilson's Lot", the land of Benjamin and Joseph Vennables. Included in the deed was 22 acres, probably iron mine land, in Maryland that Mitchel had taken up along Lewis Branch. Also conveyed in the partnership deed were shares in several Penn warrants, five Maryland warrants in Mitchel's name and one Maryland warrant in Thomas Lightfoot's name (Sussex Deed Book, Nov. 9, 1768, L-11, p. 37). Such detailed partnership deeds are unusual, even considering the need to formalize each partnership transaction in this fashion.

The company held more than 6,000 acres of unsurveyed warrants. This unsurveyed acreage could be a powerful tool. In case someone should discover iron on vacant land, the company would be in a position to claim whatever land it wanted. A discoverer without a warrant would be obliged to go to the proprietors in Philadelphia and request a warrant. By the time a local prospector had obtained his warrant to claim the land, he would have found that Abraham Mitchel was already in possession by a virtual claim-jumping procedure legalized by his unsurveyed warrants.

Walter Franklin bought the other partners' shares in 1773 but the record is silent concerning the fate of the furnace thereafter (Scharf 1888:Vol. II, p. 1289). Local legend states that the industry was halted

by the outbreak of the Revolution. Franklin died in New York, behind British lines, in 1778. His letters probate were granted by the royal governor, James Robertson, and all the witnesses to the will were Quakers (Will of Walter Franklin). It is therefore unlikely that Pine Grove Furnace participated in the war effort. Samuel Franklin, son of Walter, sold Pine Grove to Ebenezer Gracey of Derby, Connecticut, and Theophilus Brower of New York, gentlemen, in 1791 (Sussex Deed Book, Nov. 12, 1791, P-15, p. 16). They sent their agent, Nathaniel J. Burton, to Sussex County with a power of attorney to sell the land (Sussex Deed Book, April 13, 1793, B-2, p. 496).

Seth Griffith and William Elgate Hitch bought the furnace site and began selling it off in smaller tracts (Sussex Deed Book, W-21, pp. 69, 60). Hitch died in 1795 (Archives, Wills A77, FO.6-7) and Thomas Laws succeeded to his share (Sussex Deed Book, Nov. 16, 1796, W-21, pp. 73-74). Griffith and Laws laid out the town of Concord in 1796 on the "Partnership" and "New Ireland" tracts. Griffith opened a tavern which he operated until his death in 1814. The town quickly developed, and soon boasted a distillery, a tanyard, a Methodist Episcopal Church and a school. The furnace never reopened. Although it is mentioned as a landmark in deeds of 1796, it does not appear on the town plan made the same year (Sussex Deed Book, H-8, inside front cover).

### *Deep Creek*

The ironmaster at the Deep Creek Iron Works, Jonathan Vaughn, described himself as an ironmaster of Chester County when he began the Deep Creek Iron Works and Nanticoke Forge sometime before 1763. Two other ironmasters, William Douglass and John Chamberlain, were among his first partners. The other partners were Philadelphia merchants: Daniel McMurtree, Persifer Frazer and Christopher Marshall (Scharf 1888:Vol. II, p. 1299). Vaughn and his associates began buying surveyed land but after their works were built they petitioned the proprietors for warrants to ungranted charcoal land which was assured by a warrant of January 18, 1763, in the amount of 5,000 acres (Sussex County Warrant Book B, p. 363). Tunnell (1954) suggests that the forge and furnace were built four miles apart so that the charcoal could be more readily cut near each operation. Deep Creek Furnace was at the head of Deep Creek at a place now known as Old Furnace. Nanticoke Forge was at the present village of Middleford, head of navigation on the Nanticoke. The Vaughn company built a road from Middleford to Old Meadow on the Nanticoke within sight of the present town of Seaford.

The company reorganized May 18, 1764, admitting William Wishart and Jemima Edwards. Vaughn continued to add tracts to the company holdings. On October 30, 1764, he obtained a survey for 100 acres under a 1740 warrant that he had bought from Daniel Prentice (Sussex Warrants & Surveys, P3#38). The following February, Sheriff Daniel Nunez sold Vaughn 299 acres that he had taken to satisfy a 41-shilling debt (Archives Deeds N#2, Feb. 8, 1765). Since the company's holdings had grown somewhat haphazardly, the partners petitioned the proprietary land office in 1770 for a warrant to resurvey the entire property (Sussex Warrants & Surveys V1#7).

Tradition states that Deep Creek Furnace went out of blast at the beginning of the Revolutionary War, when Jonathan Vaughn went off to serve in the Continental Army (Purvis, n.d.). Frazer was a staunch Continental patriot from the beginning; he signed the 1765 nonimportation agreement and in 1774 was named to a Chester County committee to carry out the resolutions of the Continental Congress. During the war he rose to the rank of general (Frazer 1907). It is therefore certain that the war did divert the ironmakers' attention, but whatever the circumstances, it is apparent that the forge and furnace were permanently closed before the Revolutionary War.

By 1801, title to the Deep Creek Furnace and Nanticoke Forge was hopelessly entangled. Because the partnership was divided among several heirs, no business could be conducted. Some of the partners petitioned the Delaware General Assembly for a special act to empower commissioners to divide the company's assets. On January 17, 1801, Levi Hollingsworth wrote to Caesar A. Rodney, asking for his support for the partition bill, "Without an act for the Division the Property must be lost to the Heirs of the original Proprietors." (Hollingsworth 1801). The bill failed to pass during that term and a year later Hollingsworth was still pressing Rodney for help in getting it passed (Hollingsworth 1802). The "Act to Enable Certain Commissioners to Make Partition of Certain Tracts or Parcels of Land Called Deep Creek Furnace and Nanticoke Forge, with their Appurtenances, and the Lands Purchased for their Accommodation, in the County of Sussex, and for Other Purposes therein Mentioned" was passed January 27, 1802 (*Laws of Delaware*, Vol. 3, p. 220). The act named the known shareholders: William Wishart, an original partner, Levi Hollingsworth, Christopher Marshall, Charles Marshall, Christopher Marshall, Jr., Benjamin Marshall, Thomas Laws (attorney for one of the heirs of Jonathan Vaughn), and William Graham (executor of the estate of Abigail Graham). The act recited provisions of the articles of agreement dated May 18, 1764, which have not survived. By 1801, the fifths had

descended to heirs, except Wishart's, which was divided between himself and W. Richard Edwards of New Jersey. The act directed that the company's 7,000 acres be divided among five equal parts by a commission of five freeholders (Manuscript enrolled bill, 1802). The division of the Deep Creek Company holdings released much of the county's best ironmaking land; an act which could hardly fail to have a profound effect on the economy of the region.

### *Unity Forge*

The third pre-Revolutionary ironmaking project was Unity Forge, established by the Shankland Family of Sussex County. This appears to have been the only locally-financed ironworks in the region before the Revolution and the only one to survive into the Federal period. Joseph Shankland of Sussex County obtained a patent July 17, 1754, for 200 acres where he soon built the Unity Forge (Sussex Survey & Warrant Book B, pp. 581-582). Shankland's enterprise was not a furnace, but a large bloomery, as well as a gristmill and a sawmill. Unity Forge was advertised for sale in the *Virginia Gazette* in 1770 (Purdie & Dixon, Nov. 8, 1770): "To be sold,...a new double forge with four fires and two hammers, a gristmill and sawmill, with dwelling houses, smith's shop, stables, three horse teams, four waggons, and other utensils...The forge and mills are situated on a never failing stream of water on the head of Nanticoke river,..." The advertisement extolled the virtues of the property as the prospective site for a blast furnace, and its nearness to navigable waters of both the Broadkiln and the Nanticoke.

Joseph and Samuel Shankland sold Unity Forge in 1771 to Joseph Earle of Kent County, Maryland, and John Boyd and William Buchanan of Baltimore County. The deed described 811 acres of "Shankland's Discovery", 200 acres of "Iron Valley" and an iron mine (Sussex Deed Book L-11, p. 150). The various shares thereafter went through various hands. In 1774, Samuel Shankland claimed that he still owned five-sixths (Scharf 1881: Vol. II, p. 1284). By 1793, Charles Polk and John Elliott owned Unity Forge (Sussex County Certificate H #22). John Bradley bought what he thought were the outstanding shares in 1810 and 1811, only to discover that there were other claimants (Scharf 1888: Vol. II, p. 1284). The various parties went to court in 1822 and 1823, seeking to untangle their various interests (Sussex County Chancery Case B #26). Scharf states that the 200-acre "Iron Valley" tract was eventually purchased November 18, 1823, by Samuel Richards and Edward Smith, who shipped the ore to New Jersey. The various entangled land dealings associated with the Unity Forge

properties are yet to be unraveled. Unity Forge may have been operating as late as 1793 as Polk's Forge (Munroe 1954:128).

### *THE LATER BLOOMERIES*

If the bloomeries of the 19th century were merely holdovers from the older industry, historians would have just cause to dismiss them as mere remnants, backwaters in the flow of industrial progress. Some of the later operations used existing mill seats after the pre-Revolutionary companies were dissolved. However, several bloomery forges were entirely new operations established by enterprising local ironmakers on mill seats that had not been exploited by their predecessors. It is true that the bloomery phase arose from the ruins of the first furnace projects, but it was a different type of industry, in a sense more successful than its predecessors.

In 1811, General Jesse Green of Concord offered the old Deep Creek Furnace site for sale; the dam was said to have been standing for more than fifty years. A sawmill and a gristmill were then using the head of water. The advertisement proclaimed, "There is five Blumers at work within 5 miles of this seat, that make Bar Iron from Ore which is pronounced to make the finest Maleable Iron in America." (*Delaware Statesman*, Sept. 28, 1811). The county road now bypasses this site but an 1867 map shows the road crossing the dam with its sawmill and a gristmill still standing (Beers 1868: 67).

The Nanticoke Forge site at the head of that river was granted by the commissioners under the Deep Creek Act to the holders of Joseph Pennell's fifth share. Pennell Corbit, attorney in fact for the estate of Joseph Pennell, sold the site to William Huffington in 1805. Thomas Townsend and Huffington built a forge on the seat and laid out the town of Middleford. He added 400 acres of the "Brothers Agreement" tract to his own holdings, so that he controlled a considerable acreage around the mill seat. William Huffington was dead by 1826. His sons William and Edward inherited the land but did not operate the forge (Sussex Chancery Case H #81). The tract's title was clouded by dispute for some years and apparently the forge was never reopened. However, William Huffington's dam has since served a variety of mills. The earlier Nanticoke Forge dam was somewhat upstream (Kent Warrants & Surveys B9#177). General Jesse Green secured title to the upper part of "Brothers Agreement" in the course of some bitter court fights, but he sold it in 1830 (Archives Deeds, Sussex G1#15).

The longest-lived and best-documented of the post-Revolutionary

bloomeries stood about a half-mile from Coverdale's Crossroads on Gravelly Branch, at a place now known as Collins Mill. Gravelly Branch, a tributary of the Nanticoke above Middleford, contains two good mill seats, each of which supported a bloomery; Collins Forge was on the upper seat while the lower seat supported Gravelly Delight Forge. The tract called "Bad Neighborhood" was first surveyed in 1764 for Thomas Lightfoot on behalf of the Pine Grove partners. Lightfoot obtained the warrant from William Douglass, who had obtained it from Samuel Pettyjohn. The 600-acre parcel eventually passed to Griffith and Hitch, who sold it in 1794 to Captain John Collins (Collins Papers, Bonds, April 15, 1794). Because the patent to "Bad Neighborhood" was in dispute, Captain Collins obtained a State Patent, which described the tract as 655.5 acres (Sussex Patent Book T-19, p.36). Captain Collins is supposed to have built Collins Forge before his death in 1804, although Scharf (1888:Vol. II, p. 1300) states that the forge was built by the second John Collins (later Governor) in 1812.

An estimate of Collins' operations may be gained from the field account of ore raised at Smith's beds between May and September, 1821. This tally booklet, now in the Collins Papers at the Delaware Hall of Records, states that six different men hauled away 574 tons, 11 hundredweight of ore from these beds, which apparently lay near Milton.

Governor Collins' six children were minors at the time of his death at the age of 46 in 1821 (tombstone inscription). His widow soon remarried to Dr. John Carey who took over the property. At that time, the income-producing enterprises included a gristmill and "a Forge for making of Iron, a house called the Iron House, a Coal House, several tracts or parcels of land containing about eight hundred acres and divers messuages and tenements with the appurtenances, and also...ore beds or the right of raising and taking Iron Ore therefrom, Situate in Nanticoke Hundred," annual rents from which exceeded \$1,000. In 1831, Solomon Prettyman, husband of Governor Collins' daughter Sarah, filed suit alleging that Dr. Carey had leased the property at too small a rent, and had raised ore on his own account. When Dr. Carey died, during the litigation, his executors were William N. Polk, Wesley Smith and John Richards, all of whom were interested in the iron business. The chancellor finally awarded Prettyman damages of \$624.65 in 1834 (Sussex Chancery Case P #33). By then, however, the situation had changed. Theophilus came of age in 1829 and the land of the estate was finally divided in 1831. It appears from the accounts that several of the heirs retained interests in the forge business for some years thereafter (Collins Papers).

Theophilus Collins could not have refined all the ore that came from the family's beds. For instance, there is a loose slip of paper in the Hall of Records that reads: "From Collins Meadow 169 ton 3 cwt. From Davis Bed 281 ton 18 cwt." These figures probably refer to ore that was shipped out of state, or to Millsborough Furnace. Other entrepreneurs, including Governor Peter F. Causey, were making their fortunes by selling Delaware ore to New Jersey furnaces (Vincent 1881). The Collins Papers do contain a slip of paper indicating that in 1835, Aaron Mitchell bought a quantity of Collins' ore. Theophilus retired from the iron business around 1850 and died in 1857 (Scharf 1888: Vol. II, p. 1300). Beers' Atlas of 1867 - 1868 shows a sawmill and a gristmill, but no forge, on the Collins Mill seat.

There is no reason to believe that Collins Forge is the only one that left documentary records; nor should we conclude that it was the most important, merely because it is well documented. Other bloomeries, that now are known only by name, may come into focus with more research. For instance, there was a "Bloomery Mill" at Portsville, south of Laurel on Broad Creek (Tunnell 1954:88). Scharf states that this mill was begun before 1800 by Elijah Phillips. A plat of the property dated 1880 gives no hint of a bloomery (Sussex Orphans Court Survey P #16).

On Marshyhope Creek west of Bridgeville, a Bloomery Bridge crosses the creek near Bloomery Methodist Church, just west of the Maryland line. Bloomery Bridge is the first crossing of Marshyhope Creek below Iron Mine Branch on the Delaware side. Behind Bloomery Church stands a ruined forge and wheelpit, perhaps from the bloomery erected late in the 18th century by Walter Douglass.

Chipman's Forge, on Broad Creek, was making iron in the 1830's. Booth's geology of Delaware (1841:98) states that the ore for this forge was raised from Little Creek, about two miles south of Laurel. A plat of 1809 shows Polk's Forge, a gristmill and a sawmill on Chipman's Pond, which was then on the main road from Laurel to Snow Hill (Sussex Road Book 1823 - 1841:273). Scharf identified Polk's and Chipman's as the same forge, but more title-searching is needed before the history of these operations can be satisfactorily outlined.

Gravelly Delight Forge stood at the mouth of Gravelly Branch, near where it joins the Nanticoke, about two miles above Middleford. The "Brown's Manor" tract on which it stood was patented in 1775 by William Brown. A warrant for additional land was issued in Philadelphia by John Penn on July 4, 1776 (Sussex Warrants & Surveys

C3#127). The tract passed eventually to Ecilston Brown, grandson of William, who built a sawmill on the property (Kent Warrants & Surveys B9#177). He sold it in 1808 to Shadrach Elliott, who built the forge. Scharf (1888: Vol. II, p. 1300) says that the forge was abandoned around 1820. The site is now known as Fisher's Mill Bridge. The author has identified the forge site, apparently undisturbed, next to the present road.

### *SECOND GENERATION BLAST FURNACES*

Whenever a businessman makes a small success, he may expect a competitor to arrive with expectations of even larger fortune. It is not surprising, therefore, that the bloomeries should inspire some young and progressive-minded capitalists to attempt to build a blast furnace in the region. Indeed, two newer and larger blast furnaces were built, both by local men who mobilized local capital for the effort. William Dagworthy Waples was the first to make the attempt. Waples was one of six Sussex ironmasters who petitioned Congress in 1817 for a protective tariff on iron; the others being John Collins, Edward Huffington, Shadrach Elliott, Jonah Polk and John Bradley. A concurrent citizens' petition contained 106 signatures (National Archives Record Group 233). The furnace and foundry at the head of Indian River were less than two years old when the petition was written. Waples' Delaware Furnace was the largest operation then working in lower Delaware. Samuel Wright, Waples' son-in-law, took over the furnace in 1822 and immediately set about buying up ore beds and shipping iron ore to his native New Jersey. During the period 1828 - 1830, Delaware Furnace produced 450 tons of pig iron and 350 tons of castings. Gardner Wright, Samuel's son, took over the furnace in 1832 and closed the smelting operation in 1836. However, the foundry and ore-export businesses continued until the foundry finally closed in 1879, after which the ore business gradually dwindled (Scharf 1888: Vol. II, p. 1338).

The other 19th century furnace in the region was a real innovation, both in terms of technology, and as business organization. By adopting the corporation, the owners avoided the personal entanglements that had caused so much trouble in the earlier partnership operations. By using improved hot-blast blowing machinery, the ironmaster sought to increase the efficiency of his plant. This new furnace was built in Maryland, where the legal climate had long been favorable to ironmasters. A very liberal act of 1719 gave ironmasters the right to condemn rights-of-way for access roads (Dorsey 1840:52). By 1762, the colony boasted eight furnaces and ten forges (Giddens 1932:17). Some

of the iron mines in Sussex County had been granted by the Calverts before the Penn claims to the land were recognized. J. B. Pearse (1876:17) mentions sheriff sales of ironworks in Queen Anne and Somerset counties around 1770, but a search of the Maryland newspaper has failed to uncover these sales. It is therefore no surprise, from a business point of view, that the Maryland legislature incorporated the Maryland Iron Company in 1828 (Ch. 177, Maryland Laws). The company built Nassawango (or Naseongo) Furnace near Snow Hill in 1830 (Alexander 1840:93-94). A tract of 1,893 acres came to the company from Arthur Milby and Joseph Waples, who foreclosed in 1836 (Worcester Deed Books AY, p. 166, AW, p. 142 & AX, p. 159). Benjamin Jones of Philadelphia bought the furnace at a sheriff sale in 1837 (Worcester Deed Book 4JCH, pp. 115, 118) but the details of the transaction apparently were lost in the Worcester County courthouse fire in 1838 (Dorsey 1840:2299-2301).

Even though the corporation failed as an experiment in business organization in this instance, the furnace was rated at a capacity of 700 tons annually (Brewington 1955). Thomas A. Spence acquired title to the furnace around 1840, but it went out of blast forever in 1849, when Spence failed financially (Lesley 1859:62). Three failures in two decades marked the history of Nassawango Furnace. This dismal history usually is blamed on the scattered situation and low quality of the bog ores that were available to the company (Prettyman 1966) but it is entirely possible that these beds were inadequate for the demands of an up-to-date blast furnace.

Nassawango Furnace featured the very latest in warm-blast blowing machinery, which still may be seen atop the furnace stack. This type of blast machinery originated in Scotland in 1828 and was thought to have been first installed in America at Oxford Furnace in 1834 (Firmstone 1881). The stack of Nassawango Furnace has survived intact, with the pioneer U-tubes of its hot-blast blowers and the foundations of the blast engine still visible. The millrace is intact and the dam now serves as a causeway. No trace survives of the Methodist church, gristmill, sawmill, tavern, workers' houses and auxiliary industrial buildings that once stood there.

### *SUMMARY*

Bloomeries certainly must have been profitable, for they were established over a long period of years. Had they been a fad, or a false start, one should not expect new establishments to have been started after the first few years. The bloomery ironmakers were anything but



speculators; they were solid Delaware yeoman farmers and millers of a sort that were not inclined to overextension. Nor were they generally newcomers who overestimated the capacity of the region. On the contrary, the small bloomeries precisely matched the available resources. By stepping backward in technology, the yeoman farmers of Sussex County stole a march on the "furriners" from Philadelphia and Chester County.

The success of bloomeries in the face of failure for blast furnaces would seem to contradict the evolutionary dogma that bigger and better will supplant older and smaller. The American faith in bigness and complexity has spawned a view of history as an upward march, always making "progress" toward a higher plateau, enroute to the Millenium. Yet, the men who erected bloomeries in Sussex County were not ignorant and regressive; they were the leading citizens who held offices as high as the governorship. These men were fully aware of the technological and economic events of their day. Their preference for bloomeries must represent an intelligent accommodation with circumstance. By espousing simpler technology and simpler business organization, they overcame the obstacles that had defeated their predecessors and would later defeat their more expansive contemporaries.

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