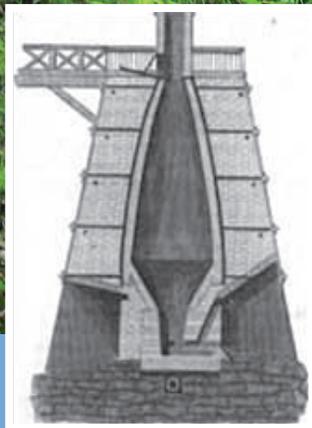
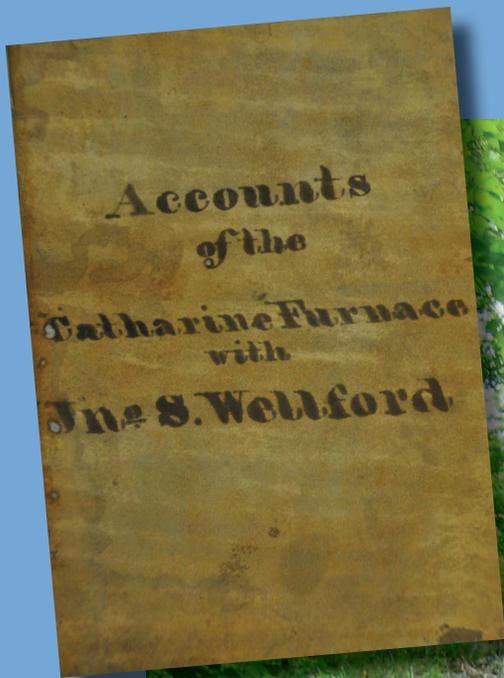




# Iron from the Wilderness: The History of Virginia's Catharine Furnace



HISTORIC RESOURCE STUDY

FREDERICKSBURG AND SPOTSYLVANIA COUNTY  
BATTLEFIELDS MEMORIAL NATIONAL MILITARY PARK



IRON FROM THE WILDERNESS:  
THE HISTORY OF  
VIRGINIA'S CATHARINE FURNACE

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HISTORIC RESOURCE STUDY

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## INTRODUCTION

### THE MANY STORIES OF CATHARINE FURNACE

Visitors to the Fredericksburg and Spotsylvania County National Military Park can still see what remains of Catharine Furnace. Although it lost its rough-cut stone exterior long ago, the circular inner lining of the stack stands as a lone reminder of the extensive complex that once stood there. A few feet from the current parking area, pieces of slag lie on the ground. These glassy chunks appear gem-like to modern eyes, even if they are evidence of nineteenth-century industrial waste. The hill behind the furnace is now heavily forested, but amid the trees on the plateau above the furnace one can still trace the outlines of the charcoal house and find the occasional brick strewn in the underbrush. Oyster shells cling to the root balls of recently upturned trees, a reminder that the ironworkers used them as flux for making pig iron. All these remnants seem quaint, and the scene at the Catharine Furnace site is quite pastoral. It is hard to imagine that a noisy, hot, and busy industrial workplace once dominated the area.

At first glance, the history of this site is fairly straightforward. Built by John Spotswood Wellford in 1837, Catharine Furnace stood out as one of the easternmost Virginia iron furnaces during a short-lived charcoal iron boom in the Old Dominion. Its proximity to Fredericksburg and the eastern seaboard served as both a blessing and a curse, as Wellford was able to contact a potential customer base as far north as New England, but ultimately failed to conquer northern markets. Without a large nearby customer for Catharine Furnace's pig iron—Richmond's renowned Tredegar Iron Works ultimately used either northern pig or iron made in the Valley of Virginia—the operation received several lucrative ordnance contracts from the U.S. War Department. After John Spotswood Wellford died in 1846, the furnace fell into disuse rather quickly. The second manifestation of Catharine Furnace from 1862 to 1865 appeared as a result of the increased demand for iron for the Confederate war effort. The ironworks operated only sporadically during that time.

Stonewall Jackson's famous flanking maneuver on 2 May 1863 dominates the memory of Catharine Furnace today. This epic march helped win the Battle of Chancellorsville for the Army of Northern Virginia and burnished Jackson's credentials as a brilliant leader. Without the help of the Wellford family, though, it is unclear whether this swift and silent march of thousands of soldiers would have been possible. The family's knowledge of the various roads and paths slicing through the area became a real asset to the Confederate cause. The battle later washed over the furnace complex itself, and although ironmaking continued in the aftermath of Chancellorsville, Union cavalry destroyed Catharine Furnace during the Wilderness Campaign of 1864. Despite a brief revival in 1865, ironmaking there never really got off the ground after the fall of the Confederacy. The furnace complex remained idle, and nature slowly began its recovery of the site until it reached its rather pastoral state of today.

In the grand scope of history, Catharine Furnace might seem insignificant. After all, there were only about thirteen years of ironmaking going on at this location in the nine-

teenth century. John Spotswood Wellford ran the operation from its corporate inception in 1836 until his death in 1846. His brother Charles revived Catharine Furnace for only a short time during the Confederate period from 1862 to 1865. Without the Wellfords, Catharine Furnace likely would have never existed. Without Stonewall Jackson's flanking maneuver at Chancellorsville, it might have been forever forgotten.

Yet, this place does have an interesting and important history, one that deserves close attention from a number of perspectives. Although its status as a military landmark of the Civil War dominates the memory of Catharine Furnace today, there are other important stories here. The fact that Stonewall Jackson marched by Catharine Furnace on his way to victory at Chancellorsville is certainly significant, but what would his soldiers have seen during that day in May 1863? Was Catharine Furnace a short-lived experiment in ironmaking? Or was it a well-established furnace community with longstanding ties to Fredericksburg? Was it an aberration amid an agricultural society brought on by the exigencies of the Civil War, or did Catharine Furnace represent an alternative path of economic development and a sign of Virginia's industrial potential? These kinds of questions point toward the larger significance of Catharine Furnace. Its legacy includes not only the events of the Civil War, but a longer historical relationship with the land and people of Virginia that stretches back decades, if not centuries.

The landscape forms the first part of Catharine Furnace's story. Environmental historians have long been interested in the impact of human settlement on various environments, and Catharine Furnace's place in this narrative is particularly intriguing. During the Battle of Chancellorsville in 1863, as well as the Battle of the Wilderness in the following year, the low scrubby terrain became a major factor, as both Union and Confederate troops struggled through a disorienting landscape and suffered from the fires that raged through the battlefield. Although it is commonly assumed that the charcoaling needs of Catharine Furnace help make the "Wilderness" over time, this assumption simplifies the more complex history of Spotsylvania County's landscape. As discussed in Chapter One, the notion that this territory contained "poison lands" stretched back to the early years of Virginia's history. Tobacco's tendency to enervate fields cleared in the 1720s and 1730s—not the demands for industrial fuel a century later—was the more likely suspect in creating the unique landscape known as the "Wilderness" by the Civil War.<sup>1</sup>

But the story of the land goes beyond simply explaining the creation of the Wilderness. "As a subject for interpretation," historian Steven Stoll argues, "soil is rich in material" and forms the "the living tissue between economy and ecology. . . . Early in the nineteenth century, soil became the focal point for a conception of nature as strictly limited." Studies as far back as Avery Craven's pathbreaking work on soil exhaustion in the 1920s have speculated that Virginia's economic trajectory was influenced by the fertility of its land. In fact, among recent generations of historians, the entire South's history has been evaluated from, quite

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<sup>1</sup> For a good example of a military historian's attribution of the Wilderness landscape to Catharine Furnace, see Stephen W. Sears, *Chancellorsville* (Boston: Houghton Mifflin, 1996), 193. This is a common assumption among much of military history, but Noel Harrison first raised the idea that the unique landscape of the Wilderness owed much more to its eighteenth-century agricultural history rather than its nineteenth-century industrial one. See Memorandum, "Thoughts on the Chancellorsville-Wilderness Landscape," Noel Harrison to the staff of the Fredericksburg and Spotsylvania National Military Park, 1 October 2008, Fredericksburg, VA. Memo in possession of author.

literally, the ground up, to question the notion that the region was “naturally” locked into an agrarian society. The idea that somehow industrial practices just “didn’t suit” the Virginia landscape, moreover, dovetails easily with stereotypical views of the Old South’s romantic attachment to the soil. Yet it was agricultural practices, in this case, the rapid cultivation of tobacco in Spotsylvania County, that created the “poison lands” by the 1730s. Catharine Furnace therefore was neither a culprit in the creation of the Wilderness, nor did it represent an industrial blight on an otherwise rich agricultural landscape. Rather, the significance of soil to Catharine Furnace’s story is one of great potential, rather than great failure. Despite the lack of fecundity for the production of crops, Spotsylvania County became renowned for its rich and accessible deposits of iron ore throughout the eighteenth and nineteenth centuries.<sup>2</sup>

So, along with its place amid Virginia’s “poison lands,” the early chapter of Catharine Furnace’s legacy also encompasses the region’s perceived industrial potential. This story has long roots in the past, stretching all the way back to the vision of Alexander Spotswood, Virginia’s Lieutenant Governor in the 1720s. Governor Spotswood built his Tubal and Massaponax furnaces to capitalize on rich deposits of ore and abundant sources for charcoal fuel; this experiment eventually faded. John Spotswood Wellford revived interest in the industrial resources of Spotsylvania County in the 1820s and was personally involved in their development throughout his long career. By the time John Wellford oversaw the construction of Catharine Furnace in 1837, the Virginia iron trade was already a century old.

As one of the centers of the charcoal iron industry, Virginia served as an unlikely center for industrial development by the advent of the Early Republic. Recent studies of the Old Dominion’s iron industry during this period, however, place it in the mainstream of American economic life. In her study of the planter and ironmaking Tayloe Family of Northern Virginia, for example, Laura Croghan Kamoie finds that plantations and ironworks shared a capitalist mentality. “The Tayloes of Virginia were not engaging in a particularly Southern economic culture,” she argues, “but instead in an economic culture shared by many early Americans.” Thus, when Catharine Furnace arrived on the stage, it was a distinct act in the long-running show of the region’s economic development.<sup>3</sup>

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<sup>2</sup> Steven Stoll, *Larding the Lean Earth: Soil and Society in Nineteenth-Century America* (New York: Hill and Wang, 2002), 13-14; Avery Craven, *Soil Exhaustion as a Factor in the Agricultural History of Virginia and Maryland, 1606-1860* (Urbana: University of Illinois Press, 1926); Jack Temple Kirby, *Mockingbird Song: Ecological Landscapes of the South* (Chapel Hill: University of North Carolina Press, 2006). For more on the fertility of soil in Virginia and its social and economic impact, see David Hackett Fischer and James C. Kelly, *Away I’m Bound Away: Virginia and the Westward Movement* (Richmond: Virginia Historical Society, 1993); William M. Mathew, *Edmund Ruffin and the Crisis of Slavery in the Old South: The Failure of Agricultural Reform* (Athens: University of Georgia Press, 1988); John Majewski, *Modernizing a Slave Economy: The Economic Vision of the Confederate Nation* (Chapel Hill: University of North Carolina Press, 2009), 53-80.

<sup>3</sup> Laura Croghan Kamoie, *Irons in the Fire: The Business History of the Tayloe Family and Virginia’s Gentry, 1700-1860* (Charlottesville: University of Virginia Press, 2007), 6. For more on Virginia’s early history of development, see Frederick Siegel, *The Roots of Southern Distinctiveness: Tobacco and Society in Danville, Virginia, 1780-1865* (Chapel Hill: University of North Carolina Press, 1987); A. Glenn Crothers, “‘The Projecting Spirit’: Social, Economic, and Cultural Change in Post-Revolutionary Northern Virginia, 1780-1805,” (PhD thesis, University of Florida, 1998). John Majewski, *A House Dividing: Economic Development in Pennsylvania and Virginia before the Civil War* (New York: Cambridge University Press, 2000).

However, Catharine Furnace relied upon slave labor, as did its antecedents in the region, making it a distinctly southern enterprise. Historian John Bezis-Selfa finds that early American ironworks blended free and slave labor, with the boundary between the two becoming blurry at times. By the 1830s, however, Bezis-Selfa's idea of an "industrious revolution" had transformed free labor in the North at the same time that it helped redefine slavery in southern ironworks. In other words, a distinct system of industrial slavery arose in the charcoal iron industry. "As the South slowly began to develop an embryonic industrial base," historian Ronald Lewis argues, "there was a corresponding dependency upon black slaves to supply the labor for this movement." Catharine Furnace's story is therefore intertwined with that of industrial slavery and, as Chapters Four and Five demonstrate, it could not survive without its bonded workers. In this sense, Wellford's furnace offers yet another case study in how owners, managers, and workers negotiated the sometimes strict, sometimes permeable boundaries of industrial slavery to create a distinctly southern iron trade. Like Charles Dew's study of the Valley of Virginia's Buffalo Forge, then, Eastern Virginia's Catharine Furnace offers an insight into the everyday lives of black and white Virginians struggling to create an industrial society.<sup>4</sup>

Interwoven into the daily life of Catharine Furnace is the story of ironmaking. As one of the prime elements in the worldwide Industrial Revolution, ironmaking became a particular concern for the American economy over the course of the nineteenth century. Before succumbing to Pennsylvania's iron smelted from anthracite or bituminous coal in the 1850s, Virginia's antebellum charcoal iron industry provided an industrial alternative to the Old Dominion's plantation-dominated past and marked, in the words of historian Kathleen Bruce, "her emergence as a state with marked industrial interests." Most of this iron came from the valley, but Catharine Furnace stood out in a number of ways. Not only was it one of the easternmost charcoal furnaces in this trade of growing import, but John Wellford also was an early adapter of the "hot blast" method of making pig iron. With ample supplies of raw materials such as ore and charcoal and with cutting-edge technology implemented from the very beginning, Catharine Furnace stood as a shining example of the Old Dominion's industrial potential when it started its first blast in 1837.<sup>5</sup>

Catharine Furnace never wanted for raw materials or labor, like many other industrial endeavors of the South. And yet, like so many southern industries, it had problems

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<sup>4</sup> See John Bezis-Selfa, "A Tale of Two Ironworks: Slavery, Free Labor, Work, and Resistance in the Early Republic," *William and Mary Quarterly* 3rd ser., 56 (1999): 677-78; and *Forging America: Ironworkers, Adventurers, and the Industrious Revolution* (Ithaca, N.Y.: Cornell University Press, 2004). Quote is from Ronald Lewis, *Coal, Iron, and Slaves: Industrial Slavery in Maryland and Virginia, 1715-1865* (Westport, Conn.: Greenwood Press, 1979), 20; Charles Dew, *Bond of Iron: Master and Slave at Buffalo Forge* (New York: W. W. Norton, 1994).

<sup>5</sup> Kathleen Bruce, *Virginia Iron Manufacture in the Slave Era* (New York: The Century Co., 1931), 148. Bruce's work remains the most comprehensive scholarly monograph dealing with the antebellum Virginia iron trade. For more on this industry, see James Swank, *The Manufacture of Iron in All Ages* (Philadelphia: The Iron and Steel Association, 1892), 269-71; Samuel Sydney Bradford, "The Antebellum Charcoal Iron Industry of Virginia" (PhD thesis, Columbia University, 1958); James Larry Smith, "Historical Geography of the Southern Charcoal Iron Industry, 1800-1860" (PhD thesis, University of Tennessee, 1982), 123-25; Robert Gordon, *American Iron, 1607-1900* (Baltimore: The Johns Hopkins University Press, 1996), 82-84.

translating material abundance into economic success. Fredericksburg's failure to emerge as a major manufacturing center and hub of transportation, despite John Spotswood Wellford's best efforts, had dire repercussions for Catharine Furnace. As past studies of major northern cities such as Philadelphia or emerging southern cities such as Richmond have demonstrated, the relationship between an urban center providing manufacturing facilities, investment capital, and a communications network, along with a growing hinterland to provide raw materials, consumer markets, and transportation corridors, was essential for nineteenth-century industrialization. Even Spotsylvania's "poison lands" loom large in the story of Catharine Furnace, as David Meyer's recent study of New England demonstrates that a thriving agricultural sector was important, even essential, to that region's industrial growth. Without a thriving community to support it, then, it seems that Catharine Furnace would continue to be uncompetitive in national markets. This failure, however, was not an inherent result from John Wellford's use of slave labor or his lack of ironmaking expertise. Instead, as Chapter Two demonstrates, his frustrated search for markets led him to federal contracting instead.<sup>6</sup>

The two phases of Catharine Furnace—John Spotswood Wellford's operation as well as its brief reincarnation during the Civil War—tell a story about the role of the state in southern industrialization. The first manifestation of Catharine Furnace was dependent upon federal contracts. John Wellford was able to translate this into profitability, but it withered after his death when the contacts of this very well-connected man died with him.

The second phase in Catharine Furnace's history is even more dependent upon public institutions and their business—its very *raison d'être* was Confederate munitions contract. In both cases, the role of state institutions played a major role in keeping the ironworks in business. The relationship between government officials and southern industrialists has a long history from the "commonwealth" studies of the 1940s and 1950s, through the pathbreaking work of Charles Dew on the influential Tredegar Works of Richmond, to recent studies of southern railroads, colliers, and other industrial ventures that owed a great deal of support to public institutions—even as they became less competitive in national markets and more dependent upon state subsidies and regional customers.<sup>7</sup>

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<sup>6</sup> On the relationship between urban growth and regional development in nineteenth-century America, see Diane Lindstrom, *Economic Development in the Philadelphia Region, 1810-1850* (New York: Columbia University Press, 1978); David Goldfield, *Urban Growth in the Age of Sectionalism: Virginia, 1847-1861* (Baton Rouge: Louisiana State University Press, 1977); Majewski, *A House Dividing*. Keith Edward Littlefield's study, "Economic Challenge and Mercantile Enterprise in a Southern Urban System: A Case Study of Fredericksburg, Virginia, 1835-1880," (PhD thesis, University of Maryland, 1999), examines the phenomenon in Fredericksburg. David R. Meyer, *The Roots of American Industrialization* (Baltimore: The Johns Hopkins University Press, 2003)

<sup>7</sup> For more on the role of the state in southern industrial development, see Milton Heath, *Constructive Liberalism: The Role of the State in the Economic Development of Georgia to 1860* (Cambridge: Harvard University Press, 1954); Carter Goodrich, *Government Promotion of American Canals and Railroads, 1800-1890* (New York: Columbia University Press, 1960); J. Mills Thornton III, *Politics and Power in a Slave Society: Alabama, 1800-1860* (Baton Rouge: Louisiana State University Press, 1978); Charles Dew, *Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works* (New Haven: Yale University Press, 1966), 10-37; Majewski, *A House Dividing*; Sean Patrick Adams, *Old Dominion and Industrial Commonwealth: Coal, Politics, and Economy in Antebellum America* (Baltimore: Johns Hopkins University Press, 2004).

As mentioned earlier, the Civil War serves as the focal point for Catharine Furnace, albeit in an indirect way. But Charles Wellford's furnace touches on questions dealing with the Confederate economy in a significant way. As an iron furnace utterly dependent upon Confederate ordnance contracts for its existence, Charles Wellford's endeavor offers a way to explore the ways in which Confederate officials managed the southern economy. Many historians argue that the strong Confederate state was a creature spawned brought about by military necessities and that secessionists in 1861 never anticipated nor desired the leviathan in place by 1865. The apparent paradox between the heavy hand of the Confederate state and the states' rights ideology espoused by many secessionists forms an important part of the "Lost Cause" mythology by further demonstrating how the noble origins of southern dissent had lost their way by the end of the war. In his recent study of economic visions of secession and the southern economy, John Majewski argues that the defense of slavery, rather than wartime necessity, spurred this change of heart. "Once the creation of the Confederacy made the protection of slavery a national issue," Majewski writes, "former advocates of states' rights shifted rather quickly to the support of a strong national government." The story of Catharine Furnace cannot explore all the facets of this debate, but it does shed light on one important aspect of Majewski's argument. Charles Wellford was no mild southern patriot—he served time as a hostage taken by Union forces and aided Stonewall Jackson's march voluntarily. Wellford also worked closely with Confederate officials to provide pig iron for the cause and continued to depend upon slave labor at Catharine Furnace until 1865. For him, a strong Confederate state managing the economy while protecting slavery wasn't a paradox. Even though Catharine Furnace operated only sporadically during the Civil War, the time that it did spend in blast had implications beyond its role as a landmark for the Army of Northern Virginia at Chancellorsville.<sup>8</sup>

Catharine Furnace, despite its brief career, touches upon all of these themes in some way. As a site rich in environmental, business, labor, technological, and social history, these ironworks provide an insight into many aspects of Virginia, the South, and the nation's industrial heritage. For these reasons, its story is an important one that merits a closer look. The following five chapters lay out a story that reaches far beyond Spotsylvania County in its significance. Chapter One relates the earliest history of ironmaking in the region and attempts to explain the origins of the "poison lands" that played such a prominent role in its later history. Chapter Two introduces the business history of John Spotswood Wellford and the Fredericksburg Iron and Steel Manufacturing Company. Chapter Three explains the process of ironmaking and explores further the idea that Catharine Furnace played a role in the creation of the "Wilderness." Chapter Four attempts to recreate the lives of those black and white workers who labored at Catharine Furnace. Finally, Chapter Five tells the story of Charles Wellford's Catharine Furnace and its many ordeals during the Civil War. In the end, it is a story limited in years and small in space, but rich in meaning.

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<sup>8</sup> Majewski, *Modernizing a Slave Economy*, 114. For more on the issue of Confederate nationalism and its economic implications, see Emory H. Thomas, *The Confederacy as a Revolutionary Experience* (Englewood Cliffs, NJ: Prentice Hall, 1972); Paul Escott, *After Secession: Jefferson Davis and the Failure of Confederate Nationalism* (Baton Rouge: Louisiana State University Press, 1978); Richard Franklin Bensel, *Yankee Leviathan: The Origins of Central State Authority in America, 1859-1877* (New York: Cambridge University Press, 1990); Harold S. Wilson, *Confederate Industry: Manufacturers and Quartermasters in the Civil War* (Jackson: University Press of Mississippi, 2002); Chad Morgan, *Planters' Progress: Modernizing Confederate Georgia* (Gainesville: University Press of Florida, 2005).

## CHAPTER ONE

### CREATING THE LANDSCAPE OF CATHARINE FURNACE

The landscape surrounding Catharine Furnace has seen many different enterprises come and go. Different modes of cultivating the land came in and out of fashion. Marketable crops such as tobacco, wheat, and corn each had their turn in Spotsylvania County's economic history. The one consistent element, according to observers across three centuries, was the land's rich deposits of mineral ore and the poor quality of the soil surrounding them.

The ore deposits were a result of nature. The ore outcroppings, known as "gossans," occurred when erosion wore down the layer of soil covering the raw iron, exposing it to the air and giving it a deep brown or red gloss of rust. These gossans had always been a part of the Spotsylvania County landscape. The "sour" or "poison" lands that surrounded them, however, were the likely result of human habitation and cultivation of the soil. The optimism surrounding the industrial potential of the region's iron ore would be tempered by the descriptions of the "wilderness" that surrounded it. Both the optimism and the "sour" fields were man-made; this chapter describes their early history.

#### MAKING A WILDERNESS

John Smith and Robert Beverley published books a century apart, yet their description of Virginia's soil, climate, and forests seem remarkably similar. When John Smith wrote his *Generall Historie of Virginia* in 1624, he offered an interesting assessment of the new colony's soil. Although he found "the nature of the soil to be lusty and very rich," he also claimed that "for the most part it is a blacke sandy mould, in some places a fat slimy clay, in other places a very barren gravell." Robert Beverley bragged in 1722 that Virginia's "soil is of such variety, according to the difference of situation, that one part or other of it seems fitted to every sort of plant that is requisite either for the benefit or pleasure of mankind." These rich soils, both narratives claim, along with Virginia's temperate climate, spurred the growth of dense, nearly impenetrable forests. Smith maintained that, aside from the swampy marshes in Virginia's Tidewater, the entire area was covered with large trees and bushes. "Other plaines there are few, onely where the Salvages inhabit," Smith wrote, "but all overgrown with trees & weeds, being a plaine wilderness as God first made it."

Beverley's descriptions a century later were strikingly similar. He told readers that along Virginia's rivers, one could expect land "stored with large oak, walnut, hickory, ash, beech, poplar, and many other sorts of timber, of surprising bigness." These early accounts of the Chesapeake were written with the promotion of colonization in mind, but nonetheless formed an early consensus among European settlers that Virginia's agricultural bounty would be endless.<sup>1</sup>

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<sup>1</sup> John Smith, *The Generall Historie of Virginia, New England, & the Summer Isles* (Glasgow: Glasgow University Press, 1907 [1624]), 44-45; Robert Beverley, *The History of Virginia in Four Parts*, ed. Charles Campbell (Richmond, VA: J.W. Randolph, 1855 [1722]), 96, 97.

As those Europeans arrived in greater numbers, however, they learned that Virginia's soil was not quite as fecund as they had imagined, particularly in the area that would surround Catharine Furnace. Recent evaluations have shown the soil there to be "deep, well-drained sandy loams with clayey or loamy subsoils." This strongly acidic earth first gave rise to a mix of oak and hickory trees. Contrary to Smith's belief, American Indians likely altered the landscape far before European contact with a series of planned burns, thus making the more fire-resistant red oak prevalent by the time Beverley wrote his description of Virginia in the 1720s. Europeans undermined this oak forest during the first phase of their settlement with early practices of clearing land such as "girdling." Girdling strips a layer of bark around a tree, leaving it to die and making it easier to chop down. Once thinned, the land became available for cultivation among the stumps. It also became subject to erosion from the Virginia Piedmont's notoriously hard rains. Simply put, hard rains wash away nutrients that otherwise would remain in the topsoil, leaving an impoverished soil that sustained pine and some oak, but not in the densities that characterized the Virginia forest at the time of European contact. Erosion became an important factor in the colony's early growth and would remain so over the next two centuries. "No settled place on the continent lost its tillable surface as completely as the southern Piedmont," historian Steven Stoll argues. By the time the Virginia colony had committed to tobacco as its primary crop, therefore, the area around what would be Catharine Furnace was still a "wilderness," albeit a man-made one.<sup>2</sup>

Virginia's agricultural practices further degraded this already weakened land as it became officially organized as Spotsylvania County in 1721. As more land and more slaves became available on Virginia's borderlands, the land dedicated to tobacco cultivation increased steadily westward, putting the newly formed county squarely in its sights by the 1720s. By 1724, 91 percent of Virginians subject to taxation were engaged in the production of tobacco, with no discernible difference in that ratio as one moved across the established areas of the Tidewater to the new settlements in the Piedmont. In Spotsylvania County this process occurred rather rapidly. According to a census commissioned by the House of Burgesses in 1726, production of tobacco effectively doubled in Spotsylvania County over the short time of two years. This production took a heavy toll on the land. "Because tobacco was such a heavy consumer of plant nutrients and because its growth encouraged soil toxicity," forest historian Michael Williams argues, "it was inevitable that the land would become exhausted and 'sour' in time and would then be abandoned." Tobacco cultivation encouraged a process of skimming the fertility off the topsoil and then moving on to new, unbroken land—referred to by contemporaries as the "Virginia mode of cultivation." As historian Avery Craven noted in his classic study of soil depletion in Virginia and Maryland, tobacco cultivation ravaged the eighteenth-century landscape, giving way to corn production. The results were not good for the soil. "As tobacco moved on into new lands," Craven argued, "the fields still clean and open, were either left unused and neglected, to be quickly cut into deep gullies, or were given over to a period of wheat and more likely to a succession of corn crops." Corn cultivation offered

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<sup>2</sup> David A. Orwig and Marc D. Abrams, "Land-Use History (1720-1992), Composition, and Dynamic of Oak-Pine Forests Within the Piedmont and Coastal Plains of Northern Virginia," *Canadian Journal of Forest Research* 24 (1994): 1216-225; Craven, *Soil Exhaustion as a Factor in the Agricultural History of Virginia and Maryland*, 27; Stoll, *Larding the Lean Earth*, 137.

no relief—it was just as enervating to the soil as tobacco. Such habits required large amounts of land to sustain profitability; this explains why most early Virginia planters measured their holdings in the thousands of acres and how they managed, according to one nineteenth-century estimate, to remove three-quarters of the Chesapeake’s vegetative cover between 1607 and 1800.<sup>3</sup>

Very early observers of the Spotsylvania County landscape noted this trend. At some point, land in the area earned the reputation of “poison lands” or “wilderness.” The latter name probably dates back to the “Wilderness Tract” created in 1719 or a creek and bridge of the same name built in 1727. The reputation of this land’s spoiled nature is equally present during this time. In 1732, the planter William Byrd described the landscape in Spotsylvania County while riding to visit Alexander Spotswood’s ironworks. “I rode 8 Miles together over a Stony Road,” he recalled, “and had on either side continual poisen’d Fields, with nothing but Saplings growing on them.” When riding on a “fine Road” that Spotswood had constructed to his ore pits, Byrd found “a great deal of Land in his Mine tract exceedingly barren, and the growth of Trees upon it is hardly big enough for Coaling. . . . However,” Byrd continued, “the Treasure under Ground makes amends, and renders it worthy to be his Lady’s Jointure.” The “wilderness” thus had a double meaning; it referred to both the tangled and stunted growth of the cleared land in the area, but also the rich potential for industrial exploitation. Spotswood himself mentioned his desire to overcome the paucity of soil in 1724 when defending his purchase of massive tracts in his namesake county. “I, who led the way to take up large tracts of those long neglected lands called Poisoned Fields,” he wrote a superior, “and if I, how have been at the trouble and expence of seating about 300 people upon lands in this county, must by a forced construction to be excluded from the King’s bounty, I have only to regret the pains I have taken.” The ways in which several Virginians, most notably Alexander Spotswood, attempted to draw substance from this poor-looking land made industrial potential a common theme in Spotsylvania County’s history for the next hundred years.<sup>4</sup>

#### SPOTSWOOD’S IRONWORKS

When Alexander Spotswood arrived in Virginia as the colony’s lieutenant governor in 1710, Chesapeake’s tobacco culture was already nearly a century old. Most of Virginia’s 80,000 residents were engaged in tobacco production, and nearly a quarter of them were African-American slaves. As the chosen representative of the colony’s official governor, Lord George Hamilton, Earl of Orkney, the thirty-four-year old Spotswood had left a rather distinguished military career to pursue imperial administration. Lord Orkney would never make it

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<sup>3</sup> Leonidas Dodson, *Alexander Spotswood, Governor of Colonial Virginia, 1710-1722* (Philadelphia: University of Pennsylvania Press, 1932), 227-28; Paula Felder, *Forgotten Companions: The First Settlers of Spotsylvania County and Fredericksburgh Town (With Notes on Early Land Use)* (Fredericksburg, VA: Historic Publications of Fredericksburg, 1982), 30-31; Michael Williams, *Americans and Their Forests: A Historical Geography* (New York: Cambridge University Press, 1989), 66; Craven, *Soil Exhaustion as a Factor*, 35; Kirby, *Mockingbird Song*, 83-84.

<sup>4</sup> William Byrd, “A Progress to the Mines,” in *The Writings of Colonel William Byrd of Westover in Virginia, Esquire*, ed. John Spencer Bassett (New York: Doubleday, Page & Co., 1901), 356, 370; Felder, *Forgotten Companions*, 242; Harrison to staff, memorandum, “Thoughts on the Chancellorsville-Wilderness Landscape.”

to Virginia; Alexander Spotswood would therefore act with the full confidence of that office. Immediately following his arrival, Spotswood laid out an ambitious program for Virginia, one that reflected his youthful energy and confidence. Tobacco would, of course, serve as the colony's economic engine, but Spotswood noted Virginia's great potential for industrial development as well. "There is a project intended to be handed to this next Assembly for the improvement of Iron mines lately discovered in this country," he wrote to the Council of Trade on 24 October 1710, "which upon Tryl have been found to be extraordinary rich and good." Spotswood recommended that the work be done at "Publick Charge" and that Virginia's iron trade would allow England to become less dependent upon foreign sources. Later that year Spotswood implored again to his authorities to support Virginia iron, complaining that the House of Burgesses had rejected his overtures with narrow self-interest in mind: "These Iron mines lying only at the Falls of James River, and the rest of the Country did not apprehend any benefit they should reap thereby. . . . I have been assured that the Oar has been tried and found extraordinary Rich, and I have discoursed the Owners of the Land, and find them very willing to yield up their Right into her Maj'tie's hands without expecting any other consideration than such an Office in the management of the work as they shall be capable of." Spotswood pleaded again in the summer of 1711 for help from England in establishing an ironworks in Virginia, but could find no official backing for his project.<sup>5</sup>

Spotswood was not the first person to note Virginia's potential for making iron. Robert Beverley's 1722 history of the colony mentions "proof of good iron ore" at Falling Creek along the James River in the early years of Virginia colony. By the winter of 1621-22, John Berkeley was overseeing the construction of a smelting furnace in an area described by one early colonial official as "if nature had applied herself to the wish and direction of the workmen." An attack by American Indians in March of 1622 destroyed this venture and cost the lives of Berkeley and the majority of his ironworkers. A century later, Beverley lamented that this early venture began "where the iron proved reasonably good; but before they got into the body of the mine, the people were cut off in that fatal massacre." Plans to renew the venture popped up over the next century, but by the time of Spotswood's arrival, no other iron furnace had been established in the colony.<sup>6</sup>

Although frustrated in his attempt to construct a state-funded ironworks, Spotswood took advantage of an opportunity to promote Virginia's iron trade in 1712. In that year, Baron Christopher de Graffenreid asked to relocate a group of Palatinate Germans from North Carolina, where they had attempted to establish a settlement, to the Virginia colony. Spotswood saw the German settlement as a potential buffer against Iroquois incursions along the northern Virginia borderlands and was very receptive to de Graffenreid's suggestion that skilled German miners could enhance Virginia's economic prospects. By 1714, de Graffenreid had recruited skilled miners from Siegen to emigrate to Virginia, but had run out of funds. At that point, Spotswood took over the venture by paying passage for those miners from

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<sup>5</sup> R.A. Brock, ed., *The Official Letters of Alexander Spotswood, Lieutenant-Governor of the Colony of Virginia, 1710-1722*, vol. 1 (Richmond: Virginia Historical Society, 1882), 20-21; 41; 88-89; Dodson, *Alexander Spotswood*, 228-30; Walter Havighurst, *Alexander Spotswood: Portrait of a Governor* (Williamsburg, VA: Colonial Williamsburg, 1967), 2-6.

<sup>6</sup> Beverley, *The History of Virginia in Four Parts*, 38, 99; Frank Grizzard, Jr. and D. Boyd Smith, *Jamestown Colony: A Political, Social, and Cultural History* (Santa Barbara, CA: ABC-CLIO, 2007), 73-74.

London to Virginia and establishing forty-two Germans in a small palisaded settlement on a horseshoe-shaped bend on the Rapidan River on the outer reaches of Virginia's northwestern borders. The community was deemed "Germanna," from the combination of "German" and the original name of the Rapidan River, the "Rapidanna." At first, Spotswood hoped that the community would mine for silver. In 1716 one visitor to Germanna's nearby mines claimed that the "Germans pretend that it is a silver mine," but when they tested the ore they "could get nothing out of it." Eventually, though, these skilled miners recognized that iron, not silver, was the mineral resource in abundance near Germanna.<sup>7</sup>

The small settlement of German miners along the Rapidan gave Spotswood the wedge he needed to begin ironworking in earnest. His acquisition of massive amounts of land in what would eventually become Spotsylvania County provided a second major step. In 1716 Spotswood acquired title to the Germanna Tract, totaling more than 3,000 acres, and in 1719 added the Mine Tract (15,000 acres), Wilderness Tract (3,000 acres), and the Massaponax Tract (3,000 acres). The original residents of Germanna had left by then for greener pastures in nearby Fauquier County, but Spotswood sent new German settlers into the region to set up an ironworks. His plan to settle the area rapidly was aided by government policy with the creation of Spotsylvania County in 1721 and the Board of Trade's acquiescence in a plan to suspend quit rents for landholders there for ten years. The following year, Spotswood stepped down from his position as Lieutenant Governor of Virginia, but not before he had acquired the Spotsylvania Company Tract (40,000 acres), swelling his personal stake in his namesake county to more than 60,000 acres. By 1723, Spotswood's German indentured servants and African-American slaves had constructed a blast furnace, called Tubal Furnace after the biblical character Tubal Cain, and Spotswood shipped twenty-three tons of pig iron to England as ballast. Spotswood left Virginia for six years, beginning in 1724, to defend his rather extensive land claims. Tubal Furnace, under the management of Spotswood's cousin, John Graeme, continued to make pig iron during his absence.<sup>8</sup>

At some point, Spotswood's holdings expanded to three furnaces, including the Fredericksville Furnace on the North Anna River and an "air furnace" for making iron castings at his Rappahannock River plantation in the Massaponax Tract. These ironworks, along with Stafford County's Accokeek Furnace and Maryland's Principio Company furnaces, formed the crux of the colonial Chesapeake charcoal iron industry. Although significant at the time, it is important to note that these ironworks operated amid a plantation society. In 1725 the Spotsylvania Tract contained three plantations, and the Iron Mine Tract had six of them. As both an absentee and resident landlord, Spotswood rented out 14,639 acres to small-scale tobacco farmers in 104 allotments, each of whom paid an annual rent of 800 pounds of tobacco per 150 acres of land. The 1720s therefore saw Spotsylvania County as the center of extensive land clearing for both tobacco cultivation and charcoaling, which must have taken an extensive toll on the landscape. On the whole, ironmaking took a back seat to tobacco

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<sup>7</sup> Willis Miller Kemper and Harry Linn Wright, eds., *Genealogy of the Kemper Family in the United States* (Chicago: George K. Hazlitt & Co., 1899), 10-13; Bruce, *Virginia Iron Manufacture*, 8-10; Raymond E. Myers, "The Story of Germanna," *The Filson Club History Quarterly* 48 (1974): 27-42; Ann Maury, ed., *Memoirs of a Huguenot Family* (New York: G.P. Putnam & Sons, 1872), 282.

<sup>8</sup> Lester J. Cappon, *Iron Works at Tubal* (Charlottesville: University of Virginia Press, 1945), 91-93; Dodson, *Alexander Spotswood*, 246-48, 280-82; Havighurst, *Alexander Spotswood*, 95-96.

planting. Not that this would always be the case; many Virginians had high hopes for their iron industry. “Since the little Hills so plentifully abound with the best of Iron,” the Rev. Hugh Jones wrote in his 1724 account of Virginia, “for the digging, melting, working and Exportation whereof Providence has furnish’d us with all wonderful Conveniences; if we would add but a little Expence, Art, and Industry.” Jones hoped that Spotswood’s furnace would “in a small Time prove very advantageous to Great Britain,” and that it would no doubt succeed under his “skillful Management and indefatigable Application to such noble Undertakings and glorious Projects.”<sup>9</sup>

Little is known about the everyday workings of Tubal Furnace or any of Spotswood’s other ironmaking endeavors during this period. William Byrd’s 1732 travel narrative entitled “A Progress to the Mines” offers the most detailed perspective on Spotswood’s ironmaking operations. Byrd first visited Charles Chiswell at the Fredericksville mine, in southwestern Spotsylvania County. Fredericksville had a furnace of their own, “elegantly built of Brick, tho’ the Hearth be of Fire-Stone,” but the founder there “lookd a little Melancholy, because he had nothing to do, the Furnace having been Cold ever since May, for want of Corn to Support the Cattle.” Chiswell told Byrd that Fredericksville Furnace represented a capital investment of £12,000, and that they had made more than 1,200 tons of pig iron. Although its bare bones labor force was forty workers, “they had not more than 80 Negroes, and a few of those Virginia born,” suggesting that Chiswell had tapped into slave markets to augment his workforce. Byrd learned that the furnace controlled 15,000 acres of land, “tho’ little of it rich except in Iron,” thus reinforcing the paucity of Spotsylvania County’s soil by 1732. In fact, Fredericksville Furnace still imported corn to feed its workforce, hence the work stoppage during Byrd’s visit. Chiswell estimated that his furnace was good for about twenty tons of pig iron per week when running full, but the want of provisions made that impossible. Chiswell, however, seemed optimistic that his furnace would be in blast soon, and after “tipping a Pistole to the Clerk, to drink prosperity to the Mines with all the Workmen,” Byrd was on his way to visit Spotswood’s “enchanted Castle” and ironworks.<sup>10</sup>

As the “Tubal Cain of Virginia,” Spotswood still believed in the power of the iron trade. He told Byrd that the colony’s four active furnaces “circulated a great Sum of Money for Provisions, . . . took off a great Number of Hands from Planting Tobacco,” and offered relief for the British economy from foreign imports. By 1732 Spotswood had a fairly sophisticated iron operation on his 45,000 acres in Spotsylvania County. After making pig iron at Tubal Furnace, he was “oblig’d to Cart the Iron” some fifteen miles to his air furnace at Massaponux, where he refined it into both bar iron for export and casting such as stove backs. This system had only just begun to recover from the “wretched Management of Mr. Greame” under whom “his Furnace stood still [a] great part of the time, and all his Plantations ran to ruin” while Spotswood was in England defending his land claims. Byrd learned that he too could set up an ironworks in Virginia for about £700, with yearly expenses of £500. Spotswood claimed that his iron would earn a clear profit of £3/ton, once labor, materials, and transportation costs to England were subtracted. Since Byrd learned that a Virginia iron furnace should make

<sup>9</sup> Dodson, *Alexander Spotswood*, 296-99; Hugh Jones, *The Present State of Virginia* (London: J. Clarke, 1724), 58.

<sup>10</sup> *Virginia Iron Manufacture*, 14-15; William Byrd, “A Progress to the Mines,” 350-55.

about 800 tons per year, he seemed favorably inclined to the future prospects of both Chiswell and Spotswood's endeavors.<sup>11</sup>

One of the most notable elements of Spotswood's operation was his use of slave labor. He boasted to Byrd that, save for "raising the Mine and running the Iron," he used his "own People," or African-American slaves on every facet of his ironmaking operation to save money. "Nay," Byrd wrote, "he believ'd that by his directions he cou'd bring sensible Negroes to perform those parts of the Work tolerably well." Such a strategy also eliminated the need to recruit skilled labor from the ranks of white, free workers. Not only would attracting free labor be expensive, enlisting free white workers and enslaved black ones also might create discord in his isolated industrial community. A uniformly enslaved workforce, Spotswood believed, could "preserve a constant Harmony among themselves." A model ironworks, Spotswood mused, would have at least a "Hundred Negroes employ'd in it, and those upon good Land would make Corn, and raise Provisions enough to support themselves and the Cattle, and do every other part of the Business." Thus, Spotswood's enterprise established a firm connection in Virginia between slave labor and ironworking. Although free white laborers continued to work in southern iron furnaces, more and more tasks were allotted to enslaved workers. By the 1750s, for example, slaves played a prominent role in fellow Virginian John Tayloe's ironmaking operations in Prince William County. As the enslaved workforce became more skilled there, Tayloe, like many Virginia ironmasters after him, became dependent upon them. "By the 1770s," historian Laura Croghan Kamoie argues of Tayloe's operations, "slaves possessed the full spectrum of skills related to the works and increasingly replaced white craftsmen in the head positions."<sup>12</sup>

Considering Byrd's glowing account, one might expect Spotswood's iron operations to be a fixture in Virginia's economy for decades. By 1739, however, Spotswood put Tubal Furnace and the 23,000 acres attached to it up for rent. Quite tellingly, he highlighted the skilled labor that accompanied the twenty-one year lease on Tubal Furnace, the Massaponax plantation and furnace, and roughly 23,000 acres of Spotsylvania County land: the "sixty able looking slaves (with 12 or 15 of their children)" which "have all been trained up and Employed in the Iron works and are Capable of Carrying on the same of themselves as they have done for some years past, without putting me to the Expense of Wages or Salaries in any Branch of the Business" except for the founder and a general overseer. Spotswood asked for a £10,000 surety and £1,500 rent annually, which demonstrates his belief that he left a profitable enterprise in place and the huge value he placed upon his "Slaves, who have no Wages and who will always be more Subservient and Observant of orders than Freemen in this country will be." Spotswood died in 1740 and willed his ironworks to his underage son, John. Fragmentary evidence suggests that Tubal Furnace shipped 410 tons of pig iron to England in 1750, and a decade later slaves still worked the valuable ore mines. Little is known, however, of the actual

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<sup>11</sup> Byrd, "A Progress to the Mines," 358-62.

<sup>12</sup> Byrd, "A Progress to the Mines," 360; Cappon, *Iron Works at Tuball*, 15; Bezis-Selfa, *Forging America*, 78-79; Kamoie, *Irons in the Fire*, 85. In his survey of colonial metal industries, James Mulholland claims that "no lasting heritage stemmed from [Spotswood's] ironworking efforts in Virginia," but this discounts the successful application of slave labor to ironworking in Virginia, which became an essential aspect of the trade for the next century. See James Mulholland, *A History of Metals in Colonial America* (Tuscaloosa: University of Alabama Press, 1981), 65.

demise of Spotswood's enterprise. By the American Revolution, Tubal Furnace lay in ruins, and Spotswood's dream of a vibrant iron trade enriching Virginia was put on hold.<sup>13</sup>

Fredericksburg's iron industry saw a brief renaissance during the Revolutionary War. Once again, public authorities were the first to hear requests for help. James Hunter, the owner of the Rappahannock Forge, sought the aid of Virginia's state government in both expanding his existing manufacturing concern as well as reopening the old Accokeek Furnace in nearby Stafford County. Hunter received Governor Patrick Henry's promise for "the assistance of the Publick in the Prosecution of his Works on a more enlarged plan" in 1777, which precluded any financial aid, but did exempt his workers from military service and authorized him to explore for iron ore and either rebuild or construct smelting furnaces. In 1779, a legislative committee endorsed Hunter's quest for pig iron by encouraging him to explore the Accokeek renovation, as well as looking at "other Lands [that] can be explored for Ore and convenient Furnace Seats." Local landowners challenged Hunter's rights to the Accokeek property, though, and clear title to the land became tied up in courts for years. The 1779 committee's hope that furnaces would be constructed "on the same direction & vein of Ore with Mr. Spotswoods & Mr. Chissels" colonial ventures never came to pass. Hunter never secured a new source for pig iron, and although Rappahannock Forge did yeoman service in fabricating muskets for the Revolution, he was out of business by 1782. The next phase in ironmaking for the "Wilderness" would wait until another Spotswood arrived on the scene.<sup>14</sup>

#### JOHN SPOTSWOOD WELLFORD'S ROAD TO IRONMAKING

Although his middle name evokes the early history of Virginia, John Spotswood Wellford was the firstborn son of a British physician and soldier. Dr. Robert Wellford served as an army surgeon in the First Battalion of Grenadiers and first arrived in America in the early years of the American Revolution. He resigned his commission with the British Army in Philadelphia and attended to several American prisoners while that city was under military occupation. One of the most gravely wounded prisoners was Colonel John Spotswood, grandson of Governor Alexander Spotswood, who had been injured at the Battle of Brandywine. Physician and patient struck up a friendship, which resulted in Robert Wellford's move to Virginia. Dr. Wellford settled in Fredericksburg and married a widow with two children, Catharine Yates, in 1781. Robert and Catharine eventually raised ten children in Fredericksburg, but to honor his lifelong friend, Dr. Wellford named his first-born son John Spotswood Wellford in 1783. At seventeen, young John moved to Francis Preston's salt works in Southwestern Virginia. At the time, he had some formal education and some training in surveying. Yet Dr. Wellford considered this move away from Fredericksburg an important part of young John's education. He implored Francis Preston's brother, General John Preston, to check up on him from time to time. "He is a youth untainted with the doctrines of modern philosophy as taught by Godwin and Paine," Dr. Wellford wrote to General Preston in 1800, "and that he might be ignorant of

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<sup>13</sup> Cappon, *Iron Works at Tuball*, 16-20; Bruce, *Virginia Iron Manufacture in the Slave Era*, 16-17.

<sup>14</sup> Bruce, *Virginia Iron Manufacture in the Slave Era*, 66-76; Jerrilyn Eby, *Laying the Hoe: A Century of Iron Manufacturing in Stafford County* (Westminster, MD: Hermitage Books, 2003), 50-54; "Fredericksburg in Revolutionary Days (Part 1)," *William and Mary Quarterly*, 1st ser. (1918): 86, 88.

Vice & become a good moral character, valuable in society, his classical studies were closed when those books were introduced to the pupils.”<sup>15</sup>

When John Spotswood Wellford returned to Fredericksburg a few years later, he became enmeshed in the city’s elite cultural and political institutions. In December 1803, John was involved in an infamous duel between his half-brother, William Thornton, and his cousin, Francis Fitzhugh Conway. The two young men were rival suitors of Nellie Madison, niece of President James Madison, who often visited Fredericksburg. After trading insults, the two combatants met at nearby Alum Spring Rock to fight it out with pistols. The duel was fatal for both parties, even though John rushed his brother to his father’s house back in Fredericksburg to seek medical attention from the noted physician. Soon thereafter, John Spotswood founded John S. Wellford & Company, a firm that sold dry goods and hardware. But tragedy struck again. In 1807 John had married the “uniform and placid” and “easy and agreeable” Francis Page Nelson and began raising two daughters and a son. Nine months after giving birth to another daughter, Francis and her young child fell gravely ill. On 2 October 1815, the youngest Wellford daughter passed away. The next day, at the young age of twenty-eight, Francis quietly slipped into unconsciousness and death as John attended her bedside.<sup>16</sup>

By 1820, John S. Wellford had remarried and was emerging as one of Fredericksburg’s leading citizens. From his humble beginnings as a dry goods merchant, John prospered enough to purchase land in the form of a large house in town as well as a thriving farm. His commercial connections allowed him to serve as a director of the Fredericksburg branch of the Bank of Virginia for many years. As a member of the Fredericksburg Agricultural Society, John Wellford served on a committee to promote innovations in planting and animal husbandry through exhibitions and fairs. He also participated in Fredericksburg’s Agricultural Society Show and Fair, where he sat on several prize committees honoring innovations in small-scale manufacturing. His own agricultural pursuits won him honors for the “Best Fatted Work Oxen” and “Best Grass-Fed Beef” in 1835. Five years later, he took home the award for the best turnips in the region. John’s second wife, Janet Henderson Wellford, along with their seven daughters, became fixtures in Fredericksburg’s Presbyterian Church, even donating the land to build a new church.<sup>17</sup>

Although he was a wealthy farmer and a leading member of Fredericksburg society, John Spotswood Wellford’s views led him to break with Virginia’s Jeffersonian political tradition. He first tested the political waters as a founding member of Fredericksburg’s

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<sup>15</sup> Robert Wellford, ed., “A Diary Kept by Dr. Robert Wellford, of Fredericksburg, Virginia, during the March of the Virginia Troops to Fort Pitt (Pittsburgh) to Suppress the Whiskey Insurrection in 1794,” *William and Mary Quarterly* 11 (July 1902): 1-19; Robert Wellford to General John Preston, 12 May 1800, Preston Family Papers, Virginia Historical Society, Richmond, VA.

<sup>16</sup> Robert Reid Howison, “Dueling in Virginia,” *William and Mary Quarterly*, 2nd ser., 4 (October 1924): 234; Clara S. McCarty, *Duels in Virginia and Nearby Bladensburg* (Richmond, VA: The Dietz Press, 1976), 32-34. These narrative accounts misdate the duel as occurring in 1817; contemporary newspapers correctly date it in 1803. See, for example, *Philadelphia Repository and Weekly Register*, 28 January 1804. Francis Page Wellford’s obituary can be found in the *Religious Remembrancer* 14 (2 December 1815), 54; Edward Lloyd Lomax, *The Genealogy of the Virginia Family of Lomax* (Chicago: Rand McNally & Co., 1913), 54-56.

<sup>17</sup> *The American Farmer* (Baltimore, MD), 25 November 1825; *Political Arena* (Fredericksburg, VA), 14 October 1828, 1 September 1829, 29 April 1834, 24 November 1835, 11 December 1840.

Anti-Jackson Committee in 1827. When Henry Clay visited Fredericksburg a year later, he received well-wishers and political aspirants at Wellford's house.<sup>18</sup> Wellford followed Clay into the Whig Party, where he served as a prominent figure in Spotsylvania County's local party apparatus. In 1834 he participated prominently in a convention that denounced President Jackson's removal of federal deposits from the Bank of the United States, chaired several Spotsylvania County Whig Party meetings, and headlined a formal request that Henry Clay come to Fredericksburg to do a "public entertainment" in 1840.<sup>19</sup> John's approach to the politics of slavery followed lockstep with that of other Virginia Whigs. He joined the Fredericksburg Auxiliary to the American Colonization Society in 1826 and served as a manager for several years. Despite his affiliation with the ACS's mild form of anti-slavery, John owned at least seven slaves in Fredericksburg by 1835. That same year, he was named to a committee to explore "measures necessary to be adopted in regard to the movements making in the Northern States with respect to the Abolition of Slavery." Apparently mild antislavery initiatives sat well with John Spotswood Wellford, but any immediate threats to the "peculiar institution" provoked an urgent response. His brother and close business associate, Beverly, soon joined the Fredericksburg Anti-Abolition Committee.<sup>20</sup>

Internal improvements in the region formed as one of John Spotswood Wellford's true passions, as he was involved personally in a number of projects over a number of years. Plans for improving the Rappahannock River to link Fredericksburg's tidewater port to upriver markets date back to the late eighteenth century. By 1811, the Virginia Legislature commissioned the Rappahannock Company to oversee the "opening, clearing, and extending the inland navigation" of the river. In 1816, state officials commissioned an official survey of the route, but these ambitious plans stalled. John Spotswood Wellford was a director of a later version of this firm, called the Rappahannock Navigation Company, that received corporate charters from the state in 1826 and 1828. John's warehouse held the lumber ready for the construction of locks, he advertised for "10 or fifteen able bodied negro men" to work on the project, and at a groundbreaking ceremony offered a toast in praise of the Virginia Board of Public Works: "The fund of Internal Improvement—the State helps those who help themselves." These ambitious plans again ran into trouble, as company officials deemed the Rappahannock navigation inadequate by 1836.<sup>21</sup>

John hardly remained idle in the quest to connect Fredericksburg to other markets. In 1831, he was unanimously elected secretary and treasurer of the Fredericksburg and Potomac Company, a firm that sought to build a turnpike, then railroad, linking the city to a

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<sup>18</sup> *Political Arena* (Fredericksburg, VA), 2 October 1827, 30 September 1828.

<sup>19</sup> *United States Telegraph* (Washington, DC), 14 January 1834; *Political Arena* (Fredericksburg, VA), 9 August 1838, 18 February 1840, 8 May 1840.

<sup>20</sup> *African Repository and Colonial Journal* 2 (March 1826): 30; Fredericksburg City Personal Property Tax Records for 1835, p. 11, Library of Virginia, Richmond, VA; *Political Arena* (Fredericksburg, VA), 24 February 1829, 11 September, and 22 September 1835.

<sup>21</sup> *A Collection of All Such Acts of the General Assembly of Virginia of a Public and Permanent Nature as Have Passed Since the Session of 1801* (Richmond, VA: Samuel Pleasants, 1808 [1812 Supplement]): 81-91; *The North American Review and Miscellaneous Journal* 8 (1819): 7-8; *Political Arena* (Fredericksburg, VA), 12 February, 2 May, 12 August, 1 September 1828; 5 February 1836; *Literary Register; a Weekly Paper* (Oxford, OH), 7 February 1829.

steamboat landing on Potomac Creek. Although the founders predicted their system could carry merchandise from Fredericksburg to Baltimore in ten hours or less, this plan also failed to materialize. A year later, he helped secure a charter for the Fredericksburg and Potomac Creek Railroad Company, which apparently failed to attract enough stock subscriptions. Finally, in 1835, John agreed to serve as a manager of the Rappahannock and Blue Ridge Railroad, yet another plan that failed to come to fruition.<sup>22</sup>

Despite these failures, John Spotswood Wellford believed in the industrial potential of the region. In the 1820s, he sought the aid of northern investors in developing its industrial resources when he wrote to the Philadelphia merchant and ironmaster Samuel G. Wright. In 1823, John touted the richness of Spotsylvania County's ore deposits. After sending Wright a sample, he wrote that, "I am informed the land abounds with it, it is to be found in great quantities of the same quality sent you and that near the surface." Wellford reported that the tract for sale was "about ten miles on a turnpike road from this place to the land, I understand the tract is a large one and for sale, the land is generally very poor and consequently may be purchased cheap," and offered to "send you a few Tons of the ore where you could better judge of the propriety of working the purchase." Nearly four years later, Wellford still offered hopes that Wright would invest in ore mining. Even though he inadvertently revealed the lack of indigenous investment in Spotsylvania ore fields by claiming "there is no fear of competition, so you will lose nothing by a little delay," Wellford hoped to secure Wright's partnership. Neither overture resulted in a land purchase.<sup>23</sup>

These unfinished projects must have been frustrating for John Spotswood Wellford. Although he remained a prominent public figure in Fredericksburg, a prominent member of the Presbyterian Church, the anchor of a well-respected and influential family, and a successful banker and merchant, his attempts to bring industrial prosperity to his hometown seemed mired in mediocrity. In 1836, however, these prospects would change as a short-lived boom in the Virginia charcoal iron trade gave Wellford the opportunity to build not only upon his hard-earned expertise in Fredericksburg and on Spotsylvania County's economic potential, but also to continue the legacy begun more than a century ago by his namesake, Alexander Spotswood. In 1836, John Spotswood Wellford built Catharine Furnace, a venture that would consume his life for the next decade.

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<sup>22</sup> *Political Arena* (Fredericksburg, VA), 3 May 1831, 13 April 1832, 12 February 1836

<sup>23</sup> John Spotswood Wellford to Samuel G. Wright, 31 January 1823, and 30 December 1826, Wright Family Papers (Accession 1665), Series One, Samuel G. Wright Letters Received. Hagley Museum and Library, Greenville, DE.



## CHAPTER TWO

### THE FREDERICKSBURG IRON AND STEEL MANUFACTURING COMPANY

The prospects for ironmaking in Virginia seemed very bright in the early months of 1836. The American economy appeared awash in money. An influx of Mexican silver engorged the nation's supply of hard currency at the same time that Andrew Jackson's "slaying" of the Bank of the United States triggered a dramatic—and intemperate—expansion of bank loans. The price of basic commodities such as cotton and wheat continued to press higher and higher, while land values soared. Iron seemed a particularly attractive investment on national, regional, and local levels.<sup>1</sup> The South, Virginia in particular, was going through a railroad-building boom that would insure a high demand for iron rails for years. In the winter of 1836-37, Virginia pig iron sold from \$50 to \$55 a ton—more than double the \$25 per ton that pig iron commanded in 1832 and at least ten dollars higher than the average price of charcoal iron in Philadelphia. "The Virginia iron industry, though a worthy pioneer," historian Kathleen Bruce argued, "had worked with mole-like inconspicuousness," particularly in the areas of eastern Virginia so vibrant during the Colonial and Revolutionary eras. The swell in economic activity combined with the effect of a protective tariff to create, according to Bruce, a new "speculative spirit" after 1835 that reinvigorated interest in the Virginia iron industry.<sup>2</sup>

Of course, the Panic of 1837 and subsequent years of a crushing economic depression—the worst the United States had ever seen—was on the horizon, but a boom mentality gripped Virginia's capital. In a session that saw a flurry of corporate chartering occur in Richmond, several Virginians sought to capitalize on the high-flying economy. Some of them sought to revive the semidormant iron industry of Eastern Virginia. On 21 March 1836, the Virginia Legislature passed an act incorporating the Fredericksburg Iron and Steel Manufacturing Company. This twenty-year charter authorized the company to manufacture "iron, steel, and materials of the like nature" and allowed the ownership of up to 5,000 acres of land in Spotsylvania, Stafford, Orange, Louisa, Culpepper, Rappahannock, and Fauquier counties. Its five original incorporators, Francis Deane, John Heth, John S. Wellford, Edward H. Carmichael, and Alexander Henderson, were charged with raising a capital amount between \$50,000 and \$150,000 via shares with a par value of \$100 each. Although shares of stock in the com-

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<sup>1</sup> For an overview on the American economy on the eve of the Panic of 1837, see Peter Temin, *The Jacksonian Economy* (New York: W.W. Norton, 1969), 59-112; Sean Wilentz, *The Rise of American Democracy: Jefferson to Lincoln* (New York: W.W. Norton, 2005), 436-46, 456-65; Daniel Walker Howe, *What Hath God Wrought: The Transformation of America, 1815-1848* (New York: Oxford University Press, 2007), 498-508.

<sup>2</sup> On the railroad boom in Virginia, see Charles Turner, "The Early Railroad Movement in Virginia," *Virginia Magazine of History and Biography* 55 (1947): 367-69; James Ward, "A New Look at Antebellum Southern Railroad Development," *The Journal of Southern History* 39 (1973): 409-20; 416-17. On the growth of iron in eastern Virginia, see Swank, *The Manufacture of Iron in All Ages*, 269-71, 514; Bradford, "The Ante-Bellum Charcoal Iron Industry of Virginia," 170; Bruce, *Virginia Iron Manufacture in the Slave Era*, 147; 123-25; Smith, "Historical Geography of the Southern Charcoal Iron Industry, 1800-1860," 123-25; Gordon, *American Iron, 1607-1900*, 82-84.

pany were open for purchase by the public, ownership of the firm was divided into five equal parts. This effectively meant that the Fredericksburg Iron and Steel Manufacturing Company, although technically a corporation subject to public ownership, operated as a partnership between the five original incorporators. This was not an altogether unusual arrangement in the antebellum Virginia business world, as it allowed for large amounts of land and capital stock ownership without the complicated inheritance issues that sometimes plagued limited partnerships and proprietary firms.<sup>3</sup>

The incorporators of the Fredericksburg Iron and Steel Manufacturing Company came from various walks of life, but two of the Richmond incorporators would have been quite familiar with industrial pursuits. Francis Deane already knew the iron business well; he had recently created the Virginia Foundry Company in Richmond and would be the founder of the Tredegar Iron Company in 1837. He was, by all accounts, a man of great ambition. “With a mixture of half pride, half-smiling tolerance his immediate contemporaries dubbed him a ‘visionary,’” wrote one historian of the Virginia iron industry. Deane served as the first president of the Tredegar Works, but resigned in 1842 to promote steam navigation on the James River and Kanawha Canal. After the failure of this venture, Deane moved to western Virginia to establish a foundry in Lynchburg. There he became a leading expert on the Virginia iron trade well into the Civil War years.<sup>4</sup> John Heth had recently reorganized coal mines outside of Richmond owned by his family into the Black Heath Company of Colliers, the first coal mining company to receive a charter. At the time of the Fredericksburg Iron and Steel Manufacturing Company’s creation, however, Heth’s firm was recovering from an explosion that had killed nearly fifty of his workers.<sup>5</sup>

The Fredericksburg incorporators came from more diverse backgrounds. William Crump was a Fredericksburg merchant who had recently invested in the Fredericksburg Silk and Agricultural Company.<sup>6</sup> Dr. Edward H. Carmichael practiced medicine with his father, Dr. James Carmichael. As physicians, the Carmichaels often worked with Dr. Robert Wellford, father of the final, and perhaps most notable, incorporator of the Fredericksburg Iron and Steel Manufacturing Company, John Spotswood Wellford.<sup>7</sup>

In many ways, John Spotswood Wellford’s entire life had lead up to the creation of the Fredericksburg Iron and Steel Manufacturing Company. His adherence to Whig principles, relentless promotion of Fredericksburg’s commercial interests, and extensive family and community ties made him the ideal person to lead the firm in 1836. In addition to his

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<sup>3</sup> Soon after incorporation, Alexander Henderson gave up his share in the firm to William Crump. *Laws of Virginia*, 1835-36, 337-38; O.F. Northington, Jr., “The Revival of the Iron Industry in Eastern Virginia as Exemplified by the History of the Catharine Furnace in Spotsylvania County,” *William and Mary Quarterly*, 2nd ser., 16 (January 1936): 72. For more on this use of corporate law in antebellum Virginia, see Adams, *Old Dominion, Industrial Commonwealth*, 167-69.

<sup>4</sup> Bruce, *Virginia Iron Manufacture in the Slave Era*, 150, 171-72; Dew, *Ironmaker to the Confederacy*, 222-23.

<sup>5</sup> Ida J. Lee, “The Heth Family,” *William and Mary Quarterly* 42 (July 1934): 278-79; Lewis, *Coal, Iron, and Slaves*, 67; Adams, *Old Dominion, Industrial Commonwealth*, 166-67.

<sup>6</sup> *Laws of Virginia*, 1836-37, 240.

<sup>7</sup> George Lane to Messrs. Carmichael and Wellford, 4 February 1823, Dr. James Carmichael Papers, Albert and Shirley Small Special Collections Library, University of Virginia Library, Charlottesville, VA; *The Virginia Herald* (Fredericksburg, VA), 11 September 1816, 25 October 1828.

well-appointed house in Fredericksburg, he owned 1,357 acres in Spotsylvania County valued at \$45,078.73, on which he would build a country residence and farm.<sup>8</sup> He owned at least twenty-four slaves, five of whom resided in the Fredericksburg house and nineteen in his Spotsylvania estate.<sup>9</sup> John's brothers, moreover, had been involved in a number of commercial ventures in the region. Beverly Wellford, for example, was one of the incorporators of the Phoenix Mining Company, a small firm capitalized at \$50,000 that opened a copper mining operation in Fauquier County in 1836.<sup>10</sup>

#### THE BIRTH OF CATHARINE FURNACE

"The construction of the hearth is a business in which the founder takes an active part," Frederick Overman wrote in the 1854 version of his extensive guidebook, *The Manufacture of Iron in All its Various Branches*. As a furnace superintendent drawing an annual salary of \$1,000, John Spotswood Wellford undoubtedly involved himself in the early construction and operation of the furnace. First and foremost, he gave the furnace its distinctive name, "Catharine," after his mother, Catharine Yates Wellford. But perhaps more importantly, Wellford kept a careful account of the cost of labor and materials that went into the making of Catharine Furnace. This account book provides an invaluable insight into the furnace operation.

Wellford's entries, shown in Figure 2.1 (see Appendix A), were terse in the fashion of most nineteenth-century business account books. Nonetheless, these entries provide a narrative history of both the day-to-day and long-term goals of the enterprise. Even though the Fredericksburg Iron and Steel Manufacturing Company was a corporate endeavor, John Wellford ran the business much like a proprietary owner. By the end of 1837, the construction tab had run to a little more than \$7,000. When coupled with the cost of acquiring land for charcoaling and mining ore, this put Catharine Furnace well within the cost range of the average Virginia charcoal furnace, but much beyond the range of most individual proprietors.<sup>11</sup>

Iron furnaces were usually "blown in" in the early spring, so it was important that Catharine Furnace be completed in the winter of 1837-38. By early January, a set of hearth stones had been delivered to the site for the inside lining of the furnace, the final brickwork on the furnace was being completed, and the furnace's "suction engine" (most likely a steam engine for operating the furnace bellows) had been repaired and was ready for use. A sizeable work force of at least eighty-six slaves was in place, with nineteen slaves allocated to work in various ore mines in the area. Although no official production figures are extant, John Wellford's account book notes that by May of 1838, the first shipment of iron was hauled away from the area. The shipment of new hearthstones in late September signaled a successful first blast, as furnace linings often wore away as workers continuously fed the blast.<sup>12</sup>

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<sup>8</sup> Spotsylvania Land Tax Rolls 1836, Library of Virginia.

<sup>9</sup> Fredericksburg City Personal Property Tax Records, 1837, Library of Virginia.

<sup>10</sup> *Laws of Virginia*, 1835-36, 307-8; *Political Arena* (Fredericksburg, VA), 8 July 1836.

<sup>11</sup> Frederick Overman, *The Manufacture of Iron in All its Various Branches* (Philadelphia: Henry C. Baird, 1854), 158.

<sup>12</sup> Spotsylvania County Personal Tax Records, 1838, Library of Virginia; see pp. 6-7 of the Catharine Furnace Account Book, Fredericksburg Area Museum and Cultural Center (FAMCC), Fredericksburg, VA.

Making the iron was one facet of the Fredericksburg Iron and Steel Manufacturing Company's business—how to transport their goods to market was an entirely different matter. Overland travel was the simplest and most common option but also the most expensive. Charcoal iron operations needed to be located near ample supplies of ore and timber, which usually meant they were in sparsely populated areas. When Rockbridge County's William Weaver sought to expand his iron manufacturing business in 1826, he purposely located his new forge close to his blast furnace so as to minimize the distance that the heavy iron pigs would travel in wagons or carts. The Union Forge in Patrick County paid eight dollars per ton to ship its iron only a short distance to market. In this regard, Catharine Furnace's close proximity to Fredericksburg and its flat terrain gave it an advantage over other Virginia charcoal iron furnaces, the majority of which were located in the mountainous counties in the Valley of Virginia. The Swift Run Gap Turnpike, commonly known as the Orange Turnpike, served as Spotsylvania County's major road project. The area's distinctive red clay, in the words of one historian, was "sticky as fish glue when wet" and caked around wagon wheels. Conditions on this road were so bad that in 1823 a lawsuit found the company negligent of regular repair and maintenance. Hauling iron in these conditions could be done only over short distances, which ruled out most overland routes for shipping iron from Spotsylvania County.<sup>13</sup>

Whenever possible, ironmakers shipped their products to market via natural or improved waterways. William Weaver's placement of his new forge in 1826 sought to reduce overland shipping costs, but also put manufacturing iron within easy distance of the North River, where flat-bottomed boats could ship directly to major market centers. When the James River and Kanawha Canal reached the foothills of the Blue Ridge Mountains at Lynchburg in 1840, the ironmakers of the Valley saw a dramatic reduction in transportation costs to Richmond. Even though John Spotswood Wellford's dream of easy water navigation on the upper Rappahannock failed to materialize, Fredericksburg still served as an important link to the eastern seaboard via its tidewater port. An 1835 guide to Virginia referred to Fredericksburg as a "prosperous port" and noted that its wharves could handle vessels up to 140 tons. Local officials felt that they could have more support in developing seaborne traffic from their state and federal governments. In 1836 citizens petitioned Congress to make Fredericksburg an official port of entry—ships had to pay collection duties at Tappahannock, sixty miles lower on the Rappahannock River—arguing that this has caused "great trouble, expense, and inconvenience" to their merchants. Nonetheless, iron could be shipped by water out of Fredericksburg at a fraction of the cost of land transport, and this would remain the major outlet for Wellford's iron business throughout the antebellum period.<sup>14</sup>

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<sup>13</sup> *Dew, Bond of Iron*, 66; Bradford, "The Ante-Bellum Charcoal Industry of Virginia," 177; Ralph Happell, "The Chancellors of Chancellorsville," *Virginia Magazine of History and Biography* 71 (July 1963): 261; William Brockenbrough, *Virginia Cases, or Decisions of the General Court of Virginia*, vol. 2 (Richmond: Peter Cottom, 1826), 361-62.

<sup>14</sup> *Dew, Bond of Iron*, 66; Lewis, *Coal, Iron, and Slaves*, 16-17; Gordon, *American Iron*, 83-84; Joseph Martin and William Henry Brockenbrough, *A New and Comprehensive Gazetteer of Virginia, and the District of Columbia* (Charlottesville, VA: Joseph Martin, 1835), 282-83; "Petition of Inhabitants of Fredericksburg and Falmouth, in the State of Virginia, Praying that Fredericksburg May be Made a Port of Entry," H.R. Doc. No. 130, 24th Cong., 1st sess. (1836).

Fredericksburg's connection to Virginia's railway network was provided by the Richmond, Fredericksburg, and Potomac Railroad Company. Chartered in 1834, this railroad at first contained a rare and controversial clause that gave it the exclusive rights to build a rail line between Richmond and Washington, D.C. The Supreme Court struck down this clause, but the RF&P nonetheless served as the major north-south artery for eastern Virginia by linking Fredericksburg to Richmond in 1837. The RF&P later built a branch to Aquia Creek in 1842, which connected Fredericksburg to Washington, D.C. via steamboat. Unfortunately, many of these transportation projects were limited at the time Wellford turned to iron manufacturing, as the many failures in the region's internal improvements kept Fredericksburg on the margins of Virginia's budding industrial economy. One geographer notes that as Alexandria expanded from the north and Richmond extended from the south, by 1835 Fredericksburg "did not reflect a tightly integrated settlement system, and this pervasive weakness highlighted the fragile underpinnings of the local economy."<sup>15</sup>

#### THE EARLY SEARCH FOR MARKETS

Despite the unsteady connections to market, John Spotswood Wellford successfully brought Catharine Furnace into producing iron in short order. Unfortunately, the price of iron plunged right at the time that the Fredericksburg Iron and Steel Manufacturing Company started selling it. The economic downturn on the heels of the Panic of 1837 pushed iron prices down \$25 to \$22 a ton, about half the level that they had been in the previous year. Luckily, the company had a number of close ties with potential customers. In 1838, \$1,400.80 worth of Catharine Furnace pig iron went to the Fredericksburg Union Manufacturing Company and another \$1,118.00 in the following year. Undoubtedly, the presence of two Fredericksburg Iron and Steel Manufacturing Company stockholders, William Crump and Edward Carmichael, on the board of this local firm helped close that sale. Wellford's account book suggests that most of Catharine Furnace's initial production made its way to the Tredegar Iron Company in Richmond, where it would have likely been made into bar rails in Tredegar's new rolling mill. As Francis Deane was both a major stockholder in the Fredericksburg Iron and Steel Manufacturing Company and the President of the Tredegar Iron Company, the purchase of \$2,500 worth of pig iron—or 55 percent of Catharine Furnace's sales in 1838—benefited both firms.<sup>16</sup>

John hoped to reach markets outside the Old Dominion in Catharine Furnace's initial years of iron production. While his younger brother, Charles Carter Wellford, was in New York City on business in 1838, John shipped a sample of Catharine Furnace iron for testing in that market. The iron must have answered relatively well, as Wood, Johnston, and Burritt, a dry goods firm in New York City with ties to Richmond, purchased \$228.18 worth of iron from Wellford that same year. Three years later Wood, Johnston, and Burritt sold another \$1,167.29 worth of Catharine Furnace iron that had been shipped to them via the

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<sup>15</sup> Turner, "The Early Railroad Movement in Virginia," 359-61; Littlefield, "Economic Challenge and Mercantile Enterprise in a Southern Urban System", 47.

<sup>16</sup> Sales figures here from p. 27 of the Catharine Furnace Account Book, FAMCC. For the Fredericksburg Union Manufacturing Company's charter, see *Laws of Virginia, 1835-36*, 338-40; Bruce, *Virginia Iron Manufacture in the Slave Era*, 152-56.

schooner *Andrew Browne*. The only other out-of-state customers in 1838 was C.G. Morris of Charleston, South Carolina, who purchased \$228.18 worth of pig iron and sash weights from Wellford.<sup>17</sup>

The quest for new markets continued over the next few years, with varying levels of success. In February of 1839, Wellford sold two tons of iron to a customer in the District of Columbia. No additional entries appear for this particular buyer, so it seems that Catharine Furnace iron did not take off in the Washington area. That same year, Wellford shipped six tons of pig iron to Boston, at \$27.51 per ton. The New England market seemed a bit more promising, as Wellford received \$2,915.68 in sales from Charles Dyer of Providence. This was most likely pig iron for use by the Phoenix Iron Foundry Company, a Providence firm that manufactured various finished iron products such as gear wheels and specialized machine tools. In 1841, John S. Wellford noted in his account book that “iron was taken to Portland to try the market” by Capt. Freeman Smith, and that Smith sold at least three tons at \$26.32 per ton in Maine.<sup>18</sup>

It is clear that in its early years the Fredericksburg Iron and Steel Manufacturing Company exploited Francis Deane’s high position in Tredegar Iron Company, but that relationship blossomed only briefly. Deane had been present in the creation of many Virginia ironworks, and his personal connections in the state trade were unparalleled. In 1839 alone, Tredegar purchased \$16,500—likely more than 500 tons worth—of iron from Catharine Furnace. As an incorporator of the Fredericksburg Iron and Steel Manufacturing Company, Deane had the opportunity to enrich both his primary employer as well as his Fredericksburg investment by purchasing pig iron from Catharine Furnace. The following year, however, sales to Tredegar slowed to \$3,500, and no more major transactions between the two companies occurred after 1840. This was, in part, due to the financial problems suffered by the Tredegar Works, and in particular, Deane’s inability to sell the firm’s products. By 1841, the fortunes of the Tredegar Works were, in the words of Kathleen Bruce, at a very “low ebb”, and Deane was on his way out as the company’s chief executive the following year. Tredegar’s ties with Fredericksburg continued after Deane’s departure; Joseph Reid Anderson contacted John Spotswood Wellford in the summer of 1841 to inquire about introducing Tredegar iron in Fredericksburg. Apparently the two had discussed the project in Washington, D.C., and Anderson offered Wellford work as an agent of the Tredegar Iron Works. “From the prices paid as I understand and quantity of country iron shipped there from [Richmond],” Anderson wrote, “as well as the high character of the Tred. Iron at present I am led to believe that advantage to all concerned may accrue from its introduction into that market.” Some Catharine Furnace iron was sold out of Tredegar’s yard in Richmond, as David J. Burr & Co. purchased seventeen tons in 1841, found that load wanting in quality, and so asked Wellford

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<sup>17</sup> Charles Carter Wellford to Beverly Wellford, 13 April 1838, Wellford Family Papers, Section 9, Virginia Historical Society; Walter Barrett, *The Old Merchants of New York City* (New York: Thomas R. Knox, 1885), 154.

<sup>18</sup> All sales figures for 1838-1841 come from pp. 28-31 of the Catharine Furnace Account Book, FAMCC. For more on the Phoenix Iron Foundry Co., see the entry for Charles Dyer in the *Transactions of Rhode Island Society for the Encouragement of Domestic Industry* (Providence, RI: Knowles, Anthony & Co., 1862), 75, and George Bass Holmes in *The National Cyclopaedia of American Biography*, vol. 12 (New York: James T. White, 1904), 282-83.

to replace the iron. In the summer of 1845, a manager at Tredegar offered to purchase 60 or 70 tons of “high and mottled Pig Iron” from Catharine Furnace at the relatively high rate of \$28 per ton.<sup>19</sup>

#### MAKING SHOT AND SHELL FOR WASHINGTON

Following Deane’s departure from Richmond, the future of Catharine Furnace was even more in the hands of John Spotswood Wellford. In 1841, Wellford increased his personal ownership in the company to a little more than 40 percent through the purchase of a controlling amount of capital stock from one of the original incorporators. His son, William Wellford, also held Edward Carmichael’s share in trust, thus giving the Wellford family functional command over the firm, as the Wellfords controlled 60 percent of the corporation. The first three full years of operation at Catharine Furnace had seen sales totals of \$4,501.91 in 1838, \$18,376 in 1839 and \$6,775.68 in 1840—a combined revenue of \$29,653.59. Revenues thus lagged well behind the operating costs of the furnace that had run to \$68,748.91 by 1840. Figure 2.2 (see Appendix A) demonstrates this trend. Clearly a new business strategy was needed in order to make this endeavor work, as Catharine Furnace had difficulties breaking into various private markets. In the summer of 1841, John Spotswood Wellford, Francis Deane, and Edward Carmichael traveled to Washington, D.C. to seek ordnance contracts from the US War Department.<sup>20</sup>

As it turns out, contracting with the federal government suited Catharine Furnace quite well. On 11 September 1841, Wellford signed a contract with the Navy to deliver 70,000 rounds of 32-lb. solid shot at three cents a pound to Gosport Naval Yard in Norfolk, Virginia. The contract came into force on 2 February 1842, with the final delivery of shot taking place by 31 January 1844. Pending inspection and satisfaction by the Navy, Wellford would receive \$67,200 from the federal government. In the spring of 1842, Catharine Furnace obtained shot patterns from James Walker. That summer at least five moulders, William H. Ferguson, William Pulham, R. Parker, Nicholas Wharton, and A. Sutherland, were hard at work making 32-lb. solid shot from Catharine Furnace iron, and in June of 1842, Wellford sent his first shipment of 5,230 shot to Norfolk. Naval records indicate that the ordnance officers at Gosport received more than 24,000 shot by the end of 1842. Shipments tended to occur fairly regularly, and Catharine Furnace produced an impressive amount of ordnance in a relatively short period of time, as illustrated in Figure 2.3 (see Appendix A). Assuming that each piece of 32-lb. solid shot actually weighed thirty-two pounds—an assumption that

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<sup>19</sup> J.R. Anderson to John S. Wellford, 9 July 1841; 29 September 1841, Tredegar Iron Works Business Records, Series VII: Correspondence, Outgoing, Box 865, Library of Virginia. For transactions between Tredegar and Catharine Furnace, see pp. 27-29 of the Catharine Furnace Account Book, FAMCC; David J. Burr reference is from the entry for 12 February 1841, p. 25, Catharine Furnace Account Book, FAMCC. J.R. Anderson to John S. Wellford, 11 June 1845, Tredegar Iron Works Business Records, Series VII: Correspondence, Outgoing, Box 868, Library of Virginia; Bruce, *Virginia Iron Manufacture in the Slave Era*, 154-70, quote is from p. 164.

<sup>20</sup> Northington, “The Revival of the Iron Industry in Eastern Virginia,” 73-74; Wellford’s entry in the Catharine Furnace Account Book for 13 August 1841 (p. 31) reads, “Paid my expenses to Washington city with Messrs. Deane & Carmichael to obtain contracts for ordnance.”

did not always hold true for nineteenth-century naval ordnance—then the estimated value of Wellford’s contract in 1842 alone was roughly \$23,208.96.<sup>21</sup>

Wellford secured yet another contract for 70,000 32-lb. solid shot in February of 1843. The terms of the contract were the same as the 1841 deal, although this time Wellford had less than a year to complete the deal. Since he shipped only about a third of this amount from Catharine Furnace in 1842, it is questionable whether or not Wellford expected to produce all of the contracted shot at his own works. It was not uncommon for contractors, even if they owned or operated an iron furnace themselves, to subcontract production to other firms at the time. In fact, Wellford notes in his account book that 118 tons of pig iron shipped from the Fredericksburg wharf to Catharine Furnace in 1842 to be melted into ball in his cupola furnaces. Whether or not he had purchased this iron from other furnaces or recalled it from pig iron meant for sale elsewhere is unclear. But a year later, Wellford paid for fifty-five cartloads, or twenty-seven and a half tons, of pig iron from the Fredericksburg wharf back to Catharine Furnace, noting that this iron had been sent back from Boston unsold “on acct of its being so white” and “was therefore worked into ball.”<sup>22</sup>

Producing shot for the Navy secured a solid stream of income for the Fredericksburg Iron and Steel Manufacturing Company as well as a steady demand for iron for the workers at Catharine Furnace. These ordnance contracts required constant vigilance, however, as John S. Wellford visited Washington D.C. on numerous occasions to maintain his political connections with the War Department. He also paid William Ridgely \$85.00 “for arranging acts and settling with [the] Naval Board” in 1842. Ridgely was a longtime employee of the Navy who had been the Chief Clerk of the Naval Commissioners until September of 1842, when he took a new position as Chief Clerk to the Bureau of Navy Yards and Docks. Sporadic payments to Ridgely ranging from \$20 to \$100 continued over the next few years, but Wellford’s entries do not give a full account of the services rendered to him. It is likely that Wellford’s various contacts in Washington provided him with valuable information. When he learned that a Baltimore firm had failed to supply 5,000 cannon shot and that inspection officials had rejected 5,000 additional units, Wellford wrote to Commodore W.M. Crane to see if he could provide any information about securing a contract for himself to make up the 10,000 in lost shot to the Navy.<sup>23</sup>

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<sup>21</sup> Contract between John S. Wellford and the US Navy, 11 September 1841, Records Collection of the Office of Naval Records and Library, Entry 390: Bureau of Construction, Equipment, and Repair, Contract Ledgers, 1833-1857, Vol. 1, p. 270, RG45, National Archives and Records Administration, Washington, DC. (NARA); Entries for 23 May, 30 June, 20 July, and 30 July 1842, pp. 35-37, Catharine Furnace Account Book, FAMCC.

<sup>22</sup> Contract between John S. Wellford and the US Navy, Ordnance Contracts, 1845-1876: Records of the Bureau of Ordnance, Entry 162: Records Relating to Supplies, Accounts, Contracts, and Personnel, 1836-1939, Vol. 1, pp. 9-10, RG74, NARA. Entries for 31 December 1842 and 31 December 1843, p. 43, 51, Catharine Furnace Account Book, FAMCC.

<sup>23</sup> Entries for 30 December 1842; 5 April, 21 July, and 19 September 1843, in Catharine Furnace Account Book, pp. 40, 46, 49, FAMCC; William G. Ridgely’s appointments can be traced in “Naval Register, Corrected to the 1st of April, 1837,” *The Naval Magazine* 2 (May 1837): 57 and *Register of the Commissioned and Warrant Officers of the Navy of the United States* (Washington: C. Alexander, 1853), 16; John S. Wellford to Commodore Crane, 30 March 1843: Records of the Bureau of Ordnance, Entry 22: Miscellaneous Letters Received, RG74, NARA.

Wellford also tried to squeeze larger profit margins out of the contract by rearranging one of Catharine Furnace's great economic disadvantages—its high cost of transportation. The 1843 contract, for example, had an allowance of \$2 per ton from Catharine Furnace to Fredericksburg and another \$1 per ton from Fredericksburg to Gosport. In March of 1843, a naval official informed Wellford that “after reciting the price to be given for the shot, transportation to Fredericksburg, and freight, that no other allowance is to be made” for shipping shot to Norfolk. Whether or not the inspection of the ordnance occurred at the furnace or at the naval yard was another factor in making contracts profitable. Shot and shell that was rejected at Catharine Furnace could be recast cheaply on the spot; rejected ordnance at Gosport needed to be shipped back to the furnace at the company's expense. Shipments to Gosport in the summer of 1843 were delayed by late arrival of an inspection officer to Fredericksburg. Some years later, Wellford complained to the Navy that their insistence upon inspections at the yard increased his already prohibitive transportation costs.<sup>24</sup>

Needless to say, Wellford found ordnance a lucrative business for the Fredericksburg Iron and Steel Manufacturing Company. By 1843, Wellford's ordnance contracts with the War Department were providing nearly all of Catharine Furnace's income. This strategy carried some risk, as Wellford lost out on a contract to provide shot and shell for the Navy in 1844. This contract went to the Tredegar Company, now under the leadership of Joseph Reid Anderson and making not only basic ordnance such as shot and shell, but also casting cannon for the federal government. Wellford's relationship with the Navy soured in 1845 to the point that he was ordered to send back the government's shot gauge, gauge plate, and cylinders, as well as any other instruments for shot inspection.<sup>25</sup>

Nonetheless, Wellford found making shot for the Navy to be a financially lucrative endeavor. As Figure 2.4 demonstrates, the percentage of business afforded from government contracts dominated Catharine Furnace's sales after 1842. In a memorandum written into his account book, Wellford justified a \$3,444.50 commission, or five percent, on his Navy contract in 1843 for “furnishing the required security and taking the contract in my name for better or for worse.” He continued, “this contract I gave the furnace of the advantage of, and I do not hesitate to say that I could have sold it for a profit of 10 per cent [,] I would give that to day for a similar one.” Completing the Navy's contract on 32-lb. shot, he argued in late 1844, kept him “5 days in the week absent from his family”, so he considered his personal charge of \$1,221.91 on the year's receipts to be perfectly reasonable. Wellford had reason to value his experience with the Navy, as he received \$32,263.20 worth of contracts in the 1844-45 fiscal year to provide shot and shell for the Navy's land-based fortifications. These contracts accounted for 27.2 percent of the Navy's expenditure for this purpose, and it made John S. Wellford

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<sup>24</sup> William Wellford to W.M. Crane, 30 June 1843; John S. Wellford to W.M. Crane, 19 August 1843; W.M. Crane to John S. Wellford, 10 October 1843; John S. Wellford to L. Warrington, 2 October 1846: Records of the Bureau of Ordnance, Entry 5: Miscellaneous Letters Sent, 1842-1883, Vol. 1, p. 66, RG 74, NARA.

<sup>25</sup> W.M. Crane to Goveneur Kemble, John S. Wellford, F.B. Deane, George L. Pervis, and Cyrus Alger, 20 August 1844; W.M. Crane to J.R. Anderson, 20 August 1844, W.M. Crane to John S. Wellford 22 May 1845: Records of the Bureau of Ordnance, Entry 5: Miscellaneous Letters Sent, 1842-1883, Vol. 1, pp. 105, 175, RG74, NARA; Dew, *Ironmaker to the Confederacy*, 11-13.

the single largest contractor for this purpose. Losing this lucrative stream of income hurt the future financial prospects of Catharine Furnace.<sup>26</sup>

Rather than dwell on the failures with the Navy, Wellford jumped into the manufacture of eight- and ten-inch artillery shells and 12- and 24-lb solid shot for the U.S. Army by signing a \$24,428.27 contract in 1844. He also upped his own commission to ten percent, arguing again that he was remaining personally responsible for the contract. "This contract I gave the Furnace the advantage of," he argued in defense of his \$2,416.97 from the company's account. Rather than subcontract the work to other ironworks, Wellford reminded his partners that he planned to keep all of the Army business at Catharine Furnace. He did not "hesitate to say I could have sold it for a much larger advance" for his own personal profit. In the summer of 1844, Wellford rushed shell patterns from an armory in Washington and after receiving guidance from ordnance officer Col. George Talcott, he was shipping shot and shells to Fort Monroe. For this job, Wellford secured a favorable rate of four cents for ten-inch shells, five cents for 8-inch shells, and three and one-quarter cents for 12- and 24-lb. solid shot. Although the initial contract was for a little under \$25,000, Wellford continued to make shot and shell for the Army well into 1846 by signing several small contracts in 1845 and a large \$12,444.69 order in 1846. Since Wellford upped his commission to 15 percent for that later work, he clearly felt that his personal stake in the army contracts merited a larger share of the company's profits.<sup>27</sup>

John S. Wellford's fortunes with Catharine Furnace seemed to have finally turned the corner. By 1846, he had acquired a controlling interest in the Fredericksburg Iron and Steel Manufacturing Company by purchasing more shares in the corporation, bringing ownership stake to three-fifths. Charles Dyer of Providence, moreover, had recently concluded that "this is as good if not the best market in the country to dispose of all he has or may in future make" for Catharine Furnace pig iron. Wellford had 150 to 200 tons of pig iron on hand at the Fredericksburg wharf ready to ship out to the Northeast. Although the fortunes of many Virginia charcoal iron furnaces seemed to be on the decline, Wellford's connections with the War Department and the suggestion of a niche market for Catharine Furnace's "gray iron" in Providence offered a glimpse of hope in late 1846.<sup>28</sup>

Following the outbreak of the War with Mexico, Navy officials approached Wellford about a new contract for shot and shell. On 3 September 1846, the head of the Navy's Bureau of Ordnance, Commodore Louis Warrington, praised Wellford's past service and, in

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<sup>26</sup> Entries for 31 December 1843 and 31 December 1844, pp. 53, 61, Catharine Furnace Account Book, FAMCC; R.J. Walker, "Letter from the Secretary of the Treasury Transmitting an Account of the Receipts and Expenditures of the Government for the Year Ending June 30, 1845," H.R. Doc. No. 14, 29th Cong., 1st sess. (1845): 173.

<sup>27</sup> Entries for 2 July 1844, 5 October 1844, 31 December 1844, pp. 54, 55, 61, Catharine Furnace Account Book, FAMCC; John S. Wellford to L. Warrington, 2 October 1846: Records of the Bureau of Ordnance, Entry 22: Miscellaneous Letters Received, Box 4 (August 1846 to December 1847), RG 74, NARA; W.L. Marcy, "Letter from the Secretary of War, Transmitting Statements of Contracts Made Under Authority of That Department During the Year 1845," H.R. Doc. No. 51, 29th Cong., 1st sess. (1846): 64; W.L. Marcy, "Letter from the Secretary of War, Transmitting Statements of Contracts Made Under Authority of That Department During the Year 1845," H.R. Doc. No. 46, 29th Cong., 2nd sess. (1847): 67-68.

<sup>28</sup> Northington, "The Revival of the Iron Industry in Eastern Virginia," 74; Charles Dyer to C.C. Wellford, 21 January 1847; R.H. Cunningham to Messrs. McFarland and Rhodes, 19 February 1847, Reneau Manuscripts, Fredericksburg and Spotsylvania National Military Park, Fredericksburg, VA (FRSP).

light of a shortage of shot and shell, offered Wellford the opportunity to provide 10,000 units of solid 32-lb. shot and 7,000 shells for 32-lb. cannons for the Navy. Wellford responded in the positive, as Commodore Warrington sent out a contract in October or November of 1846 for his signature. However, Wellford never signed the contract and in late December of 1846, the residents of Fredericksburg were startled to discover that John S. Wellford, the driving force behind so many social, economic, and political forces in Spotsylvania County, had died at the moment when Catharine Furnace seemed on the brink of big success.<sup>29</sup>

In the wake of John's death, the future direction of Catharine Furnace was in doubt. Edward Carmichael, now living in Richmond, attempted to assume control over John S. Wellford's Navy contract for 10,000 32-lb. shot and 7,000 shells in early January, 1847. As William Wellford stalled in settling John's estate, Carmichael argued that the Navy should transfer the Catharine Furnace work to his authority. Carmichael also undertook some contracts to supply Army ordnance that he expected to be filled with Catharine Furnace iron. He immediately wrote to Fredericksburg, asking for two or three pigs of "the very best Gray iron" from Catharine Furnace to be sent to Richmond immediately so that he could complete this contract at local forges. In early February, a "fearful" Carmichael advised William to ship any remaining shot and shell on the Catharine Furnace grounds to Norfolk by mid-March, so as to fulfill any obligations he had to the Navy. By late February, William had taken inventory of the remaining ordnance stock at Catharine Furnace and agreed to ship the shot and shell on hand for the Army, and to "mould the 24 lb Solid Shot and the 32 lb Sold Shot for the Navy, with one workman on each" through mid-March. The completion of this final contract would be the last bit of ordnance manufacture done at Catharine Furnace during its antebellum phase, as William Wellford made clear in his correspondence.<sup>30</sup>

William's decision to halt this particular line of contracts was a good one, as Carmichael's contracts with the Army were of dubious legality, and his aggressive behavior in assuming Catharine Furnace's obligation masked a duplicitous strategy. In 1850, Carmichael applied to the Army for a major ordnance contract, but then subcontracted it to the Tredegar Works. Apparently, Carmichael used samples from Catharine Furnace to secure the contract, swore that he would reopen the works, and then subcontracted the work to Joseph Reid Anderson and the Tredegar Works. This was "gross deception" in the eyes of one ordnance officer. The following year, Benjamin Talcott, now a general, was court-martialed and removed from service as a result of Carmichael's actions. Over the course of the trial, Carmichael was described as "not solvent or in good circumstances." He had banked on the strong reputation of Catharine Furnace's ordnance, albeit for illicit purposes. "Is that not a beautiful operation for the Doctor!" one frustrated officer exclaimed, in regard to Carmichael's machinations.<sup>31</sup>

<sup>29</sup> Lewis Warrington to John S. Wellford, 3 September 1846, 20 October 1846, 26 October 1846, 18 November 1846: Records of the Bureau of Ordnance, Entry 5: Miscellaneous Letters Sent, 1842-1883, vol. 1, pp. 287, 292, 295, 306, RG 74, NARA.

<sup>30</sup> Contract between Edward Carmichael and the US Navy, Ordnance Contracts: Records of the Bureau of Ordnance, Entry 162: Records Relating to Supplies, Accounts, Contracts, and Personnel, 1836-1939, vol. 1, pp. 170-71, RG 74, NARA. Edward Carmichael to William A. Jackson, 14 January 1847; Edward Carmichael to William Wellford, 1 February 1847; William Wellford to Edward Carmichael, 27 February 1847, Reneau Manuscripts, FRSP.

<sup>31</sup> *Review of the Testimony given Before the General Court Martial Upon the Trial of Brig. General George Talcott, in June and July, 1851* (Albany, NY: Joel Munsell, 1851), 13, 24, 27, 51, 73.

With John Spotswood Wellford's death, Catharine Furnace's future was in doubt. William Wellford, John's younger brother, became the de facto manager at the furnace, although he seemed to be a reluctant heir to this position. William wrote to Edward Carmichael in early 1847 that "I can by no means accept the execution of the Navy contract," and that it "appears to be equally illegal for you and Mr. C acting as surviving partners to undertake it." Because the Army and Navy contracted with individuals and not corporations, John S. Wellford's personal estate—not the Fredericksburg Iron and Steel Manufacturing Company—were the only ones authorized to complete any remaining work. Indeed, John S. Wellford's attorney had recently advised that William was authorized to continue Catharine Furnace's operations only "for the purpose of completing the execution of any contracts which may have been entered into, but not fully executed by his testator at the time of his death," and that "at the death of Mr. Wellford the partnership which existed between himself & others in the iron works ceased, except for the purpose of completing existing engagements and winding up the business." Only a few weeks later, the trustee of Francis Deane's share in the firm, Richard H. Cunningham, announced that after several meetings with William Wellford, it was clear that he "had no desire or intention of purchasing the property" and that the best course of action would be to liquidate the physical assets of the corporation and ask \$40,000 for the "Estate, Fixtures, and Mules (not including any Pig Iron)." By early April, Fredericksburg's Democratic Recorder advertised a June sale at auction of "The Catharine Furnace, with Dwelling, 4648 acres of land, containing iron ore, well wooded; fixtures, patterns, stock, steam engine house, cupolas, blacksmith's tools, &c. &c., with everything requisite for a complete iron manufacturing establishment."<sup>32</sup>

While waiting for the sale of Catharine Furnace, William Wellford set to work clearing the site of any remaining product. In February of 1847, there were about 600 tons of pig iron on hand at Catharine Furnace, as well as between 150 to 200 tons of iron at the Fredericksburg wharf. Kemey Sampson of New York City received 100 tons of iron from Catharine Furnace in April, but hesitated to sell it immediately. "As this Iron is unknown in our market," he wrote William, "we have deemed it best to put the lot into store and to send samples to the different manufacturers of Bar Iron so as to allow them to test the quality and to satisfy them in regard to it." At the same time that Catharine Furnace iron re-introduced itself to an unfamiliar market in New York, Charles Dyer of Providence inquired about the remaining 600 tons at the furnace site. Both Sampson and Dyer continued to sell small quantities of Catharine Furnace iron in their respective cities through the year, with Dyer occasionally prodding William on whether he would reopen Catharine Furnace and offering hints for how to improve sales. "It is quite important that a careful selection should be made at your furnace," he wrote in June of 1847, "as a mixture of the hard & soft injures the sale of both." By October, the sales of the existing stock of pig iron were dwindling, and Catharine Furnace had no buyer. William widened the scope of advertisements for a December 1847 auction sale to include Pennsylvania, but could still find no buyers. Small nibbles and letters of interest trickled in, but as late as 1852, Francis Deane wrote to William exhorting him to "use every possible effort to sell the Catharine Furnace property during the present excitement in the

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<sup>32</sup> Memorandum of N.C.L. Moncure, 5 February 1847; William Wellford to Edward Carmichael, 6 February 1847, Reneau Manuscripts, FRSP; The Democratic Recorder (Fredericksburg, VA), 2 April 1847.

Iron business,” and advised him to advertise in the Philadelphia, Lancaster, and Harrisburg, Pennsylvania newspapers.<sup>33</sup>

The Fredericksburg Iron and Steel Manufacturing Company had functionally perished when John Wellford died. It was in good company. Of the eleven charcoal iron furnaces in eastern Virginia identified by J.P. Lesley in his comprehensive guide to ironworks in 1859, only three were still operating, the rest described alternately as “dilapidated,” “in ruins,” and “out of repair.” Corporations rarely get eulogies; they simply fade into bankruptcy, dissolve their assets, and disappear. Yet Lesley’s description of Catharine Furnace in 1859 comes about as close as one can to a corporate obituary:

*153. Catharine Steam (?) Charcoal Furnace*, owned by J.S. Wellford’s heirs and others, Dr. Wellford, Executor, Brandy Station, Culpepper, Spotsylvania county, Virginia, stands where the Fredericksburg and Valley Plank Road crosses the Nye River, nearly ten miles due west of Fredericksburg, was built about 1837 and abandoned in 1846, the hematite ores used were from three banks within a half-mile of the furnace.

Despite the brevity of this entry, Lesley does highlight one of the main advantages of Catharine Furnace: its close proximity to high quality iron ore. Although the natural endowments of Spotsylvania County could not support the fortunes of the Fredericksburg Iron and Steel Company in the long term, it kept Catharine Furnace in blast for a decade.<sup>34</sup>

#### JOHN WELLFORD AND THE PERILS OF PERSONAL CAPITAL

Was Catharine Furnace successful? This is a difficult question to address without understanding the early context in which the firm operated, as well as its utter dependence upon the personal capital of John Spotswood Wellford. The Fredericksburg Iron and Steel Manufacturing Company struggled to find a reliable outlet for the products of Catharine Furnace during its early history. Local, state, and national trends created an unfavorable atmosphere for starting an iron smelting operation during the late 1830s and early 1840s; John Wellford would have been well aware of his disadvantages in this regard. As a longtime Fredericksburg resident with first-hand familiarity of the grandiose visions, false starts, and frustrating stalls of local projects such as the Rappahannock Navigation Company or the Fredericksburg and Potomac Creek Railroad Company, John Wellford followed his entrepreneurial instincts into less traditional markets for ironmakers. Rather than wait for Fredericksburg’s prospects to magically reverse, or dump his own financial resources into a new improvement or manufacturing investment, Wellford used his long history of political and economic contacts to his firm’s advantage. Military contracts shifted the responsibility of success or failure into an entirely new area of risk—John Wellford’s ability to maintain his contacts in the War Department and to spin them into lucrative contracts for the production of shot and shell. In the short term, the firm’s reliance upon government contracts saved Catharine Furnace and made the operation profitable. In the long run, though, the dependency on John Spotswood

<sup>33</sup> Kemey Sampson to William Wellford, 19 April 1847; Charles Dyer to William Wellford, 13 April 1847, 16 June 1847; William Wellford to John Gamber, 2 December 1847; Francis B. Deane to William Wellford, 8 November 1852, Reneau Manuscripts, FRSP.

<sup>34</sup> J.P. Lesley, *The Iron Manufacturers’ Guide to the Furnaces, Forges, and Rolling Mills of the United States* (New York: John Wiley, 1859), 63.

Wellford's personal capital bound the fortunes of the Fredericksburg Iron and Steel Manufacturing Company to its owner and manager.

Local factors played a large role in creating a dependency on personal, rather than physical, capital for Catharine Furnace. The most promising regional market, Richmond, essentially closed up to Catharine Furnace pig iron by the early 1840s. Once Francis Deane left the employ of the Tredegar Company, that firm failed to make massive purchases of Catharine Furnace iron. As the James River and Kanawha Canal linked the ironmakers of the Valley of Virginia to Richmond, Catharine Furnace was further left out of the mix. Without strong connections to market, John S. Wellford's successors likely would have continued to struggle to compete with other, more integrated ironmakers. In a larger sense, Fredericksburg's entire manufacturing economy was being squeezed out of the picture during the antebellum period. Geographer Keith Littlefield estimates that the city lost control over 76 percent of its rural hinterland by 1860, as Richmond and Alexandria expanded their commercial reach at Fredericksburg's expense. John Wellford's own experience with failed turnpikes, river improvements, and railroads during his pre-ironmaking days signaled a failure among local boosters to secure a variety of market outlets for Fredericksburg's manufacturers. Because Wellford's furnace produced pig iron—a high-bulk and low-value commodity—shipping costs were a major factor in marketing its products afar. As the city's commercial and manufacturing sector served a smaller and smaller area, Fredericksburg's economic prospects and the ability of Catharine Furnace to ship its iron to immediate and far-flung markets shrunk in kind.<sup>35</sup>

State-level factors also hampered the ability of Catharine Furnace to ship iron efficiently and cheaply. Pig iron, like other bulk commodities, was cheap to make but expensive to ship. Like the cost of raising coal at the mine, then, pig iron's expense at the furnace itself was less critical to market competition than the added carrying rates. This made an integrated system of canals or railroads critical to the success of regional ironmaking. In the valley, ironmasters first used rivers, then canals, to ship pig iron to Richmond. State politics in Virginia exacerbated a trend toward politically connected internal improvements. The Old Dominion's creation of the Virginia Board of Public Works in 1816 offered state subsidies on some internal improvement projects; it also placed a heavy emphasis on the creation of a central waterway linking Richmond with the Ohio Valley. The James River and Kanawha Canal therefore received the lion's share of attention and funding, despite John Spotswood Wellford's toast in 1828 touting the board as an agency that "helped those who helped themselves." Shipping tobacco, wheat, and corn along this route became the major concern of Virginia's internal improvement network, such as it was, as the Board of Public Works followed a political calculus that favored the products of Tidewater and Piedmont agricultural interests along the James River corridor. As Spotsylvania County did not figure in this route, its chances of securing a state-funded turnpike or canal were slim. The timing of Catharine Furnace's construction in the wake of the Panic of 1837 was also disadvantageous, not only because general business conditions in the state deteriorated, but also because Virginia's public investment in its internal improvement network completely stalled in the early to mid-1840s. Without private capital to finance internal improvements, and with state actors primarily concerned with the James-

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<sup>35</sup> Swank, *Iron in All Ages*, 271; Dew, *Ironmaker to the Confederacy*, 32; Littlefield, "Economic Challenge and Mercantile Enterprise in a Southern Urban System" 167.

Kanawha corridor, Catharine Furnace could not count on any decrease in their shipping costs either within or out of Virginia. Like colliers and saltmakers in western Virginia who found the policies of the Virginia legislature wanting, ironmakers in eastern Virginia found themselves on the outside looking in when it came to the Old Dominion's sponsorship of economic growth.<sup>36</sup>

Finally, national economic trends diminished Catharine Furnace's future as a traditional charcoal-based iron operation.<sup>37</sup> In 1846, Democrats in Congress pushed through a massive revision of tariff rates that effectively ended the protective duties on American iron. When Congress lowered the tariff on iron from a flat rate of \$25 on bar iron to an ad valorem rate of 30 percent—functionally a drop of more than half the duty on iron—prices for Virginia charcoal iron pigs plummeted to \$20 a ton.<sup>38</sup> In December of 1846, Virginia ironmasters met in Richmond to discuss the precipitous drop in tariff rates and its resulting effect on prices. In a missive to Congress, they concluded that “the trade will ere long be destroyed by the reduction.” The Federal government seemed like a good place to assign the immediate blame for the misfortunes of charcoal ironmakers of Virginia. In fact, the reduction in the duties on iron only accelerated a national trend in the iron trade away from charcoal fuel. In 1840, David Thomas successfully adapted anthracite coal to the Lehigh Crane Iron Company's blast furnace near Allentown, Pennsylvania. The successful adaptation of coke, or processed bituminous coal, in western Pennsylvania and Maryland blast furnaces offered yet another low-cost alternative to charcoal iron. Even if it had survived its founder, it is highly unlikely that Catharine Furnace would have been able to compete in the rapidly changing American iron trade. The use of slave labor by iron furnaces in the Old Dominion had very little to do with this trend, as managers like Wellford made very efficient use of bonded labor in their operations. Rather, the overall impact of slavery upon Virginia's political economy, which hampered technological innovation, investments in skilled labor, and a flexible work force, undermined Virginia iron in the national context. Although Virginia charcoal ironmakers clung to the idea that theirs was a superior product, their inability to lower costs in the face of northern competition sealed their fate by the 1850s. Simply put, the future of ironmaking in the United States was moving steadily to the north and to the west. Virginia's long tradition of ironmaking, stretching back to Governor Spotswood's day, could not overcome these new innovations in the use of mineral fuel and more efficient techniques.<sup>39</sup>

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<sup>36</sup> Wayland Dunaway, *History of the James River and Kanawha Canal* (New York: Columbia University Press, 1922): 50-58; Carter Goodrich, “The Virginia System of Mixed Enterprise: A Study of Planning of Internal Improvements,” *Political Science Quarterly* 64 (1949): 355-87; Robert F. Hunter, “The Turnpike Movement in Virginia, 1816-1860” (PhD thesis, Columbia University, 1957), 49-51; Adams, *Old Dominion, Industrial Commonwealth*, 86-92.

<sup>37</sup> Catharine Furnace did use some anthracite coal, but this was likely reserved for the smaller cupola furnaces. There is no evidence that the main stack was retrofitted for burning coal. For more, see Chapter Three.

<sup>38</sup> Bradford, “The Ante-Bellum Charcoal Iron Industry of Virginia,” 172-74.

<sup>39</sup> *Memorial of the Coal Owners and Iron Masters of Virginia to Congress, January 1847* (Richmond: n.p., 1847), 10; W. Ross Yates, “Discovery of the Process of Making Anthracite Iron,” *Pennsylvania Magazine of History and Biography* 98 (April 1974): 206-23; Louis Hunter, “Influence of the Market Upon Technique in the Iron Industry in Western Pennsylvania Up to 1860,” *Journal of Economic & Business History* 1 (February 1929): 260-61; Bruce, *Virginia Iron Manufacture in the Slave Era*, 276-77; Bradford, “The Ante-Bellum Charcoal Industry of Virginia,” 171-83; Peter Temin, *Iron and Steel in Nineteenth-Century America: An Economic Inquiry* (Cambridge, MA: The MIT Press, 1964), 77-80; Smith, “Historical Geography of the Southern Charcoal Iron Industry,” 125-34; Gordon, *American Iron*, 155-70.

The combination of these local, state, and national factors spelled doom for Catharine Furnace's iron in traditional iron markets. In this sense, John Spotswood Wellford acted as any talented manager would and shifted the resources of his firm into the most profitable environment. His effective control of the company allowed him to pursue ordnance manufacture as a main avenue for profit; his personal connections served as the single most important factor in that business. Although it served as Virginia's first chartered iron company, the Fredericksburg Iron and Steel Manufacturing Company functionally operated as a single proprietorship under the leadership of John Spotswood Wellford. Because of the vagaries of the antebellum military contracting system, Wellford was able to blend his personal capital with Catharine Furnace's physical capital. The resulting strategy was an unusual one not shared by most other Virginia charcoal iron firms in the antebellum era.

So long as John Spotswood Wellford controlled Catharine Furnace, this business strategy worked. Estimates of the annual operating costs and revenues suggest that Catharine Furnace was breaking even by 1841 and had become profitable by 1842. These figures, however, do not take into account long-term capital expenditures such as land purchases, and they are rough estimates drawn from Wellford's own account book. Nonetheless, for a firm that came on line during one of the worst business environments in the history of the United States, making it into the black was an impressive accomplishment. The reliance upon Wellford's personal capital, though, had a downside. As Figure 2.4 (see Appendix A) suggests, Catharine Furnace had become almost completely dependent upon ordnance contracts for its income by 1842. Since these contracts were made with individuals, not corporations, John S. Wellford's personal contacts and reputation were essential to this revenue stream. So even though the Fredericksburg Iron and Steel Company was a corporation that could outlive any one of its shareholders, it could not survive without its most essential one, John Spotswood Wellford.<sup>40</sup>

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<sup>40</sup> For a more detailed explanation of how these figures were calculated, as well as the strengths and weaknesses of using the Catharine Furnace Account Book, see Appendix A.

## CHAPTER THREE

### FROM ORE TO PIG: MAKING IRON AT CATHARINE FURNACE

The process of making iron is relatively simple: mix ore, fuel, and a mediating agent (or “flux”) in a furnace to separate the iron from oxygen and allow carbon to take its place. The molten iron will separate from the waste product (or “slag”) in the furnace. Experienced ironmasters then tap the furnace and let the liquid iron run into trenches of sand laid out in a way that resembles (at least it did to some ancient ironworkers) a line of piglets nursing at a sow. Once the “pig iron” is cool enough to handle, it can be reheated and cast in the shape of a finished good such as a plow, a stove piece, or an artillery shell. Or, the pig iron can be shipped off to another forge for more complicated reworking. Of course, ironmakers refined this simple recipe over the centuries, but the process of creating iron that was in place at Catharine Furnace in the 1830s and 1840s would have looked familiar to a medieval, or even a Roman, ironmaster. In other ways, though, Catharine Furnace represented the future of American ironmaking. By integrating steam-engine technology, high-quality casting, mineral fuel, and cupola furnaces, John Wellford’s operations were on the cutting edge of nineteenth-century ironmaking. This blend of both familiar and innovative industrial processes, and how it transpired during the antebellum manifestation of Catharine Furnace, is the focus of this chapter.

Virginia’s iron industry saw a renaissance of sorts in the 1830s. With the continued development of the James River and Kanawha Canal, the established iron furnaces in the Valley of Virginia could ship pig iron to Richmond at a low cost. The discovery of iron ore in the Richmond area, the exhortations of Virginia’s state geologist, William Barton Rogers, and the unrestrained boosterism of local newspapers made for a “sort of hysteria” about the Virginia iron trade in the late 1830s, according to one historian. Ironmasters in Virginia and elsewhere griped constantly about the level of federal protective tariffs on iron, yet rates remained high enough in the period between 1818 and 1846 to ensure that Virginia charcoal iron remained competitive nationally. So long as railroads continued to grow in the United States, the demand for iron would remain high. As early historian of the American iron trade B.F. French remarked, the 1830s saw “the construction of important lines, connecting the Atlantic seaboard with the great lakes and fertile valleys of the West, creating a demand for iron rails on a scale of magnitude not anticipated by the iron masters of this country.” At least twenty-two charcoal iron furnaces were built in Virginia during the 1830s, making it the most significant antebellum decade for the industry. By 1840, Virginia’s charcoal iron trade was in full swing. B.F. French listed Virginia as the fourth-leading iron-producing state, responsible for \$470,262 worth of pig iron, or 6.5 percent of the nation’s total amount. Although blast furnaces across the Old Dominion sprung up at an admirable rate, most of the state’s pig iron left the state for further working, as Virginia accounted for only 1.3 percent of the nation’s value of iron castings and 3 percent of its wrought iron production. Virginia therefore was an important iron-

smelting state, but outside of the Tredegar Works in Richmond, not necessarily an important location for iron and steel finished products.<sup>1</sup>

In this heady economic atmosphere, the founders of Catharine Furnace attempted to strike it rich with their own blast furnace operation. By 1837 the Fredericksburg Iron and Steel Manufacturing Company had purchased nearly 5,000 acres of land in Spotsylvania County and work began on an extensive furnace complex near John S. Wellford's property southwest of Fredericksburg.<sup>2</sup> This was well outside the established region of Virginia iron furnaces, which tended to be in the Valley of Virginia or in the Allegheny Mountains, so Catharine Furnace represented a return to the Old Dominion's earliest industrial past; the Rappahannock Valley would once again see iron production in the tradition of Alexander Spotswood and Tubal Furnace. The company hired Mark McAfee to choose the site and construct a modern charcoal-fueled furnace complex, the centerpiece of which would be a thirty-foot square stone-lined furnace in the shape of a truncated pyramid. A typical charcoal furnace at this time took somewhere between eight to twelve months to build in Virginia, and McAfee's final payment of \$529.12 on 8 September 1837 suggests that he had completed the main furnace stack by that time. Meanwhile, a small force of carpenters and bricklayers worked on the auxiliary buildings around the furnace stack, using more than 16,000 feet of wood plank and 57,000 shingles. In the early months of the company's existence, this included the essential structures. First, a bridge house and platform that linked the top of the furnace to Furnace Hill provided the means for workers to access the top of the shaft and transport materials to the furnace. The second major structure was a large coal house, used as a storehouse to keep the charcoal fuel and iron ore sheltered from the elements. Third was the casting house, which was built at the base of the hill and was used to shield molten iron from the elements. Other auxiliary structures, including an engine house, blacksmith shop, and office, rounded out the initial construction of the furnace complex.<sup>3</sup>

The centerpiece of the complex, in both its contemporary and modern form, was the blast furnace itself. Virginia charcoal furnaces usually ranged between twenty-five and thirty-five feet high and of the twenty-six in operation in 1859, the average height was thirty-three feet. These dimensions had very practical reasons. A tall stack would help secure a large enough draft to support combustion in the hearth, but the prevalence of charcoal fuel set an upward limit to the size of the stack, as the ore and flux stacked too high would crush the charcoal at the bottom and extinguish the fire. Figure 3.3 shows a typical antebellum charcoal iron furnace design, with the tapered top and thick walls being the prominent features. A 1977 archeological assessment estimated a height of thirty-six feet for Catharine Furnace's circular stack with a surrounding structure made of mortared sandstone blocks. Although it is unclear exactly how tall this enclosing truncated pyramid reached, it most likely was not as tall as the stack, so as to provide a six-foot base for workers to use as a platform. These dimensions sug-

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<sup>1</sup> Bruce, *Virginia Iron Manufacture in the Slave Era*, 137-48, quote is on p. 145; B.F. French, *History of the Rise and Progress of the Iron Trade of the United States, From 1621 to 1857* (New York: Wiley & Halstead, 1858), 54-55, 61. Count of iron furnaces comes from Bruce, Appendix II, pp. 454-57.

<sup>2</sup> Northington, "History of Catharine Furnace," 72-73.

<sup>3</sup> For more on the day-to-day operations at Catharine Furnace, see Chapter Four; Bradford, "The Ante-Bellum Charcoal Iron Industry of Virginia", 43-45; and pp. 2-3 of the Catharine Furnace Account Book, FAMCC.

gest that Catharine Furnace's designers were confident that the local hardwood forest would create a charcoal rugged enough to withstand a heavy charge during blast. The disparity between Catharine Furnace and other Virginia charcoal furnaces in terms of height also suggests that its designers were from out of state. The average antebellum furnace stack in Pennsylvania stood thirty-seven feet tall, much larger than the thirty-three foot average of Virginia furnaces. Once the stack was constructed, all of the other buildings at the complex—the coal house, the casting house, the engine house—would all be oriented toward it.<sup>4</sup>

In 1936, O.F. Northington provided a conjectural reconstruction of the Catharine Furnace complex, based upon extant structures and archeological evidence. Figure 3.1 is a ground plan of the complex, while Figure 3.2 (see Appendix A for both figures) shows an artist's rendition of what Catharine Furnace might have looked like in the 1840s. While these images are useful in understanding the spatial arrangement of the furnace complex, the artistic reconstruction of the stack itself is misleading. The conjectural vision portrays a round stack rather than the truncated pyramid. The modern remnant of the furnace stack is indeed cylindrical, as the repeated firings of the furnace fused the ironmaking materials to the rounded interior of the stack. When the rough-hewn blocks surrounding the stack either fell or were carried away, this hardened remnant remained standing. As the last major feature of the industrial landscape, the modern-day stack stands out like a tower. It is important to keep in mind, however, that in the 1840s the stack did not tower over the rest of the complex, but instead had been integrated into the hillside to allow for the charging of the furnace via the bridge house. Although romantic in its modern manifestation, Catharine Furnace's round stack is more like a fossil than an accurate key to what John Wellford and his workers saw in their day-to-day ironmaking.

Although the furnace stack provided the centerpiece of the Catharine Furnace complex, the necessary elements for its operation reached far beyond its immediate vicinity. Spotsylvania County's rich deposits of iron ore, for example, were a primary concern in building a successful furnace operation and most likely the reason that Catharine Furnace was placed in its rural setting. High-quality iron ore was a critical component in smelting. In 1786, Pennsylvania ironmaster Henry Drinker wrote a lengthy letter to Richard Blackledge of North Carolina in which he laid out the fundamentals of running an ironworks. Of his ten major suggestions, the first three dealt with the nature, quality, and proximity of iron ore. "Some Ore, tho' rather poor, produces more Iron in the same time & with the same flux & fuel than a richer kind that is often obstinate & hard to manage," Drinker wrote, "is it very hard or is it malleable?"<sup>5</sup> Decades later, these questions were still relevant to American ironmakers. John Wellford, for example, knew that the area outside of Fredericksburg contained iron ore of high potential value. As mentioned in Chapter One, Wellford had contacted Samuel Wright in

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<sup>4</sup> T.T. Brady, "The Charcoal Iron Industry in Virginia," *Virginia Minerals* 37 (1991): 29; Richard H. Schallenberg and David A. Ault, "Raw Materials Supply and Technological Change in the American Charcoal Iron Industry," *Technology and Culture* 18 (1977): 439, 444; Victor Rolando, "19th Century Charcoal Production in Vermont," *IA* 17 (1991): 16; Jacob Gruber, "A Report on the Excavations at Catharine Furnace in the Fredericksburg National Military Park, March 5-12, 1977," MSS report in the FRSP Archives, pp. 23-24.

<sup>5</sup> Thomas Doerflinger, "How to Run an Ironworks," *Pennsylvania Magazine of History and Biography* 108 (1984): 362.

1823 to inquire about his investment in Spotsylvania County's ore beds, and even offered to send a sample his way.<sup>6</sup> In that case, Wellford sought Wright's investment, but by the time he was considering a jump into ironmaking himself, the richness of iron ore still struck observers. Virginia's state geologist, William Barton Rogers, described eastern Virginia's iron ore in 1834:

The ore is a *hematite*, in irregular masses, sometimes cellular and frequently mammillary. The cells often contain acicular white crystals of great luster. The colour of the ore varies from a yellowish to a blackish brown. Its hardness in different localities also differs, and in the immense mass above described, is such as to render blasting necessary.<sup>7</sup>

A quarter century later, J.P. Lesley mentioned the rich hematite ore in his brief descriptions of charcoal furnaces operating in eastern Virginia. An 1885 compilation of Virginia's resources done by the Commissioner of Agriculture defined the ore surrounding Catharine Furnace as limonite, or brown iron ore. More modern analyses have confirmed that Spotsylvania's ore deposits were gossan limonite, meaning that these yellow/brown outcroppings of iron occurred from the weathering of iron sulfides known as pyrite and pyrrhotite. The exact scientific composition was unimportant to the ironmakers at Catharine Furnace—they simply regarded it as a rich building block for making iron.<sup>8</sup>

Rogers and other nineteenth-century observers mentioned that eastern Virginia's ore lay close to the surface, which meant that gathering it was more of a quarrying process than a traditional mining venture. Virginians used the British term "pit" to refer to mines of many types; Catharine Furnace's "ore pits" were close to describing the actual form of the excavation. Limonite ore deposits in eastern Virginia ranged from eight to twenty-five feet in thickness and could usually be located from reddish streaks in rock outcroppings or the soil. These geological features were known as gossan deposits because they were the results of oxidation that occurred as the ore bed became exposed to air. Once located, a team of workers would begin digging trenches in the ground to find the limits of the deposit. Or, if the gossan deposit occurred on a hillside, miners would begin carving into the slope. Archeological surveys of the area found several ore mines within a quarter mile of the furnace stack, and some ore mining had actually been done a few hundred feet to the west of the stack on the hill next to the furnace. The excavation of these open-air workings is difficult to reconstruct. Studies of contemporary iron ore mines in other locations suggest that most of the digging was done by hand with pick and shovel, although John Wellford's account book includes the purchase of blasting powder every three years, which indicates that at least some of the deposits needed to be loosened by an explosion. The depth of some of these pits a century and a half later—one of the quarries on Furnace Hill is still twenty feet deep—indicates that the working of the ore beds in the immediate proximity of the furnace went on for some time. Easily obtained iron ore was a critical element for nineteenth-century ironmaking, as proximity to high-quality iron ore, not fuel or markets, was the most important

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<sup>6</sup> John S. Wellford to Samuel G. Wright, 31 January 1823. Wright Family Papers, Series one, Samuel G. Wright Letters Received, Box B-5, Folder 3. Hagley Museum and Library, Greenville, DE.

<sup>7</sup> Emma Rogers, comp., *A Reprint of Annual Reports and Other Papers, on the Geology of the Virginias* (New York: D. Appleton and Company, 1884), 80.

<sup>8</sup> Lesley, *The Iron Manufacturer's Guide to the Furnaces, Forges, and Rolling Mills of the United States*, 63-64; Randolph Harrison, *Hand-Book of Virginia* (Richmond: Johns & Goolsby, 1885), 59; Edwin Gooch, *Iron in Virginia. Mineral Resources Circular No. 1* (Charlottesville: Virginia State Geologist, 1954), 3.

factor in locating charcoal furnaces. The mean distance of furnace locations from ore pits in antebellum Virginia was 1.7 miles, which supports these findings and provides a likely explanation for why Catharine Furnace was built in its remote Spotsylvania County location.<sup>9</sup>

As the pits in Catharine Furnace's shadow became depleted, John Wellford secured ore from more remote sources. Most of the ore likely came from land owned by the Fredericksburg Iron and Steel Manufacturing Company, but there is evidence that Wellford needed to secure outside sources of iron ore relatively early in Catharine Furnace's history. In 1841, he paid local landowner Reuben Magee to look at iron ore deposits on his land. Two years later, he purchased \$25 worth of ore from Mary Brock's property, and in 1845, he bought \$50 worth of ore and rented an ore pit from a local landowner. Although ore hauling seems to have been done by slaves and employees of the company, Wellford paid eight individuals for more than 100 days' worth of work hauling ore to Catharine Furnace in 1846. This implies that he had allocated his own workforce to other tasks, or that Wellford secured ore from sources farther and farther away. Whether mined on Wellford's own or rented land, the close proximity of Catharine Furnace to high-quality ore deposits was a critical factor in the location of the complex and a necessary element to the venture's profitability.<sup>10</sup>

Once the ore arrived at the Catharine Furnace complex, it was stored until needed for the blast. Traces of ore dust found in a 1977 excavation of the coal house suggest that it was kept there, along with charcoal fuel. Spotsylvania County ore, whatever its true composition, could be directly fed into a furnace without any of the washing or processing that some iron ores require. Nineteenth-century ironmakers tried to remove as much of the non-iron mineral content, known as "gangue," from ore before the refining process. The most common method in the nineteenth century was to roast the ore "to produce higher oxidation or to expel injurious admixtures," in the words of Frederick Overman. By mid-century, many ironworks constructed specialized ovens for this process. But even without a permanent oven or kiln to do the roasting, ore miners could burn some of the impurities off using open-air fires before carting the ore to the furnace. The lack of a significant ore-refining facility in contemporary and archeological surveys of Catharine Furnace indicates that either the ore used there was high enough in iron content to be put directly into the furnace or that any processing of the ore was done by miners at the various pits. It is likely that the ore was pretreated before arriving at the furnace complex, since extant records and archeological excavations did not uncover a significant ore-processing works on the immediate grounds.<sup>11</sup>

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<sup>9</sup> Brady, "The Charcoal Iron Industry in Virginia," 28; Catharine Furnace Account Book, FAMCC, pp. 7, 26, 53. For more on the archaeological studies of ore pits, see Appendix B: Archeological Sites and Cultural Features Within the Catharine Furnace Locale (Including Wellford and Maury Farmsteads and Unfinished Rail Road) in Clarence R. Geier and Kimberly D. Sancomb, "An Archeological Survey of Selected Sections and Sites on the Chancellorsville Battlefield, Part II: "The Demon of Destruction was Floundering and Belching Out Tongues and Volumes of Flames in the Murky Depths Below": The Catharine Furnace Project Area" (January 2003), FRSP; Smith, "Historical Geography of the Southern Charcoal Iron Industry, 1800-1860," 81-82; Schallenberg and Ault, "Raw Materials Supply and Technological Change in the American Charcoal Iron Industry," 446-50.

<sup>10</sup> Thomas Leonard Watson, *Mineral Resources of Virginia* (Lynchburg, VA: J.P. Bell Company, 1907), 468-69; Catharine Furnace Account Book, FAMCC, pp. 17, 31, 48, 50, 64, 68, 73.

<sup>11</sup> Overman, *The Manufacture of Iron in All its Various Branches*, 39; Gruber, "A Report on the Excavations at Catharine Furnace," 21; Gordon, *American Iron, 1607-1900*, 27-28.

The next element needed by the blast furnace was a “flux” to help fuse the impurities in the ore together and separate the iron. The most common flux used in nineteenth-century furnaces was limestone drawn from a nearby quarry, although some also used clay or burnt lime. Sporadic purchases in his account book suggest that Wellford did use some lime as flux, but Catharine Furnace’s close proximity to an urban port allowed the use of oyster shells, which Frederick Overman called “a very good flux” that was only practical “where they can be procured in sufficient quantity, and at reasonable prices.” In 1838, Wellford paid nearly \$900 for oyster shells. Catharine Furnace’s accounts record a number of purchases of barrels of oyster shells from various individuals and businesses around Fredericksburg. Wellford’s men would collect the shells and store them in a shell yard in town, then cart them to Catharine Furnace as needed. In 1839, this represented sixty-two days of work for a single horse and cart. Wellford recorded that the furnace purchased 660 hogsheads of shells in 1840 and another 450¼ in 1841 at the rate of 25 cents a hogshead. This of course, does not necessarily reflect the annual consumption of oyster shells and might have simply augmented Wellford’s stockpile of shells in the year. As Wellford increased production to meet his new ordnance contracts, the need for shells increased. He recorded collecting 1,175 hogsheads of shells from Fredericksburg residents in 1842, but eventually the demand outstripped local sources. By 1845, 883 hogsheads of shells arrived on vessels from Washington, and Wellford continued to fill his yard with both local and imported shells until his death. It is difficult to estimate the annual consumption of shells by Catharine Furnace, but Wellford’s account book does give a sense of the massive flow of oyster shells from local restaurants, boardinghouses, and taverns into his shell yard. So, providing flux for ironmaking represented an important link between Catharine Furnace and a number of proprietors in Fredericksburg.<sup>12</sup>

After collecting the iron ore and flux, John Wellford’s workers needed a high-quality fuel to make iron. Virginia’s ironmakers primarily burned charcoal in the early nineteenth century, and Catharine Furnace was no exception to this rule. Along with iron ore and oyster shells, then, a steady flow of charcoal from the surrounding forests was required to keep the operation going. Essentially, making charcoal is a process of distilling wood under a slow heat to remove impurities, burn off water, and reduce it to contain as much carbon as possible. The process was fairly simple but required a great deal of skill and patience from the “collier,” as charcoal-makers were known, who supervised the process. It is unclear whether Wellford owned or hired the majority of his colliers, but in other Virginia furnaces, the process of converting wood into charcoal fuel was done by enslaved and free African-Americans as well as white workers. Estimates vary on efficiency, but a good collier could coax thirty or forty bushels of charcoal from a single cord of wood. In Pennsylvania, for example, one master collier averaged 38 bushels per cord. J.H. Alexander’s 1840 study of the Maryland iron industry found that “under ordinary circumstances,” colliers could extract forty bushels per cord of wood. “In strict calculation,” Alexander argued, “the cord ought to be equivalent to 57 bushels; but without the greatest care, under favourable circumstances, such a proportion is never attained.” Postbellum estimates from southern ironmakers in Alabama ranged between thirty-three and forty bushels per cord, with the Woodstock Iron Company providing the

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<sup>12</sup> *Overman, The Manufacture of Iron*, 68-69; Catharine Furnace Account Book, FAMCC, pp. 8-10, 17, 24, 33, 43, 69, 72-73, 76.

most detailed amount—thirty-six bushels per cord—of how much charcoal could be gained from southern oak and pine timber. With these regional trends in mind, it is realistic to expect that Spotsylvania County colliers could extract at least thirty-five and perhaps as many as forty bushels per cord when Catharine Furnace was in full operation during the 1840s.<sup>13</sup>

The heating properties of charcoal were of dire importance to an ironmaker. Since charcoal furnaces were kept in blast for months at a time, a consistent supply of high-quality fuel could make or break a year's production. Despite its simple origins, charcoal fuel packed quite a punch; it burned faster than wood and with about twice as much heat per pound. One antebellum experiment on the heating qualities of ironmaking fuels found that one pound of charcoal could heat water at the same rate as twenty-five pounds of wood, considerably more than the values for alcohol (67½), bituminous coal (60), or air-dried wood (27), and just below the value of pure carbon (78). Most nineteenth-century colliers thought oak wood made the best charcoal, although many southern ironmakers considered yellow pine to be an abundant and cheap source for charcoal. Hard wood produced hard charcoal, which was important in large blast furnaces to keep the ore and flux from crushing the fuel and reducing combustion. Proper storage of fuel at the coal house was also necessary. In the summer of 1841, Wellford had Catharine Furnace's coal house completely rebuilt, although it is unclear whether this was to expand capacity or for other reasons. In sum, high-quality charcoal fuel was essential to the success of ironmaking. Little evidence exists concerning the specific nature of the Catharine Furnace's fuel supply, save to say that it was so important, John Wellford insured his charcoal for \$5,000 in 1844. The lack of any charcoal-related entries in the account book means that Wellford likely used his own slaves and/or employees to secure the majority of Catharine Furnace's fuel.<sup>14</sup>

Once the ore, flux, and fuel were all present at the site, Catharine Furnace was ready to start the blast. The first stage of "blowing in" the furnace required the heating of the lower part of the stack, known as the "bosh." This was accomplished by loading the stack with charcoal, igniting it from the bottom, refilling it as needed, and waiting for the furnace to achieve the proper heat. In 1732, William Byrd was told that a Virginia furnace needs "6 Weeks before it comes to that intense heat required to run the Metal in perfection," but that they started the blow in a week to ten days anyway. Improvements in furnace design likely shortened that wait even more by the Catharine Furnace's time, and a suitable heat could be achieved in a few days. Once the workers determined it was hot enough, they began dumping the ore, fuel, and flux, or "charge" into the top of the furnace stack. Hopewell Furnace in Pennsylvania used a charge of fifteen bushels of charcoal, up to 500 pounds of iron ore, and between thirty and forty pounds of limestone flux, fed into the furnace every half hour.

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<sup>13</sup> For a more detailed description of the charcoal-making process, see Chapter Four. Overman, *The Manufacture of Iron*, 102-103; J.H. Alexander, *Report on the Manufacture of Iron; Addressed to the Governor of Maryland* (Annapolis: William McNeir, 1840), 172; Ernst Sjöstedt, "Charcoal and Charcoal Manufacture," *Journal of the United States Association of Charcoal Iron Workers* 4 (1883): 247-51; "Among the Charcoal Iron-Works of the South," *Journal of the United States Association of Charcoal Iron Workers* 2 (1881): 166, and 3 (1882): 138; Joseph E. Walker, *Hopewell Village: A Social and Economic History of an Iron-Making Community* (Philadelphia: University of Pennsylvania Press, 1966), 245.

<sup>14</sup> Gordon, *American Iron*, 33-34; Overman, *The Manufacture of Iron*, 135-36; "Among the Charcoal Iron-Works of the South," 166; Rolando, "19th Century Charcoal Production in Vermont," 16; Catharine Furnace Account Book, FAMCC, pp. 31, 55.

This ratio of materials seems standard for most antebellum furnaces, but the amount of iron produced from that standard charge could vary with the quality of ore, fuel, and the skill of the furnace workers. After the charge was in place, workers forced air through the bottom of the furnace through nozzles known as “tuyeres” to start the chemical reaction needed to make iron and to drive the heat in the bosh in excess of 1500° C. If all things went right, the liquid iron would begin to pool at the bottom of the hearth, which was lined with fire bricks or “hearthstones” to accommodate the high heat. Workers kept a close eye on the level that pooled at the bottom of the stack as well as the slag that floated on the top of the iron.<sup>15</sup>

Catharine Furnace used a technique known as the “hot blast” for smelting iron. In 1828, ironmakers in Britain found that preheating the air before it entered the stack increased the efficiency of the process and required less fuel. By 1834, American ironmakers utilized the hot blast method in a variety of ways; some used water-powered bellows blowing air heated in pipes over a smaller furnace through the tuyeres and into the hearth, while others devised systems in which waste heat from the furnace was circulated back into the hearth. Small steam engines of about twenty horsepower could be used if water was not readily available to power the hot blast. The completion of a “suction engine” for this purpose in the winter of 1837-38 allowed for this innovation at Catharine Furnace. John Wellford paid \$45 to John Stuart for “expenses & services in directing [the] hot blast” and hired Thomas Pollard in 1842 for the same purpose. To keep the small steam engine up and running, Wellford kept an engineer on salary; the account book makes repeated references to replacing hoses, pipes, and other equipment for the engine. It is unclear exactly how the air was heated for the hot blast at Catharine Furnace. The continued use of charcoal fuel suggests that it was not a very sophisticated system, as most innovations in improving the power of the hot blast came with the introduction of anthracite coal and bituminous coke to iron production in Pennsylvania. The heated air in most antebellum charcoal furnaces reached between 300 and 400° F, which would have been inadequate for mineral fuel.<sup>16</sup>

Once there was enough liquid iron accumulated in the hearth, the furnace was ready to be tapped. The first tap of the furnace usually occurred one or two days after the charge had been placed and was done to remove the cinders and waste matter, or “clinkers” that might have fallen to the bottom of the hearth during the initial heating of the stack. The responsibility of overseeing the tapping of the furnace was in the hands of the founder, one of the most important positions in an ironworks. Catharine Furnace’s first founder, David Culmary, received \$706.04 for his work in 1838. The tapping of a furnace required a great deal of preparation. Culmary would have first overseen the construction of sand beds in the casting house to receive the molten iron. Then he would have checked the furnace to make sure that the iron was free of charcoal or ore debris. If this material formed on the top of the liquid

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<sup>15</sup> Byrd, “A Progress to the Mines” 350; Overman, *The Manufacture of Iron*, 164-65; Bradford, “The Antebellum Charcoal Industry of Virginia,” 59-62; Walker, *Hopewell Village*, 141; Gordon, *American Iron*, 90-124.

<sup>16</sup> Temin, *Iron and Steel in Nineteenth-Century America*, 57-62; Catharine Furnace Account Book, FAM-CC, pp. 2, 6-7, 35; Hunter, “Influence of the Market Upon Technique in the Iron Industry in Western Pennsylvania Up to 1860,” 241-81; Yates, “Discovery of the Process of Making Anthracite Iron,” 206-23; Schallenberg and Ault, “Raw Materials Supply and Technological Change in the American Charcoal Industry,” 440.

iron, Culmany would have shut off the blast and called men in to “work the hearth,” or dig out the waste material accumulating on the iron. The founder then had to judge just when the slag, which constantly ran over the “damstone” at the top of the hearth, was high enough to justify removing the clay plug that kept the iron from leaking out of the taphole at the bottom of the hearth. If all was ready, Culmany would have turned off the blast and given the order to pop the clay taphole plug and let the molten iron run out of the hearth. An assistant known as the “gutterman” would have overseen the channeling of the liquid iron into the trenches of wet sand. Once all the iron was gone from the furnace, the founder would replace the clay plug in the taphole, turn on the blast, and workers at the top of the stack would recharge the furnace. The founder would have overseen this process twice a day while the furnace was in blast. The average furnace could produce between eight and ten tons of pig iron daily.<sup>17</sup>

Once in blast, the furnace operator tried to keep it going as long as possible. Hopewell Furnace in Pennsylvania averaged eleven and one-half month blasts in the 1820s and 1830s, and ten and one-half month blasts in the 1840s. Constraints on the length of blast could include a shortage of fuel or ore, worn-out components of the furnace, or a shortage of skilled and unskilled labor. At Etna Furnace in the Valley, for example, the blast was often limited by the number of workers hired to maintain it. Old’s Furnace, a charcoal operation in Albemarle County, ran for six to nine months, with wet and cold weather sometimes ending the blast. It is unclear how long Catharine Furnace’s blasts lasted, but it is likely that they ended when the bosh needed a new lining of hearthstones. John Wellford notes purchasing or transporting new hearthstones in January and September of 1838, which makes nine months the likely length of Catharine Furnace’s first blast. Records concerning the purchase and transport of hearthstones are sporadic until the 1843-44 season, when Wellford shipped them in late November and late June, which makes a six-month blast possible. Of course, the replacing of the furnace lining was not the only factor that might abbreviate the blast—in fact some work on the bosh could still be done while the furnace was hot—but the timing of these purchases, coupled with evidence from contemporary operations suggests that Wellford could keep Catharine Furnace in blast for six to nine months at a time.<sup>18</sup>

Production estimates for Catharine Furnace are equally slippery. The average weekly output of a Virginia charcoal furnace in the 1840s was between thirty and forty tons. Annual production figures fluctuated with the length of the blast, but using the above estimate would put production somewhere between 720 and 960 tons for a six-month blast and 1,080 to 1,440 tons for a nine-month blast. There is, however, a problem with extrapolating these weekly rates into estimates for the entire blast. One thorough study of production in Virginia charcoal iron furnaces in the 1850s found that annual production ranged between 350 and 900 tons, with the most consistent operation making 750 tons of pig iron for three consecutive years. Unfortunately, no extant records document the annual production of pig iron at Catharine Furnace. Wellford’s account book, however, offers some perspective on the amount

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<sup>17</sup> Overman, *The Manufacture of Iron*, 164, 201-6; Bradford, “The Ante-Bellum Charcoal Industry of Virginia,” 61-62; Catharine Furnace Account Book, FAMCC, p. 10; Gordon, *American Iron*, 118-24.

<sup>18</sup> Walker, *Hopewell Village*, 148-49; Dew, *Bond of Iron*, 33-155; Palmer C. Sweet, “Bettie Martin Iron Mine and Old’s Furnace, North Garden, Virginia,” *The Magazine of Albemarle County* 61 (2003): 61; Catharine Furnace Account Book, FAMCC, pp. 6, 9, 12, 49, 54.

of pig iron carted from the furnace to the company's wharf in Fredericksburg. Most likely, the entries for early years are closest to the actual production of pig iron, since Wellford attempted to cultivate seaboard markets in those years. In 1839, for example, Wellford recorded loading 557 tons of pig iron at the Fredericksburg wharf, and in 1841 he shipped 351 tons of pig iron to Boston, Providence, and Richmond.<sup>19</sup>

So how much pig iron could Catharine Furnace produce in a single year? Figure 3.4 attempts to measure annual production using three methods. First, it takes Wellford's reported revenues and divides them by two sets of price estimates: Peter Temin's figures from a Philadelphia foundry that purchased charcoal pig iron and the mean price that Wellford himself recorded receiving in various account book entries. The final column is a tally of the pig iron carted from the furnace stack to the company's wharf in Fredericksburg. Although there is some correlation of the data, all of these production statistics are shaky, as Wellford did not keep close records of production in his existing account book, and some of the iron was likely reworked into casting at the furnace site. By the time Wellford was manufacturing ordnance, moreover, the shipments of pig iron tailed off, thus making estimates from this source impossible. Although flawed, the estimates in Figure 3.4 suggest that in the years before Wellford secured the lucrative ordnance contracts from the War Department, Catharine Furnace's upward production limit was probably around 623 tons—right around the average level of a Virginia charcoal iron furnace at the time.

#### IMPACT ON THE LAND

What kind of impact did Catharine Furnace have upon the surrounding landscape? In the furnace complex, a great deal of noise and activity would have accompanied the blast. High heats and charcoal fuel meant that very little smoke emanated from the main stack, but secondary fires from the blacksmith shop, steam engine, and other structures would have lent a haze to the air. Once the process of making iron was complete, the residual slag needed to be removed from the furnace area. Unfortunately, workers at Catharine Furnace seem to have employed the strategy that most nineteenth-century ironmakers used to eliminate waste: they dumped it in the immediate area. Slag from Catharine Furnace is strewn around the remains of the furnace stack even today, which suggests that workers dumped it in the immediate vicinity of the workplace. Although this industrial waste might be unseemly, it is of vital importance to modern-day industrial archeologists who can use it to determine the chemical composition of the ore and finished iron at a furnace site. Although valuable to modern-day scholars, slag disposal would have been a hassle for workers at Catharine Furnace, particularly for those assigned to haul it from the casting house and dump it in the surrounding countryside.<sup>20</sup>

Slag could be an eyesore, but Catharine Furnace is sometimes blamed for affecting the environment in an altogether different way. Many Civil War historians argue that, by 1863,

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<sup>19</sup> Smith, "Historical Geography of the Southern Charcoal Industry," 70-77; Bradford, "The Ante-Bellum Charcoal Industry of Virginia," 62.

<sup>20</sup> For how archaeologists analyze the waste products of iron furnaces, see Robert Gordon's, "Industrial Archaeology of American Iron and Steel," *IA* 18 (1992): 5-18, and "Material Evidence of Ironmaking Techniques," *IA* 21 (1995): 69-80.

the furnace had helped create the unique Spotsylvania County landscape known as “The Wilderness.” Stephen Sears describes the legend surrounding the area in beautiful prose:

It was this iron industry that gave the Wilderness its distinctive character. Most of the first-growth timber had been cut to make charcoal to feed the furnaces and foundaries, to be replaced by a second-growth tangle of dwarf pine and cedar and hickory and a scrub oak known locally as blackjack. Undergrowth in this warped and pinched forest grew dense and brambly. Men who fought in the Wilderness would remember it with fear and hatred—a dark, eerie, impenetrable maze.<sup>21</sup>

Whether or not Catharine Furnace had a major role in creating the Wilderness is a difficult question. As Chapter One demonstrated, Spotsylvania County had been the location of farming, ironmaking, and mining operations for decades. The fuel needs of all these industries obviously took a collective toll on the landscape. But how much of an impact could one iron furnace make on the environment? Estimates vary. In terms of the fuel needs of a charcoal furnace, estimates from various sources clump toward the rate of 180 bushels per ton. From there, however, it is difficult to determine exactly how much wood would be consumed in an iron furnace. Redwell Furnace in Virginia’s Shenandoah Valley needed about 50 cords of wood to produce about 30 bushels of charcoal and required about 180 bushels per ton of pig iron. This translates into roughly 300 cords of wood per ton of pig iron. Frederick Overman stated that Pennsylvania and Ohio furnaces burned 170 or 180 bushels of charcoal per ton, whereas Kentucky and Tennessee furnaces needed 200 to 250. One historian of the nineteenth-century iron industry, Peter Temin, estimated that the average antebellum charcoal iron furnaces in the United States needed an average of 180 bushels of charcoal to produce a ton of pig iron. If we combine these estimates with the charcoal yields discussed earlier in the chapter, Virginia charcoal furnaces needed anywhere from 250 to 350 cords of wood to make a ton of pig iron. The exact amount would fluctuate, of course, with the weather conditions, skill of the founder, and quality of the ore. The historical geographer Michael Williams estimates that although actual consumption of charcoal ranged anywhere from 125 to 400 bushels per ton of pig iron as the result of these variables, it is reasonable to assume an efficient furnace would require about 180 bushels of charcoal per ton on average. In this regard, then, experts seem to agree upon the fuel needs for producing pig iron, which were 180 bushels, or between 250 and 350 cords of wood per ton.<sup>22</sup>

Translating the demand for charcoal into an acreage requirement, however, is much more difficult. When William Byrd sought advice on ironmaking in 1732, he was told that “2 Miles Square of Wood, wou’d supply a Moderate furnace” in Virginia, which would mean roughly 1,280 acres. This was, of course, a different forest than John Wellford likely encountered in the 1830s and 1840s. Michael Williams provides the most systematic attempt to break down the acreage needed per ton in his book, *Americans and Their Forests*. A standard cord of wood stands four feet tall, four feet wide, and eight feet long. But since trees rarely grow to standard sizes and shapes, the exact acreage required to extract a cord of wood would vary by both the density of woods and quality of timber. Estimates for yield per acre can range

<sup>21</sup> Sears, *Chancellorsville*, 193.

<sup>22</sup> Darwin Lambert, *The Undying Past of Shenandoah National Park*, (Lanham, MD: Roberts Rinehart Publishers, 2001), 76-78. Overman, *The Manufacture of Iron*, 151; Temin, *Iron and Steel in Nineteenth-Century America*, 65; Michael Williams, *Americans and Their Forests*, 106.

anywhere from ten to thirty cords per acre; the latter figure is usually used for densely wooded regions. Spotsylvania County, as Chapter One suggested, had been subject to fairly extensive clearing as a result of agricultural and industrial activities before the nineteenth century; indeed, the land was described as “poisoned” long before John Wellford was born. So, although Williams’ best-case scenario, assuming an efficient ironworks drawing from well-stocked woodlands, offers a productive value of 6.66 tons of iron per acre of woodland, it seems more likely that Catharine Furnace’s yield would have been substantially lower—somewhere between Williams’ medium-yield estimate of 2.0 tons per acre and his lowest estimate for poor woodland yields of .66 tons per acre. Assuming that Catharine Furnace could produce up to 623 tons of iron per year, this would put the demands on the land roughly between 300 and 400 acres per year for charcoal.<sup>23</sup>

This estimate puts Catharine Furnace in the high range of forest consumption. Peter Temin is one of the few economic historians to provide a systematic estimate of all the resources needed to continually operate an antebellum charcoal furnace. He broke down the necessary amounts of ore, fuel, and flux to calculate that the average antebellum charcoal iron furnace could sustain itself on only 150 acres of woodland. Assuming that a forest would rejuvenate in twenty years, Temin argued that 3,000 acres was a sustainable level of land ownership for a charcoal iron operation capable of producing 1,000 tons of pig iron annually. If we look at what contemporary ironmakers thought they needed to sustain themselves, however, a different picture emerges. Pennsylvania’s Hopewell Furnace needed 5,000 to 6,000 cords of wood each year to make about 1,000 tons of iron. Etna Furnace, a Virginia charcoal operation in the Valley’s Rockbridge County, needed 6,000 cords a year to sustain a profitable blast. Michael Williams estimates that since most iron furnaces were not as efficient as Temin’s econometric model assumes, the need for woodlands was much greater. He claims that 500 acres per 1,000 tons produced was more accurate, and if an iron furnace operated in exceedingly poor circumstances, they might require up to 30,000 acres to be sustainable—up to ten times the amount of Temin’s model.<sup>24</sup>

The Fredericksburg Iron and Steel Manufacturing Company’s charter authorized them to own 5,000 acres, which would have been more than adequate following Temin’s guidelines but marginal to inadequate using Williams’ estimates. Catharine Furnace’s landholdings seem modest compared to other Virginia charcoal iron furnaces founded at about the same time. Lucy Selina Furnace (1831) owned 40,000 acres, Edward Bryan’s furnace (1833) owned 10,673, the Greenville Furnace and Mining Company (1837) owned 10,000 acres, and Etna Furnace (1845) owned 8,000 acres. Even so, if we assume an average consumption at the maximum range of 414 acres, even rounding up to 500 to account for wood used for purposes other than charcoaling, Catharine Furnace had at least a decade’s worth of woodland, assuming maximum production under the least efficient conditions. Since there are 640 acres in a square mile, moreover, the impact of Catharine Furnace’s charcoaling operation would have clear-cut less than a square mile per year of operation. This suggests that from 1837 to 1847, the years in which Catharine Furnace operated, the Fredericksburg Iron

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<sup>23</sup> William Byrd, “A Progress to the Mines,” 345. Williams, *Americans and Their Forests*, 105-6.

<sup>24</sup> Temin, *Iron and Steel in Nineteenth-Century America*, 83-84; Walker, Hopewell Village, 141; Dew, *Bond of Iron*, 149-50; Williams, *Americans and the Forests*, 107-9.

and Steel Manufacturing Company would have clear-cut, at the most, nine or ten of Spotsylvania County's more than 400 square miles of territory. Catharine Furnace's fuel needs, along with timber consumption by local gold-mine complexes and a recently opened plank road, certainly contributed to the environmental conditions that created the Wilderness by 1863-64, but it was by no means solely responsible for it.<sup>25</sup>

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<sup>25</sup> Smith, "Historical Geography of the Southern Charcoal Iron Industry," 93. For more on eastern Virginia's gold-mining boom, see Fletcher Green, "Gold Mining in Ante-Bellum Virginia," *Virginia Magazine of History and Biography* 45 (1937): 227-35, 357-66; Otis Young, "The Southern Gold Rush, 1828-1836," *The Journal of Southern History* 48 (1982): 373-92.



## CHAPTER FOUR

### LIFE AND LABOR AT CATHARINE FURNACE

Every ironmaking operation's fortunes rose and fell on the quality of its workforce. Brilliant designs, favorable market conditions, and rich natural resources all went to waste without the hard labor it took to mine the ore, make the charcoal, fill the stack, tap the furnace, and haul the pigs from the furnace complex. A shortage of hands at an inopportune time could ruin a furnace, so managers always found hiring responsible and reliable workers to be one of the most important aspects of their business. As early as 1786, Henry Drinker of Pennsylvania highlighted this fact when writing to a potential ironmaster in North Carolina. "I have divers Workmen that have continued with me from ten to twelve Years," he wrote, "having found those sober managing Men who do well for themselves & Families will up on the whole do best for the Employer." Employment at Drinker's furnace was so coveted, he bragged, that "while other Iron Works, within a few miles have frequently suffered largely for want of hands we have turn'd many away & scarcely ever knew the want of them."<sup>1</sup>

John Wellford knew well the value of a productive labor force. The location of Catharine Furnace in Virginia meant that he would rely upon enslaved African-Americans for the bulk of this workforce. Drinker claimed that one of his rules was to "have nothing to do with Slaves," although he admitted to his North Carolina readers that "this perhaps will not be imitated in your Country." The relationship, however, between enslaved labor and ironmaking is a long and established one. As Chapter One demonstrated, the earliest Virginia ironmakers used slave labor. In other major ironworks along the Mid-Atlantic such as those of Maryland's Principio Company, bonded labor played a major role throughout the eighteenth century. In his comparison of Martha Furnace in New Jersey and the Oxford Iron Works in Virginia, historian John Bezis-Selfa notes the continuity, rather than contrast, in the rhythms of work among free and unfree workers. Both systems, he argued, shaped the pattern of work in nineteenth-century iron furnaces. The use of slaves at every level of ironmaking became a hallmark of the southern iron industry. Ronald Lewis argues that "slaves were the key ingredient in the labor force" and that even when ironmakers needed to secure additional workers, they sought to hire African-American slaves. "This pattern," Lewis states, "hardened into a tradition that lasted until it was destroyed by the Civil War."<sup>2</sup>

While slavery played a major role in the early American iron industry, the "peculiar institution" offers certain complications in the reconstruction of life and labor at Catharine Furnace. First and foremost, the experiences and attitudes of those who worked at Catharine Furnace—like many other enslaved labor forces throughout the antebellum South—leave very few written records for historians. John Wellford's account book offers a few tantalizing glimpses into the lives of his workers. Still, a notation of a runaway, ac-

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<sup>1</sup> Doerflinger, "How to Run an Ironworks," 364.

<sup>2</sup> Doerflinger, "How to Run an Ironworks," 364; John Bezis-Selfa, "A Tale of Two Ironworks," 677-78; Lewis, *Coal, Iron, and Slaves*, 20.

counts for food and clothing, the occasional listing of an occupation such as “Kike the Collier” or “Lucky the Cook,” cannot suffice in revealing what daily life was like for these men and women. Historians such as Ronald Lewis, John Bezis-Selfa, and Charles Dew have used extant records to reconstruct the lives of bonded workers on nineteenth-century ironworks elsewhere in Virginia and the South; this chapter will draw heavily upon their findings. In doing so, it aspires to provide at least an approximation of the rhythms of everyday life and labor at Catharine Furnace.

#### CATHARINE FURNACE’S WORKFORCE

As mentioned earlier, the process of ironmaking required quite a bit of sophisticated oversight, but much of the actual work involved hauling, pulling, scraping, and other menial tasks. This meant that an iron furnace’s workforce blended a relatively small number of highly skilled workers and a larger number of unskilled hands. Thomas Doerflinger observes that in early nineteenth-century ironworks, unskilled labor was often more difficult to secure than skilled ironworkers. In the case of New Jersey’s Martha Furnace, he argues, the organization of labor was done in a “rather decentralized and unregimented way” in which itinerant laborers found employers more than willing to tolerate absenteeism, drinking, and rowdy behavior to keep the furnace in blast. As the nineteenth century progressed, labor shortages still bedeviled northern iron furnaces, particularly in sparsely populated areas. Ironmasters there resorted to strict contracts, the promise of long-term employment, higher wages, and even religious appeals to keep their workforce complete. Of course, skilled hands such as moulders tended to benefit from these innovations more than their unskilled co-workers. By the 1830s and 1840s, the labor market for ironworkers in the North reflected an ideology that seemed distant from the ubiquity of bonded labor, either in the form of indentures or slaves, which had characterized much of the colonial iron trade.<sup>3</sup>

In the South, of course, ironmakers took a different path in rounding out their workforce. While most moulders and other skilled positions were filled by immigrant or native-born white workers, the vast majority of southern ironmakers relied upon slaves for unskilled labor. The rhythm of this market was decidedly different from free labor markets in the North. In Virginia, the hiring season began in early January, when ironmasters or their agents would travel to the eastern part of the state. Orange, Louisa, and Spotsylvania counties were all prime hiring spots, and the net flow of slaves from those regions to the Valley was large. The competition could be fierce, as Valley ironmaster William Weaver discovered in February of 1836, when the owner of two potential hires in Spotsylvania Court House mentioned that the Virginia Central Railroad offered \$150 for slaves. The price for hiring slaves increased consistently throughout the antebellum period, although Weaver’s correspondent probably exaggerated the market price to spur him to action. In fact, historians estimate that the average annual price of hiring slaves for industrial work was \$66.30 from 1799 to 1833, \$100.55 from 1833-1852, and \$150.00 from 1853 to 1861. During the period that John Wellford ran Catharine Furnace, bad economic conditions kept the price of hiring slaves relatively low. One study of the Virginia charcoal iron

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<sup>3</sup> Thomas M. Doerflinger, “Rural Capitalism in Iron Country: Staffing a Forest Factory, 1808-1815,” *The William and Mary Quarterly*, 3rd ser., 59 (2002): 8; John Bezis-Selfa, *Forging America*, 190-209.

industry found \$90 or \$85 to be the going rate in 1840. Prices could fluctuate from year to year and depended upon the skill of the slave hired. Once the contract was signed, the hiring manager would agree to provide food and shelter for the slave, along with a new set of clothes upon the end of the contract, usually by Christmas of that same year.<sup>4</sup>

Because Catharine Furnace was situated in Spotsylvania County, John Wellford enjoyed certain advantages in the hiring market over his competitors from the Valley. Unlike ironmasters in the Valley, for whom distance was an issue, the Fredericksburg Iron and Steel Manufacturing Company operated in close proximity to several counties that were important sources for slave hiring, as well as the urban center of Fredericksburg. As a result, Wellford's account book contains references not only to the traditional one-year hirings, but also shorter periods of one or two months, sometimes even a few weeks at a time. As a slaveowner himself, Wellford also could allocate slaves from his own household to Catharine Furnace when necessary. As demonstrated in Figure 4.1 (see Appendix A), Wellford kept anywhere from thirteen to twenty-one of his slaves out in Spotsylvania County; undoubtedly some of these slaves were allocated to work on Catharine Furnace, whereas others likely worked on his farm or in his country house. Thus, labor shortages do not seem to be a problem in the brief history of Catharine Furnace.

A closer look at Figure 4.1, though, reveals that the number of hired slaves fluctuates from year to year. There are a few potential explanations for this trend. First of all, since Wellford often fleshed out his labor force with short-term hires, the years in which large numbers of slaves were hired might reflect a certain amount of turnover as well as periods in which the demands of ironmaking dictated a number of short-term hires. Years with low numbers of hires might reflect a slack period in the production of pig iron, which seemed to be the most labor-intensive activity done at Catharine Furnace. For example, in 1841, when the company hired only twenty-eight slaves, Wellford notes that the coal house had been pulled down by July of that year. Moreover, his account book mentions that he carted 351 tons of pig iron to Fredericksburg from 9 February to 9 June 1841. These two fragments of evidence suggest that 1841 saw a very short blast—possibly as short as four months. Because Wellford could tap into slave hiring markets easily, an abbreviated blast would mean fewer hires in that year. This fluctuation in slave hiring was not unusual in the antebellum Virginia iron industry. New Cloverdale Furnace, for example, hired thirty-five slaves in 1841, but increased this amount to fifty-five in 1842. The actual number of workers, then, often depended upon the available stockpile of raw materials, the length of the blast, and the market for pig iron in any given year. The larger numbers, moreover, may be explained by more turnover or short-term hires or by more slaves being allocated to work in the iron ore pits or at charcoaling. In sum, it is difficult to estimate just how many slaves were at work at Catharine Furnace at any given time, although the minimum number of thirty-three in 1844 seems to correlate with contemporary estimates of how many workers were needed to keep an antebellum iron furnace running.<sup>5</sup>

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<sup>4</sup> James Coleman to William Weaver, 19 February 1836, William Weaver Papers, Duke University Library, Durham, NC; Dew, *Bond of Iron*, 67-69; Lewis, *Coal, Iron, and Slaves*, 192-93; Bradford, "The Antebellum Charcoal Industry of Virginia," 107-8.

<sup>5</sup> Catharine Furnace Account Book, FAMCC, pp. 31, 33; Bradford, "The Antebellum Charcoal Industry of Virginia," 112.

## OUTDOOR WORK

Some ironmakers referred to the gathering of ore, fuel, and flux as “outdoor work.” This preparatory work was critical in managing a good, profitable blast. To maintain a good six-to- nine month blast, then, a prudent manager made sure that ample supplies of both charcoal and ore were on hand to continually charge the furnace. The manager of the Bath Iron Works in Rockbridge County, Samuel Sherrard, discovered firsthand the importance of this “outdoor work” to an iron furnace. In the spring of 1849, Samuel bemoaned the cold weather and light rain that delayed charcoaling, even though he had “all hands at chopping.” Although he expected to commence the blast in mid-April, a delay in his ore supply delayed Bath Furnace’s blast until June. By July, Sherrard complained about a shortage of moulders and ore. “Since the Red Shear ore has given out,” he wrote to his father, “I would not urge this property upon any one in whom I took an interest.” By October, Sherrard contemplated going into the cattle business, as it seemed both safe and profitable. The following month he packed up his patterns and flask and relocated to a foundry in Tennessee. Without the raw materials, an iron furnace simply could not function.<sup>6</sup>

As mentioned in Chapter Three, the limonite ore deposits of Spotsylvania County were relatively close to the surface, which made the extraction of the ore a bit easier than the shaft mining required of some Valley ironworks. This labor-intensive work was done with picks and shovels, with few innovations in the technique over time. In the Virginia charcoal iron industry, this meant devoting a great number of hands, usually slaves, to the task. Managers at the Bath Works, for example, estimated that at least ten hands were needed to work an iron ore vein. It was considered an “ugly job” at Bath Furnace; workers risked life and limb using black powder to jar the ore loose and then immersed themselves in a sea of muck extracting it from an open quarry. Rainwater collected in these pits, and since ore digging was done year round, ore miners froze in the cold months and suffered constant mosquito attacks in the warm ones. The process of draining the open pits was as unsophisticated as the raising of the ore; if no wooden hand pumps could be found, slaves often dug drainage ditches to try to keep the workings as clean as possible. If that failed, they used buckets to bail out water by hand. In 1839, John Wellford paid tax on nineteen slaves listed as residing in the “Iron Mines” of Spotsylvania County, which gives some sense of the allocation of laborers to the task of ore mining, as well as the labor intensity of the job.<sup>7</sup>

Making charcoal fuel was another major component of outdoor work. No less dirty and arduous than digging iron ore, charcoaling also required a great deal of skill and experience. A good collier was invaluable to an antebellum iron furnace. In the North, these colliers could be independent proprietors or employees of the ironworks, but in the South many colliers were enslaved. The African-American presence in this line of work in both regions is well-established. Pennsylvania’s Cornwall Furnace, for example, listed several African-American colliers among its workforce in 1780. Even after Pennsylvania abolished slavery,

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<sup>6</sup> Samuel Sherrard to John M. Sherrard, 19 March 1849, 25 June 1849, 17 July 1849, 3 October 1849, 7 November 1849, John M. Sherrard Papers, Southern Historical Collection, University of North Carolina, Chapel Hill, NC.

<sup>7</sup> Bezis-Selfa, *Forging America*, 31-32; Dew, *Bond of Iron*, 77; Spotsylvania County Personal Tax Records, 1839, Library of Virginia, Richmond, VA.

black colliers still worked in the state's charcoal iron industry. In free labor states, the wages earned by colliers could be quite lucrative. Pennsylvania's Manada Furnace paid their colliers \$20 per month in 1837, higher wages than farmworkers, teamsters, or basic laborers of the furnace. Although many southern colliers were African-American slaves, the high level of skill and isolated conditions of the work allowed black colliers more autonomy than most enslaved workers. In the Valley of Virginia's Buffalo Forge, one of William Weaver's slaves known as "Allen Collier" received \$1.50 a month for serving as the master collier. Another slave at Buffalo Forge, Major Watson, was able to earn cash by watching over the charcoal pits on Sundays.

John Wellford used both free and enslaved colliers at Catharine Furnace. His account book shows that Wellford paid "Kike the Collier" \$1.00 in 1837—most likely for extra work on the same order as Major Watson. He continued to hire Kike from John Coleman for the entire decade that Catharine Furnace operated, often at a premium price. In 1840, for example, Wellford paid \$175 to hire Kike, which was the same amount he paid Woodford Gannett for hiring two slaves that same season. Wellford also paid John Blunt, likely a free white collier, \$178.33 for supplying charcoal to Catharine Furnace in 1839.<sup>8</sup>

Wellford's willingness to pay high prices to retain Kike for Catharine Furnace reflected the high level of skill and responsibility required of a collier. Beginning in the late fall and through the early spring, Kike likely supervised the cutting and stacking of wood in a clear and dry location in the woods. The usual size of a woodchopping detail for an antebellum charcoal furnace would have been about fifteen slaves, working up to forty-five weeks a year, with each woodchopper expected to produce about nine cords a week. Workers would stack the logs—sometimes as many as forty or fifty cords—in a concentric pattern up to fifty or sixty feet in diameter, leaving a space in the middle to act as a chimney. After about six to eight of these piles had been constructed, charcoal-making could begin. Within the pile, the spaces between the logs were filled with twigs, branches, and leaves to regulate the combustion of the pile. Figure 4.2 (see Appendix A) demonstrates how these piles were designed, at least ideally. The actual piles built by colliers most likely reflected a personal style developed over years of practice. Once constructed, master colliers such as Kike would cover the pile with moss, leaves, and turf with the grassy side facing downwards. Once he was satisfied that the pile was ready, the collier would ignite it to begin the "sweating" process in which the wood slowly burned to remove water and other impurities from the pile. Once lit, the pile required constant supervision. After three or four days, the master collier then capped the chimney on the pile and opened small vents on the side, which would cause the wood to smolder. Depending on the weather, a charcoal pile took anywhere from one to three weeks to complete. Throughout this process, the master collier would check its progress by walking on top of the pile, using his feet as a guide to the evenness of the burn. To ensure a consistent reduction, the collier might poke holes in the outer layer of the pile to allow oxygen into the smoldering wood; this had to be done carefully, lest the smoldering wood fully ignite and ruin the entire load of charcoal.<sup>9</sup>

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<sup>8</sup> Walker, *Hopewell Village*, 262-63, 305; Dew, *Bond of Iron*, 119-120; Catharine Furnace Account Book, FAMCC, pp. 4, 10, 11, 13, 14, 22, 51, 60, 68, 77.

<sup>9</sup> Overman, *The Manufacture of Iron*, 104-8, and F. Knapp, *Chemical Technology; or, Chemistry, Applied to the Arts and to Manufactures*, vol. 1 (Philadelphia: Lea and Blanchard, 1848), 53-56; Charles Dew, *Bond of Iron*, 149-150; James Wettstaed, "Cutting it Back and Burning it Black: Archeological Investigations of Charcoal Production in the Missouri Ozarks," *IA* 29 (2003): 32-33.

Charcoaling was dangerous and lonely work. As it made little sense to haul massive loads of wood to a central location, the charcoaling pits followed the stocks of fresh timber. Since the pile required constant monitoring, the collier and two or three assistants set up camp close by the smoldering piles. Archeological excavations of charcoal pits in Virginia and Missouri calculated a frequency of one pit per thirteen acres of forest, each with spartan watch stations comprised of a lean-to or crude shack. The temporary nature of these charcoaling sites, coupled with their dispersal throughout the countryside, make them difficult to reconstruct for the modern historian. Colliers physically dwelled on the outskirts of the iron industry. As Chapter Three suggested, the timber cutting required to make Catharine Furnace's fuel was not as extensive as once thought, but the actual process of charcoaling made a much deeper impression on the environment in the small spaces it touched. "The activities of the charcoal getters and burners left a deep imprint on the forest," geographer Michael Williams argues, "thinning them, altering their composition as they regrew, and also altering the soil by stripping the turf and sterilizing the soil where the pits smoldered."<sup>10</sup>

Like ironmaking, the monotony of charcoaling could be interrupted by moments of intense danger. Walking on a smoldering pile of wood was risky, to say the least, and the need to occasionally poke, prod, and stir the pile made for precarious footing. Sometimes workers fell through and suffered severe burns and injury. If sealed too tightly a pile might explode when an air vent was opened. Once the collier decided that the charcoal was finished, the hazard of the load catching on fire again always loomed. As they raked the still warm charcoal after a couple days of cooling, colliers and their assistants took special care to ensure that their load did not reignite. Once it was cool enough, Kike and his assistants would have begun shoveling the charcoal onto carts, often fitted with loose boards on the bottom so that a burning load could be dumped quickly in an emergency. Even if everything went off without a hitch, charcoaling was notoriously sooty work. Colliers, it was noted, could often be identified by their rough dress and blackened appearance. When all was said and done, Frederick Overman claimed that the best hedge against danger and distress was the collier's experience and skill in managing this dangerous, dirty work. "Colliers who do not understand their business, or who are not industrious and attentive," he argued, "never make good coal, nor produce a good yield." Overman writes, "If the work is unreasonably hurried, or if the teams are not always ready at the proper time, unavoidable losses are the consequence."<sup>11</sup>

The final component needed to begin the season's blast, and the least labor-intensive aspect of outdoor work, was collection of oyster shells used as flux in the furnace. As discussed in Chapter Three, these oyster shells mostly came from town, and Wellford records purchasing them from men and women quite regularly. As shells were a waste product, Catharine Furnace's collection might have been viewed as more of a public service than a market transaction. One entry in the account book suggests that Wellford sent carts to Fredericksburg loaded with iron, and they returned loaded with oyster shells. As mentioned in Chapter Three, Catharine Furnace's demand eventually outpaced his neighbors' ability to provide them, and in 1845 John Wellford shipped oyster shells down from Washington.<sup>12</sup>

<sup>10</sup> Wettstaed, "Cutting it Back and Burning it Black," 35-36; Williams, *Americans and Their Forests*, 110.

<sup>11</sup> Bezis-Selfa, *Forging America*, 28-31; Overman, *The Manufacture of Iron*, 108.

<sup>12</sup> Catharine Furnace Account Book, FAMCC, pp. 57, 64.

The final phase of outdoor work entailed carting the iron ore, charcoal, and oyster shells from various locations to the furnace stack. Although early iron ore deposits lay in the shadow of Catharine Furnace's stack, as these were depleted workers spread out into the surrounding countryside to secure more ore. Charcoal-making also became more spread out over time, colliers followed readily available stocks of wood. Workers cleared a small network of cart paths to transport these raw materials from their isolated location to the furnace complex. Although they don't detail the actual locations and amounts, various entries in Wellford's account book suggest that the extensive network of roads and paths from various iron ore pits to the furnace complex would have seen a steady traffic of horse and ox carts carrying materials for the charge. In 1839, for example, John Wellford paid himself from company funds for forty-two days of hauling ore to the furnace at the rate of \$1 per day. In 1843, he paid a Mr. Temple \$23.85 for hauling ore and continued to pay out similar amounts for ore haulage throughout the furnace's operation. In 1840 Wellford paid for 102 days of hauling "ore, coal, wood &c." at \$1 per day; two years later he paid for 238 days cartage between the furnace and Fredericksburg.<sup>13</sup>

#### MANAGING THE BLAST, WORKING THE IRON

Once all the materials were in place, Catharine Furnace could begin the process of making the blast. Chapter Three described the process of managing the blast in detail, but it is important to add here that each step of making pig iron required a highly disciplined coordination of skilled and unskilled labor. Pennsylvania ironworks in the 1840s required about forty-five workers to operate a successful blast; Charles Dew claims that a Virginia furnace could be maintained by twenty slave laborers. Although John Wellford, his founder, and some other assistants were white, the vast majority of workers doing the day-to-day work at the furnace stack would have been African-American slaves. Under the close eye of the founder, gangs of workers would have been employed, first, in dumping the massive amounts of charcoal needed to get the hearth up to the proper temperature. Once this was accomplished, workers known as "fillers" began to dump the iron ore, flux, and more charcoal into the top of the stack. When liquid iron began to form at the bottom of the furnace, the founder made the decision to tap the hearth. Then, the "gutterman" would oversee its movement from the furnace into the casting shed while the "cinderman" tried to coax the slag into a separate pit. In the meantime, the founder would monitor the constantly burning blast and occasionally shut it down so that men could "work the hearth," or clear it of unprocessed chunks of charcoal or ore that formed on top of the liquid iron. Once the "pigs" were cool enough to handle, another group of workers broke them free from the sand trenches in the casting house and stacked them for shipment or for further working in Catharine Furnace's cupolas. Whether in the form of pig iron or a casted piece of shot or shell, the iron left the complex via horse cart to Fredericksburg for storage at Wellford's warehouse on the wharf, where it awaited its ultimate destination.<sup>14</sup>

Although the bulk of Catharine Furnace's sales were first in pig iron, then shot and shell, evidence suggests that the Fredericksburg Iron and Steel Manufacturing Company also

<sup>13</sup> Catharine Furnace Account Book, FAMCC, pp. 17, 24, 31, 43, 48, 50, 64, 68, 73.

<sup>14</sup> Dew, *Bond of Iron*, 31. This description of work at a charcoal iron furnace is adopted from Gordon, *American Iron*, 1607-1900, 188-124.

made iron castings directly from the furnace. Workers melted the pig iron into a liquid state in a smaller furnace and poured it into a mold. When the iron cooled, it retained the shape of the particular mold. Iron skillets, stove pieces, plow heads, and other products were often made at Virginia charcoal furnaces for local production. “Moulding” was a highly skilled profession that required a great deal of experience in working with iron. A good moulder employed a wooden pattern to make the mold and then packed it with sand. Pouring the liquid iron also took patience and skill, as too rapid a pour could cause bubbles to form in the iron and if poured too slowly, the iron might harden unevenly. Moulders also had to watch out for the presence of slag in the castings, which would cause imperfections in the finished product. The purchase of patterns for making Franklin stoves as well as the hire of a skilled moulder, George Hazelton, indicates that Catharine Furnace produced castings in the first year of production.<sup>15</sup>

Spotsylvania County ore produced a distinct “gray iron” that was considered high quality for refining into smaller ironware such as skillets, axe heads, gears, and other tools. One of the furnace’s first customers was Jacob Barnes & Company, who ran the Virginia Axe Manufactory in Richmond. Wellford hired several moulders throughout Catharine Furnace’s existence and purchased patterns, suggesting that castings such as stovebacks and sash weights were a significant part of his business. At some point, Wellford added two cupola furnaces—smaller furnaces used to melt pig and scrap iron into consumer products—to the Catharine Furnace complex. He also imported anthracite coal from Pennsylvania to fuel those cupolas. In 1841 castings from Catharine Furnace were purchased by six local firms at auction, adding up to \$1,022.38 in sales. An inventory of the property in 1847 mentioned “a valuable set of brass pot patterns, stove patterns, etc. etc.” Later archeological excavations of the site found artifacts such as stove sections and patterns for casting present on the grounds; the archeologists also interviewed Mrs. Jeremiah Haney, who still owned a skillet made at Catharine Furnace before 1846. Since most of these castings were simple and relatively flat, they could be made on the floor of the casting house with a pattern and moulder’s sand.<sup>16</sup>

The fabrication of shot and shell, which made up so much of Catharine Furnace’s business after 1841, was a simple casting process. Making solid shot was easy enough—one simply poured the liquid iron into a spherical mold. Wellford purchased ball patterns from Alger & Company in Boston and William Allen of Philadelphia in the summer of 1842. Later that year, Wellford traveled to Boston, Albany, West Point, and New York in search of good patterns. The process of making a shell required a bit more skill, as they were a different shape and required cavities for gunpowder. In this process, a flask was used to house the casting. Wellford purchased shell patterns and flasks from the South Boston Iron Company for \$248.12 and wrote to the Washington Arsenal for eight- and ten-inch shell patterns in 1844. Later that year, Catharine Furnace’s shell patterns required moderation, as naval inspectors found them wanting. As mentioned earlier, Wellford employed at least five moulders full-time

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<sup>15</sup> Catharine Furnace Account Book, FAMCC, pp. 6-7; Gordon, *American Iron*, 195-98.

<sup>16</sup> Bruce, *Virginia Iron Manufacture in the Slave Era*, 141; *The Democratic Recorder* (Fredericksburg, VA), 2 April 1847; O.F. Northington and Stuart M. Barnette, “Results of the Exploration Excavations at the Catharine Furnace Located on Furnace Road Near Fredericksburg, Virginia” pp. 2-3, 7, Fredericksburg & Spotsylvania National Military Park, Entry 10: National Park Service, RG 79, National Archives and Records Administration at College Park, MD.

making shot and shell when working on ordnance contracts, which was highly skilled but also highly specialized work.<sup>17</sup>

This relatively straightforward routine went on for the entirety of Catharine Furnace's blast. Since the founder usually tapped the furnace in the morning and evening, workdays were long while the furnace was in blast. Of course, workers could take small breaks between taps, but the pace and intensity of their labor was dictated by needs of the furnace, which required constant attention. Even though the bulk of the work involved lifting, dumping, and stacking heavy objects, which hardly required a great deal of experience, the coordination of all this activity made strict discipline a necessity. Here, the division between white and black ironworkers in the South becomes an important part of Catharine Furnace's story, as free and enslaved workers had very different ways of approaching this requirement for discipline.

For many of the white workers, sobriety was a crucial element of discipline. The arduous process of working an iron furnace led many workers to drink heavily. This is a long tradition among ironworkers, and one that most managers sought to minimize. In 1732 William Byrd learned that at the Fredericksville Furnace, the "founders find it very hot work to tend the Furnace, especially in the Summer, and are oblig'd to spend no small part of their Earnings in strong Drink, to recruit their Spirits." Henry Drinker's guidelines for ironmasters in 1786 recommends "to employ no intemperate drunken Person, or at least when found to be so, turn them off." Drinker acknowledged that hard drinking was customary for ironworkers, writing that "as to Rum, much pains have been taken to break them of the use of it," and "it is the only article I make them pay a high price for, & knowing my motives they submit to it without grumbling." One study of the antebellum Virginia charcoal iron industry noted the "great quantities of whiskey" consumed at furnaces. William Weaver's ironworks in the Valley could be paralyzed when his white workers were "on a Frolic," so he preferred to employ slaves. Ironworkers saw their method of blowing off steam as an essential and time-honored ritual; historian John Bezis-Selfa describes alcohol as an "entrenched feature of their lives." Americans consumed around 2.8 gallons of pure alcohol per capita in 1835, so ironworkers were not necessarily ahead of the curve in terms of alcohol consumption. Ironmasters, ship builders, textile managers, and other industrial employers across the United States struggled to contain the effects of heavy drinking in their workforce. John Wellford's experience with hard-drinking white workers is revealed in an uncharacteristically chatty passage in his business correspondence. When writing to the War Department in late November of 1846, Wellford fretted that his production of artillery shells would be delayed. "Moulders are in general a class of mechanics so intemperate and consequently difficult of management," he wrote, "that I fear the approaching Christmas holydays may disperse them, and I may not collect them again until the time, say the 15 Jan. may have gone by and thus leave me a defaulter with the Department."<sup>18</sup>

<sup>17</sup> Catharine Furnace Account Book, FAMCC, pp. 35-37, 39, 43, 54-55.

<sup>18</sup> Byrd, "A Progress to the Mines," 354; Doerflinger, "How to Run an Ironworks," 364; Bradford, "The Ante-Bellum Charcoal Iron Industry of Virginia," 90; Dew, *Bond of Iron*, 67, 100; John S. Wellford to L. Warrington, 23 November 1846, Records of the Bureau of Ordnance, Entry 22: Miscellaneous Letters Received, Box 4 (August 1846 to December 1847), RG 74, NARA; Bezis-Selfa, *Forging America*, 199; William Rorabaugh, *The Alcoholic Republic: An American Tradition* (New York: Oxford University Press, 1981), 232. Rorabaugh's figures are contested in Greg Austin and Ron Roizen, "How Good Are the Conventional Estimates? Stalking the Origins of Historical U.S. Per Capita Alcohol Consumption Statistics Revised," (1993), <http://www.roizen.com/ron/how-good.htm>.

Keeping enslaved workers productive was an altogether different task for nineteenth-century ironmakers. Conventional wisdom among slave owners dictated that alcohol was to be strictly rationed among slaves, save during the Christmas holiday or as a rare incentive for a particularly dangerous or dirty job. Some ironmasters sought positive reinforcement by paying slaves cash for extra work. This was hardly a humanitarian impulse among ironmasters; cash for “overwork” was one strategy for extracting as much work from the hired workforce as possible. As Ronald Lewis argues, overwork payments “attempted to make the industrial slave a disciplined and productive worker by merging his physical and economic interests with those of his employer.” At Catharine Furnace, these payments could be as small as the \$3 that Wellford paid to “Tom, Armstead & Cyrus” for extra work in the summer of 1837. As time went on, Wellford seemed to rely upon overwork payments more and more. In 1839 he paid \$339.27 in overwork payments, and the following year Wellford tallied \$823.25 to “Servants at Catharine Furnace for night work, extra work, pork raised by them, coal baskets, etc. etc.” Unfortunately, we do not know the reaction these workers had to overwork payments. Studies of other ironworks suggest that this form of incentive was popular among enslaved workers. Charles Dew, for example, argues that earning pay for overwork gave William Weaver’s slaves in the Valley “an absolutely critical weapon in their never-ending struggle against the dehumanizing aspects of their bondage.”<sup>19</sup>

When incentives did not work, ironmasters relied upon physical discipline in the same ways that slaveholders did throughout the antebellum South. In his comparative study of a northern and southern ironworks in the early nineteenth century, John Bezis-Selfa argued that although both free and slave labor systems balanced coercion and incentive, “slavery allowed for a wider range of options, especially punitive measures.” Whippings, beatings, and constraints thus found their way from the plantation to the iron furnace in Virginia, which sometimes provoked slaves to run away. There is no extant evidence of physical discipline at Catharine Furnace, but various entries do show up suggesting that some slaves did attempt to run away. Silas Bowling received \$6.50 for “taking up Peyton[,] a runaway” who Wellford had hired for six months in 1839. The following year, G.B. Newton received \$10 for “apprehending servant Davy belonging to Wishard.” In 1842 Wellford paid \$15.40 to the “Stafford Jail for keeping in Jail Browne’s Richard who ran away” and \$6 for the return of “Mrs. Bon’s servant William a runaway.” In 1846, Wellford paid Jesse Billing \$5 for “apprehending John Clark, a runaway.” Although it is unclear how long “Browne’s Richard” or “Mrs. Bon’s William” worked at Catharine Furnace, the evidence suggests they were among the several short-term hires Wellford made in 1842. “Davy” and John Clark, on the other hand, had been hired for the entire year; John Clark had been hired in both 1843 and 1844. We may never know the exact reasons that these men chose to flee, but their different backgrounds with Catharine Furnace suggest that running was one strategy employed by enslaved workers without regard to familiarity or affection toward Wellford’s ironworks.<sup>20</sup>

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<sup>19</sup> Lewis, *Coal, Iron, and Slaves*, 119; Catharine Furnace Account Book, FAMCC, pp. 1, 15, 23; Dew, *Bond of Iron*, 367.

<sup>20</sup> Bezis-Selfa, “A Tale of Two Ironworks,” 700; Catharine Furnace Account Book, FAMCC, pp. 14, 16, 20, 22, 36, 40, 49, 56, 76.

## LIFE AT CATHARINE FURNACE

When Catharine Furnace was in blast, workdays left little opportunity for idleness and spare time. Since the blast required constant recharges of ore, charcoal, and flux, a constant flow of carts and drivers would have been arriving and leaving the furnace complex. The hearth was tapped about every twelve hours, so the excitement of watching the liquid iron flow into the casting house would have worn off a few days into the blast; channeling the iron, digging out the pigs, and stacking them for shipment was backbreaking work. Suffice to say, the opportunities for recreation and leisure time in the middle of rural Spotsylvania County were rare, and this perhaps explains the tendency of many white ironworkers to indulge in alcoholic binge-drinking. We know even less about Catharine Furnace's enslaved labor force. What did they do in between tapping the hearth? How did they recharge themselves during the few leisure hours left to them? What was everyday life like for the workers at Catharine Furnace?

Historians of industrial slavery have little source material to work with in answering these questions; most of what we know about the daily lives of enslaved ironworkers comes from managerial sources. We do know that, as opposed to many free white ironworkers in the North, enslaved laborers could not provide their own food, clothing, and shelter. John Wellford, then, would have been responsible for providing these elements to the workforce at Catharine Furnace. It was not a negligible expense. Ronald Lewis, for example, estimates that antebellum iron works spent about \$100 per slave for "maintenance and supervision costs." This broke down to about \$50 for food, \$15 for clothing, \$7 for housing, and \$3 for medical services. Supervision, he estimates, cost about \$27 per slave, and the remaining costs would have been for miscellaneous items such as insurance and incentive payments for overwork. The expenses of using slave labor were roughly equal to the slave's hiring price; for each \$100 that Wellford would have spent on the actual hire, he spent another \$100 to maintain and supervise that employee. Even with this added expense, though, slave labor was most likely cheaper than hiring free labor in Virginia. Lewis found that using a baseline annual wage for antebellum white ironworkers--\$310 for unskilled workers and \$930 for skilled laborers—using slave labor provided southern ironmasters with an annual savings of nearly \$7,000. Another historian of industrial slavery, Robert Starobin, estimated that hiring slaves was, on average, 25 to 40 percent less expensive than using free white labor. John Wellford therefore provided the daily necessities for his workers at Catharine Furnace not out of any benevolent impulse; he did so because it made economic sense.<sup>21</sup>

The extant evidence suggests that Catharine Furnace provided rather spartan accommodations for its hired workers. Several mentions of a boardinghouse appear in contemporary and historical accounts. The 1847 advertisement putting the complex up for sale after John Wellford's death mentioned both a "BOARDING HOUSE for workmen" and a "SMOKE HOUSE." Archeological excavations at the furnace site in 1936 confirmed the location of these buildings on the hill above the stack and estimate the size of the boarding house to be roughly thirty feet wide and fifty feet long. It is difficult to estimate just how many workers lived in the boardinghouse, as the number of hand at the furnace fluctuated from year to

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<sup>21</sup> Lewis, *Coal, Iron, and Slaves*, 194-95; Robert Starobin, *Industrial Slavery in the Old South* (New York: Oxford University Press, 1970), 162-63.

year. In 1842 and 1843, Wellford hired “Luckey” as the boardinghouse’s cook, which at least indicates that a full-time domestic staff was required to keep the workforce fed. As for the white workers such as moulders or assistant managers, most likely they had separate residences in Catharine Furnace’s office complex, as archeological excavations discovered several sites resembling small domestic dwellings in close proximity to the furnace stack.<sup>22</sup>

When Catharine Furnace was in blast, John Wellford took up residence in his nearby farmhouse. Archeological excavations have uncovered a brick-walled basement measuring twenty-five feet long and twenty feet wide, with a wood-lined well and springhouse nearby. Although he still maintained his residence in Fredericksburg, John’s correspondence indicates that he and his wife spent long periods of time at the furnace homestead. This two and one-half story brick building lay about three-quarters of a mile south of the furnace, which was close enough for John to oversee production but far enough away to avoid most of the heat and noise of ironmaking. The Wellfords entertained family and friends at their furnace house, but the sense of isolation seemed palpable for John’s wife. “Your Mother longs for Fredg,” he wrote to his daughter in March of 1846, “so say her looks.” Later that year, Janet Wellford mentioned spending a week at the furnace with several family members in a letter to her son. “Great improvements going on there,” she wrote, “and I believe it is your father’s determination to make that his permanent residence. . . . I must confess that I am opposed to it,” she continued, “because I know it will fall to my lot to stay there altogether, but will not be so agreeable to stay entirely alone, as your father is never at the house except at meals and is suffering at this time with rheumatism in his shoulder.” When not busying himself with managing the affairs of the furnace, Wellford attended to his nearby farm where he raised several crops and kept livestock for both his own and his workers’ consumption.<sup>23</sup>

In addition to providing provided shelter for its managers and workers, John Wellford provided clothing for his workers. A new change of clothes was a customary provision in slave hire contracts, so Wellford needed to secure a great deal of clothing each year. John and his brother, Charles, set up a company to take advantage of this market. In 1838, *The Political Arena* published a notice for the Fredericksburg Woolens Company announcing that they would pay cash for wool. The firm advertised themselves as major dealers in “kerseys & lindseys” for male or female “servants,” which in nineteenth-century parlance meant slaves. The Catharine Furnace Account book lists a \$1,592.89 purchase for “supplies” in 1838 and further purchases of \$938.08 for 1840 and \$24.13 in 1841 from JS and CC Wellford—this most likely refers to the partnership they formed to make the Fredericksburg Woolens Company. With the cloth secured, Wellford needed only to pay tailors or seamstresses for fabricating them.

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<sup>22</sup> Northington, Jr., “The Revival of the Iron Industry in Eastern Virginia as Exemplified by the History of the Catharine Furnace in Spotsylvania County,” 76; O.F. Northington, Jr. and Stuart M. Barnette, “Report on Catharine Furnace Exploratory Project Covering Historical Research and Exploration to Date,” (1936), 3, MSS report, p. 44, 51. FRSP.

<sup>23</sup> Noel G. Harrison, *Chancellorsville Battlefield Sites* (Lynchburg, VA: H.E. Howard, 1990), 62; John S. Wellford to Susan Nelson Wellford, 18 March 1846; Janet Wellford to Francis Preston Wellford, 7 October 1846, Reneau Manuscripts, FRSP. Archeological information regarding the Wellford House is found in Appendix B: Archeological Sites and Cultural Features Within the Catharine Furnace Locale (Including Wellford and Maury Farmsteads and Unfinished Rail Road) in Geier and Sancomb, *An Archeological Survey of Selected Sections and Sites on the Chancellorsville Battlefield*. Part II..

Apparently they were not high-cost items. In 1839, for example, he paid Parke Ferrill \$50 for making fifty “suits of clothes.” The account book notes payment to several more seamstresses and tailors under the catch-all phrase “making clothes for servants” in subsequent years. The tradition of a clothing allotment was so well-entrenched that Wellford had to allocate cash to “pay the hands who receive money instead of Clothes” in 1838 and again in 1842. John’s letter to his daughter, Susan, mentions the “servants cloths” being brought in from Fredericksburg in May of 1846. Managing this clothing allotment was an important part of John Wellford’s role as superintendent of Catharine Furnace.<sup>24</sup>

Since Catharine Furnace was in an isolated location, its workforce would have a difficult time securing food. In northern iron furnaces, workers usually purchased food from their employers at a company store. In those cases, the store clerks kept accounts for each worker and might subtract workers’ purchases from their pay. At Hopewell Furnace in Pennsylvania, for example, Joseph Walker claims that the company store “served a useful purpose in providing a convenient place to secure some of the necessities of life.” Although some workers complained of inflated prices in company stores, prices at the Hopewell store were in line with local retailers and, in some cases, were lower. Nonetheless, free white workers sometimes complained that a system in which their employers sold them their daily bread was exploitative by design. The fact that many company stores were a source of profit for otherwise cash-strapped northern furnaces added to this belief. Southern ironmasters, as they relied upon slave labor, were responsible for providing food, and the company store was a less prominent institution. On the one hand, this arrangement eliminated the idea that ironmasters profited from selling necessities to their own workers. On the other hand, the managers of many Virginia iron furnaces saw the allotment of food and drink as a way to further control their workforce. Ronald Lewis argues that “ironmasters frequently manipulated their food and clothing provisions as well as their liquor rations in order to control and motivate slaves.” In the Valley’s Bath Iron Works, one manager manipulated the eating arrangements so as to watch over his workforce, claiming that “our Forge hands eat in one kitchen collectively, its being so convenient we can oversee the whole.”<sup>25</sup>

Unfortunately, there are no descriptions of the eating arrangements at Catharine Furnace; the presence of a boardinghouse rather than atomized slave quarters means that workers there probably ate together. As far back as 1732, William Byrd was told that an iron-works needed “1600 Barrels of Corn Yearly to Support the People, & the Cattle employ’d” in a Virginia iron furnace. John Wellford’s account books do offer some insight into what his workers ate. Several entries for corn, wheat, and potatoes show up, as do various purchases of beef and pork. Bacon, sometime shipped from as far away as Baltimore, was a staple of the Catharine Furnace workforce’s diet; Wellford purchased \$211.17 worth of bacon from a Baltimore supplier in 1838. Purchases of “seed wheat,” hogs, cows, and “oxen for beef” indicate that Wellford also kept crops and livestock in the vicinity of Catharine Furnace for local consumption. Purchases were often made in bulk and luxuries were few. In 1841, for example,

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<sup>24</sup> *The Political Arena* (Fredericksburg, VA), 8 June 1838, 7 December 1838, 12 March 1841; Catharine Furnace Account Book, FAMCC, p. 8, 10, 26, 33, 47; John Wellford to Susan Nelson Wellford, 5 May 1846, Reneau Manuscripts, FRSP.

<sup>25</sup> Walker, *Hopewell Furnace*, 204; Lewis, *Coal, Iron, and Slaves*, 117; Dew, *Bond of Iron*, 76.

Wellford paid \$45 for “15 barrels of herrings for use of furnace hands,” and the following year an entry for molasses shows up in the account book for the first time. Coffee and sugar were available by 1843, butter in the following year. A payment made to “servants” for “pork raised by them” in 1840 suggests that some of the company’s hired slaves also engaged in farming on the premises. Such practices were common incentives to keep hired hands in line and reduce the cost of providing processed food for them. It is telling, however, that only a few lines down in the account book, Wellford paid himself for bushels of corn meal “furnished for servants and horses from his mill,” thus undermining any dignity afforded by his practice of reimbursing enslaved workers for their labors. Well-fed workers, like well-fed horses, were more productive. When Wellford and other managers of slaves lumped animals and fellow humans into the same categories in their account books, the indignities of slave labor become much more poignant. The provision of food is one more example of the ways in which the day-to-day negotiations of slavery affected life and labor at Catharine Furnace.<sup>26</sup>

The dependency of Catharine Furnace upon hired slave labor is an important aspect of its social, as well as its economic, history. In fact, it is an enduring theme throughout the history of the ironworks. Although the antebellum chapters of that story came to a close with the death of John Wellford, the strong relationship between ironmaking and slavery at Catharine Furnace would be renewed in 1862, when the Wellford family again began making iron for munitions. Instead of the War Department of the United States, the wartime manifestation of the company dealt with the Confederate States of America. After a fifteen-year hiatus, the blast would be on again at Catharine Furnace during the Civil War.

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<sup>26</sup> Byrd, “A Progress to the Mines,” 345; Catharine Furnace Account Book, FAMCC, pp. 1, 3, 8, 11, 13, 14, 21, 23, 31-33, 39, 44, 46, 47, 53, 56, 65.

## CHAPTER FIVE

### CATHARINE FURNACE ON THE FRONT LINES

In December of 1861, Francis B. Deane wrote a letter in response to one he had received from Charles C. Wellford of Lynchburg, Virginia. Deane had been an original incorporator of the Fredericksburg Iron and Steel Manufacturing Company and an associate of Charles's brother, John Spotswood Wellford. Deane also played an important role as an early executive in the Tredegar Iron Works of Richmond, now the leading manufacturer of ordnance in Virginia. For the last two decades, though, Deane had been working in the Valley of Virginia among the various ironworks that blossomed there in the 1840s and 1850s. By 1861, F.B. Deane, Jr. & Son had become the leading foundry in Lynchburg and purchased pig iron from several furnaces in the area. As a doyen of Virginia with strong ties to both the past and present leaders of the industry, Deane seemed a natural choice for Charles Wellford to contact concerning the reopening of Catharine Furnace fifteen years after John's untimely death.<sup>1</sup>

Deane's missive responded to a series of inquiries. He first addressed the issue of raw materials such as ore and wood for charcoaling by claiming that the "quantity of Wood is certainly sufficient for many years" and that the "supply of ore is very sufficient." With new improvements in the "hot blast" method of charcoal iron production, moreover, Deane estimated that the efficiency of ironmaking at Catharine Furnace could improve dramatically. Although Deane could not speak as to the cost of repairing the facilities, he did estimate that Catharine Furnace could be reopened with "highly effective labourers + 25 to 30 mules," five or six coal wagons, and six to eight ore carts. Skilled founders would not be a problem, Deane reasoned, as the seventeen iron furnaces of Rockbridge, Botetourt, and Allegheny counties that were in blast in the early 1850s had been, by 1861, whittled down to only four by economic conditions. Deane then predicted that Catharine Furnace could be in blast up to nine months out of the year and produce about 1,000 tons of pig iron annually. As for technical improvements, Deane rejected the idea that brand-new techniques for making charcoal iron need be adopted. "The improved production in the charcoal Furnaces may be ascribed," he wrote, "to more systematic management & to the very general use of [the] Hot blast."<sup>2</sup>

As for the motivation for restarting Catharine Furnace, Deane enthusiastically concluded that "the opinions heretofore expressed of the result of working the Catharine Furnace under a contract with the Government for Pig Iron at \$50.00 per ton are still confidently entertained." This price made the revival of ironmaking in Spotsylvania County a lucrative venture, considering that prices throughout the 1850s had been flat. The Panic of 1857 had

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<sup>1</sup> Charles Dew, *Bond of Iron*, 250. For more on Francis B. Deane's career, see Bruce, *Virginia Iron Manufacture in the Slave Era*, 150, 171-72.

<sup>2</sup> Francis B. Deane to Charles C. Wellford, December 1861, FRSP 989 in the archival collection at Chancellorsville Battlefield Visitor Center, Fredericksburg and Spotsylvania National Military Park. Hereafter referred to as "Chancellorsville FRSP Archives." This is a separate collection from the documents held at the main office of the FRSP in Fredericksburg.

ushered in a general economic slowdown that greatly affected the American iron trade. One Philadelphia foundry was able to secure pig iron for \$22.75 a ton in 1860 and \$20.25 in 1861. In Virginia, many ironworks simply closed, and those that did not sold their pig iron at cut-throat rates. William Weaver's Etna Furnace sold pig iron at \$22.50 in local markets in 1860. The outbreak of war, however, pushed prices higher. In the spring of 1861, Francis Deane raged at Weaver when he offered pig iron at \$40 a ton, claiming that price was "higher than your iron can be sold in any market in the world to me." But by late summer, Deane was paying Weaver's \$40 a ton for pig iron; when he asked for more that October, Weaver informed him that the new price was \$50. This undoubtedly made an impression on Deane and most likely spurred him to endorse Charles Wellford's idea of restarting Catharine Furnace.<sup>3</sup>

Catharine Furnace's second act, like the creation of the Fredericksburg Iron and Steel Manufacturing Company, began amid the heady atmosphere of \$50/ton pig iron. John Spotswood Wellford's furnace ran for nearly a decade; the Catharine Furnace Company survived only three years. Whereas John Wellford had to deal only with fickle prices and markets, his Civil War successors encountered the Union and Confederate armies, as the Battle of Chancellorsville quite literally washed over the area in May of 1863. After serving as the location of a skirmish during Jackson's famous flanking maneuver in that struggle, Catharine Furnace was occupied and destroyed by Union cavalry during the Wilderness Campaign a year later. The furnace had been rebuilt by February of 1865, but evidently contributed little to the Confederate war effort by that time. The story of Catharine Furnace's wartime manifestation is brief and vague in its economic and social sense, but quite rich in its military context.

#### A NEW COMPANY

On 25 January 1862, the Virginia Senate considered House Bill No. 49, "An act to incorporate the Catharine furnace company, in the county of Spotsylvania." After two readings, the Senate voted on the bill, which passed by a vote of twenty in favor and only eight against. For unknown reasons, the charter was not signed into law until 25 January 1863, when it officially created the Catharine Furnace Company, a firm authorized for "mining iron ore, and of working and smelting the same into pig iron or otherwise, and also for the purpose of manufacturing iron in all its branches and uses." Charles Wellford, John Wellford's brother, was one of the original incorporators, along with George B. Scott, J. Warren Slaughter, A. Alexander Little, and C.B. Wellford.<sup>4</sup> The new firm had the authority to raise up to \$200,000 in capital and hold up to 10,000 acres of land. Aside from the Wellfords, the rest of the incorporators were drawn from Fredericksburg's commercial and social elite, not surprising since shares in the Catharine Furnace Company were priced at \$1,000 each. Alexander Little was

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<sup>3</sup> Deane to Wellford, December 1861, BV 268 in the Fredericksburg & Spotsylvania National Military Park Bound Volume Collection, Fredericksburg, VA. Hereafter referred to as "FRSP Bound Volume Collection." Temin, *Iron and Steel in Nineteenth-Century America*, 283; Dew, *Bond of Iron*, 289-291. Deane quote is from p. 290.

<sup>4</sup> Virginia Senate, *Senate Journal*, 1861-62 (Richmond: William F. Ritchie, 1862), 104; Virginia House of Delegates, *Journal of the House of Delegates of the State of Virginia for the Session of 1861-62* (Richmond: William F. Ritchie, 1862), 115; *Acts of the General Assembly of Virginia, Passed at Called Session, 1863, in the Eighty-Eighth Year of the Commonwealth* (Richmond: William F. Ritchie, 1863), 35-36. The "C.B." Wellford here likely refers to Charles Beverly Wellford, Charles C. Wellford's son.

the long-time publisher of the semi-weekly *Fredericksburg News*; Slaughter a wealthy banker and merchant from one of Fredericksburg's leading families; and Scott was a wealthy businessman involved in the new railroad project that traveled next to the Catharine Furnace property, the Fredericksburg and Gordonsville Railroad.<sup>5</sup>

The incorporators actually purchased the Catharine Furnace property for \$23,243.75 in December of 1861 from William Wellford, who was acting as a trustee for Edward H. Carmichael and the executor of John S. Wellford's estate, and Richard H. Cunningham as Francis B. Deane's trustee. This was a considerable discount from the \$40,000 asking price quoted in the immediate aftermath of John Wellford's death, and likely represents the deterioration of the property as an industrial site. James Diggs and his family occupied the old Wellford house and farm by 1860, where he raised wheat, corn, and oats. Diggs was listed as an employee of the Catharine Furnace Company later in the war, so he likely acted as a caretaker for the furnace complex. Little mention of the condition of the ironworks during the fourteen-year hiatus, however, survives. The incorporators hedged their investment by paying with a series of promissory notes payable in 1862 and 1863, thus taking advantage of anticipated wartime inflation as well as avoiding massive cash payments up front. By early 1862, before the charter had wound its way through the Virginia Legislature, workers began repairing the main furnace complex. In April of 1862, George Scott oversaw the hauling of oyster shells from Fredericksburg to the furnace, which suggests that founders there were preparing for the blast to begin sometime later that year. The Catharine Furnace Company also secured leave for some Confederate soldiers in 1862 to return to Fredericksburg to work on the furnace; large shipments of bacon to the furnace indicate that workers were on site by September of that year. Historian O.F. Northington argued that the presence of soldiers on leave not only indicated that furnace operations were starting up, but was proof "that the Government was sufficiently interested to identify itself with the undertaking as early as the second year of the War."<sup>6</sup>

Catharine Furnace's contracts for this business, in fact, had been secured before the company formally existed. In January of 1862, George Scott and Charles Wellford secured a contract with the Confederate Navy to provide 2,000 tons of pig iron. The value of this contract, to be completed over three years and end in 1865, is unknown, as is the ultimate destination. Since Confederate officials had abandoned Norfolk's naval yard—the destination for John Wellford's naval ordnance—Catharine Furnace likely shipped iron to Richmond, where it was used by either the Tredegar Works or the government-operated Virginia State Armory there. George Minor, the head of the Bureau of Ordnance and Hydrography, wrote a number of these contracts for pig iron with generous financial terms for participating firms

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<sup>5</sup> The background of the incorporators is derived from Sylvanus Jackson Quinn, *The History of the City of Fredericksburg* (Richmond, VA: The Hermitage Press, 1908), 226; Horace Edward Hayden, *A Genealogy of the Glassell Family of Scotland and Virginia* (Wilkes-Barre, PA: E.B. Yordy, 1891), 284; Walter Homan Ficklin, *A Genealogical History of the Ficklin Family* (Denver, CO: The W.H. Kistler Press, 1912), 95; *Acts of the General Assembly of Virginia, 1855-56* (Richmond: William Ritchie, 1856), 109.

<sup>6</sup> O.F. Northington, Jr., "The Revival of the Iron Industry in Eastern Virginia as Exemplified by the History of the Catharine Furnace in Spotsylvania County," 77-79. Northington relied heavily upon oral testimony for his portrait of the wartime furnace, which made exact dating of the furnace's activity quite elusive. Harrison, *Chancellorsville Battlefield Sites*, 62; Promissory Notes of 20 December 1861 are FRSP 7639, FRSP 7640, FRSP 7641, FRSP 7642, FRSP 7643, FRSP 7644, FRSP 7661; "Catharine Furnace Account with George B. Scott," MSS account fragment, FRSP 7669, Chancellorsville FRSP Archives.

and exemptions for all furnace workers from military service. Nonetheless, pig iron shortages plagued the Confederate War Department early in the struggle. “Our contractors are many of them at a dead stand for lack of Iron,” Chief of Ordnance Gen. Josiah Gorgas wrote to the Secretary of War James Seddon in November of 1862, “and it will be impossible to supply projectiles for the new guns now in the field, unless it can be had.” Gorgas went so far as to recommend a state confiscation of iron stocks, but the Confederacy relented on this strategy and worked through a contracting system and interest-free loans for private firms in lieu of state control.<sup>7</sup>

The outbreak of the Civil War, nonetheless, recharged the charcoal iron industry across Virginia. Only fourteen furnaces were in blast in 1861, while twenty-two lay idle for want of markets. The massive Tredegar Iron Works of Richmond, now the new Confederacy’s leading foundry complex, demanded 15,000 tons of pig iron annually—much more than the weakened Virginia charcoal iron furnaces, whose output reached only 9,096 tons in 1860, could supply. The decline of production in the Old Dominion was a real problem. As practically the sole provider of large guns, armor plating, shells, and other war materials at the onset of the war, Richmond became the center of Confederate iron manufacturing but had problems securing enough pig iron. Tredegar, with its 900-strong workforce, received several government ordnance contracts and would ultimately furnish the Confederate military with more than 1,000 cannon, iron plating for both ironclads and experimental submarines, large castings such as boilers and propellers, along with a steady stream of shot, shell, and other projectiles. Although he first tried to secure pig iron from across the Confederacy, the leader of Tredegar, Joseph Reid Anderson, persuaded ironmasters across Virginia to bring their furnaces out of mothballs and begin producing pig iron for the Confederate war effort. Most of them went back into blast, and four new furnaces came online during the war.<sup>8</sup>

The Union Army disrupted production, but Virginia iron furnaces eventually reached a peak annual capacity of 20,000 tons of pig iron. Joseph Reid Anderson played a huge role in the revival of the state’s furnaces. Although it remained a private firm, the Tredegar Iron Works became a de facto arm of the Confederate War Department, and Anderson coordinated the flow of coal, pig iron, and other raw materials from the Virginia countryside into Richmond. It is probable that some of the iron produced for the Confederate Navy ended up in Anderson’s possession, as an 1862 arrangement between the Richmond firm and the War and Navy secretaries allowed raw materials to flow from government contracts into the Tredegar Iron Works. That same year, the Confederacy shipped 855 tons of iron to the Tredegar Works. Despite the renaissance of the state’s charcoal iron furnaces, the Confederacy could never quite allocate enough pig iron to its various contractors and state-operated

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<sup>7</sup> Statement of Contracts Made by the Navy Department,” from US Naval War Records Office, *Official Records of the Union and Confederate Navies in the War of the Rebellion, ser. 2, vol. 2, Navy Department Correspondence, 1861-1865, with Agents Abroad* (Washington: Government Printing Office, 1921), 7; “Statement of Agreements for Iron of All Kinds Made by Office of Ordnance and Hydrography, Navy Department, January 8 to August 7, 1862,” *ibid.*, 248; Dew, *Ironmaker to the Confederacy*, 140-43; Gorgas quoted in Frank Vandiver, *Ploughshares into Swords: Josiah Gorgas and Confederate Ordnance* (Austin: University of Texas Press, 1952), 147.

<sup>8</sup> Bruce, *Virginia Iron Manufacture in the Slave Era*, 361-65; Dew, *Ironmaker to the Confederacy*, 102-4; John D. Capron, “Virginia Iron Furnaces of the Confederacy,” *Virginia Cavalcade* 17 (1967): 10-13.

armories. The shortage of pig iron from government sources was so acute, in fact, Tredegar acquired four blast furnaces in western Virginia in 1862. By 1863, moreover, the company controlled ten blast furnaces in the Valley and had taken over coal production in Richmond's nearby bituminous coal region. Even with this impressive degree of vertical integration, historian Charles Dew argues that "the underdeveloped state of the Southern pig iron industry constituted the single most important obstacle to Tredegar production throughout the war."<sup>9</sup>

#### CATHARINE FURNACE AT WAR

Unfortunately, few sources exist that describe daily life at Catharine Furnace during the Civil War. An account book contains some entries from 1862, but most of them have to do with the internal financial dealings with the company. The aforementioned evidence that George Scott was moving oyster shells to the furnace complex helps date the likely time of the first blast; by July of 1862 more entries for shells, the purchase of a horse and wagon, and some meal shipped to the furnace complex provide further evidence of economic activity. Several fragments of evidence reinforce the idea that Charles Wellford took Francis Deane's advice and repaired Catharine Furnace's hot blast equipment. One account entry mentions the purchase of a steam engine from North Carolina in March of 1862, and an undated description of the complex, likely done in 1864 or 1865, mentions the "necessary pipes and fixtures for using the Hot Blast." The new operators also apparently installed a "20 inch iron pipe leading from the top of the stack [which] conducts the Gas under the Boilers for Fuel." This does not refer to the use of natural gas, but instead depicts the practice of capturing waste heat from the furnace stack and redirecting it for the production of steam power and also to heat the air used in the hot blast. As for the remainder of the 1862 and 1863 blast, O.F. Northington used oral testimony from local residents to piece together an account of the furnace operation. "Hundreds of men, soldiers on special detail and civilians," he wrote, "worked both day and night at the varied tasks necessary for the maintenance of such a project. . . . Forests were leveled and converted into charcoal, ore was mined and hauled to the Furnace, blacksmiths and mechanics were busy with repairs and replacements, and certain contingents of workers were occupied with raising both forage and food."<sup>10</sup>

Northington's mention of "soldiers on special detail" hammers home the notion that the Catharine Furnace Company was a wartime operation in an area that witnessed a great deal of military activity. This could have had both advantages and disadvantages to the firm. Charles C. Wellford found out about the setbacks firsthand when the Federal Government took him into custody for six weeks beginning in July of 1862. The Union's military operations in Fredericksburg later that year drove Charles and his family away from their house in the city and onto the Wellford Family's Catharine Furnace property. On the other

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<sup>9</sup> Capron, "Virginia Iron Furnaces of the Confederacy," 14; Dew, *Ironmaker to the Confederacy*, 152-78. Quote is from p. 177; Majewski, *Modernizing a Slave Economy*, 148.

<sup>10</sup> Catharine Furnace Account Book, 1862, pp. 3-4. This book is in the archives of the Fredericksburg and Spotsylvania National Military Park in Fredericksburg, VA. Information on the hot blast comes from "Catharine Furnace," undated ms., FRSP 7675, Chancellorsville FRSP Archives. The context of this document suggests it is advertising the wartime prospects of the furnace, and the appended corporate charter of the Catharine Furnace Company dates it after January of 1863. Northington, Jr., "The Revival of the Iron Industry in Eastern Virginia," 78-79.

hand, dealing with the Confederate Government during a pig iron shortage could be financially advantageous to iron furnaces. Not only did military officials offer to buy all the produce of Virginia furnaces, they also offered credit for furnace masters to make improvements. For example, W.L. Sanders, an Alabama ironmaster, received a \$50,000 advance in Confederate bonds for his 1863 contract, and a Smythe County, Virginia, iron furnace secured free passage on canals and railroads courtesy of the Confederate Mining and Nitre Bureau. It is unclear whether or not Catharine Furnace's "hot blast" benefited from this program, nor the extent to which operations were altered by Charles Wellford's more immediate presence following the bombardment of his Fredericksburg house in December of 1862.<sup>11</sup>

Although Catharine Furnace did not see much of a direct impact from the Battle of Fredericksburg in December of 1862, the Battle of Chancellorsville very much encompassed the ironworks. The Army of the Potomac, under the command of General Joseph Hooker, faced the Army of Northern Virginia, led by General Robert E. Lee, outside of Fredericksburg. Despite the resounding defeat suffered by the Army of the Potomac only a few months earlier at Fredericksburg, new leadership and a two-to-one advantage in troops appeared to favor the Union fortunes. On 20 April 1863, advance elements of the Union Army arrived in close proximity to the furnace complex. Evelina Wellford was an eyewitness living in the family house just south of Catharine Furnace and described the situation. "The Yankees were down at the Furnace not a mile from us," she wrote to her sister after the battle, "indeed all around they were shouting and shooting, and we four unprotected females every moment expecting their appearance at the house." Charles Wellford ran into the woods as the soldiers began "searching the house for arms and Confederates, shooting the fowls, and stealing provisions." Although Evelina described the soldiers as well-behaved, she also mentioned that "they seemed confident of their success, and thought Richmond was almost within their grasp." By 1 May 1863, the two armies were in contact in the forested area in between Catharine Furnace and Fredericksburg.<sup>12</sup>

Catharine Furnace served as the launching point for a movement by Georgia infantry and Virginia cavalry on the southern portion of the Union line on 1 May 1863. Troops from the 22nd and 48th Georgia Infantry moved through the dense forest in an attempt to turn the Union Army's southern flank. There they found the soldiers of the 123rd New York, who fell back to a position that offered artillery cover. General Thomas J. "Stonewall" Jackson arrived at Catharine Furnace during the attack and attempted to watch it with the commander of the Confederate cavalry, General Jeb Stuart. A fierce barrage of artillery fire from the Union lines repelled the Confederate advance and drove Jackson and Stuart back to the Catharine Furnace area. One of Stuart's staff officers, Major Channing Price, was hit by a shell fragment that severed an artery. Evelina Wellford reported that "poor Major Price of Richmond" was evacuated back to the Wellford House, where he died. Stuart and his men spent the night nearby, while Stonewall Jackson sought a meeting with General Lee. By the evening of 1 May

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<sup>11</sup> Quinn, *The History of the City of Fredericksburg*, 77; "Charles Carter Wellford," BV 135, FRSP Bound Volume Collection. Military contracts come from Confederate State of America Nitre and Mining Bureau, *Message of the President, Feb. 15, 1865 [and Communication from the Secretary of War Transmitting a Report from the Chief of the Nitre and Mining Bureau]* (Richmond: n.p., 1865), 7-10, 11-13. C.I. 1322, Confederate Imprints Collection, Virginia Historical Society, Richmond, VA.

<sup>12</sup> Evelina Wellford to Frances Ellen Jones, 15 May 1863, BV 135, FRSP Bound Volume Collection.

1863, the Union soldiers' confidence appeared well-suited to the situation as the Army of the Potomac still held the decisive edge in the battle.<sup>13</sup>

General Stonewall Jackson's famous flanking maneuver on 2 May 1863 provided a dramatic turning point in the battle and drew Catharine Furnace directly into its tempest. The plan to move three divisions in columns—more than 29,000 soldiers—in a quick march to hit the Union right flank required a detailed knowledge of the local landscape. Since this flanking maneuver would split the Confederate forces in the face of the enemy, timing and speed would be of the essence, and knowledge of the local terrain a must. Captain Jedediah Hotchkiss, a member of Jackson's staff who had become a kind of personal cartographer for the General, remembered Jackson awakening him in the early dawn of 2 May to "ride down to the Furnace and see Col. Welford, who then lived there, and ascertain if there was any road by which we could get around to the turnpike in the vicinity of the old Wilderness Tavern, under the cover of the woods, without making the long circuit by way of Todd's Tavern." When Hotchkiss arrived at the furnace, Charles Wellford was roused for a meeting. "He got up and received us and I told him my mission, having spread my map of the county upon a table," Hotchkiss later reminisced, "by the light of a candle he indicated the location of a new road that he had recently cut across the Brock road for the purpose of getting cord wood and iron for his furnace." After marking the route, Hotchkiss assigned Charles the task of guiding the march and reported to Jackson, who along with Robert E. Lee, sat on cracker boxes planning the strategic move.<sup>14</sup>

Early the next morning, Jackson put the plan into action. The silent column marched along Furnace Road with Charles B. Wellford—Charles C. Wellford's son—leading the way. "Jackson with his Army passed through," Evelina witnessed from the Wellford House, "making that grand flank movement by this road." The roads that the younger Wellford led the column upon were designed for small carts carrying charcoal or ore, not a modern army. One North Carolina soldier wrote that the "day was very warm, the route poor" and that "we rushed jumping bushes, branches up and down hill." The widest that Jackson's men could march was four abreast, and several delays created gaps in the line. It took nearly four hours for the end of the column to begin its march, and when it strung by the Wellford House, its occupants were cheered. "We met with many of our friends," Evelina Wellford remembered, "and enjoyed it of course, feeling so secure too, against any more trouble that day from the Yankees."<sup>15</sup>

Although Jackson's flanking march would be a resounding success, Evelina's hopes of peace and quiet would be dashed. Despite the order for silence among Jackson's column, Union observers took note of a troop movement. Union General Dan Sickles was convinced of a major troop movement, but had trouble convincing his superior, General Joseph Hooker, of a pressing need to send troops in force rather than to simply lob some

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<sup>13</sup> Sears, *Chancellorsville*, 220-22; Evelina Wellford to Frances Ellen Jones, 15 May 1863, BV 135, FRSP Bound Volume Collection.

<sup>14</sup> Jedediah Hotchkiss to James P. Smith, 16 April 1867. BV 021, FRSP Bound Volume Collection; Sears, *Chancellorsville*, 234-35.

<sup>15</sup> Sears, *Chancellorsville*, 240-43; Michael C. Hardy, *The Thirty-Seventh North Carolina: Tar Heels in the Army of Northern Virginia* (Jefferson, NC: McFarland & Company, 2003), 127; Evelina Wellford to Frances Ellen Jones, 15 May 1863, BV 135, FRSP Bound Volume Collection.

artillery shells in the general direction of the noise. Evelina Wellford noted that “the Yankees discovered Jackson’s movement, and thought he was retreating, so determined to give him a parting salute, and planted their cannon on Furnace hill.” There was no choice for the remaining four female members of the Wellford family but to flee with the help of some Confederate soldiers. “In expectation of some trouble the carts were waiting at the door, and our trunks and some other valuables being put in, and sent off, we hurriedly took our departure to the woods, making as good time as you might imagine under those circumstances.” The women rushed headlong into the dense woods, “perfectly ignorant” of where they were heading, when “the shells came whizzing by, bursting apparently near us.” The escape party wandered for a bit more until coming upon a house where they took shelter for the evening.<sup>16</sup>

Eventually Hooker gave the go-ahead for Sickles to “advance cautiously” to “harass the movement” at Catharine Furnace. As Jackson’s column snaked along the Furnace Road, the 23rd Georgia Infantry fanned out along Catharine Furnace’s piles of ore and charcoal and hid in the complex’s engine and casting house. They had been put there to stem any Union advance and buy time for Jackson’s march. When Colonel Hiram Berdan’s U.S. sharpshooters probed the Confederate line, the 23rd Georgia revealed themselves. “We received a lively fire as we advanced from a spot near the large building,” one Federal sharpshooter recalled. “We got the bugle call ‘charge’ and we made a quick run for the building and came down on a regiment covered in a large pit where the rebels mined iron and the building was a foundery where they cast shot and shell for their artillery.” Overwhelmed and outflanked, the soldiers of the 23rd Georgia fell back to the unfinished railroad cut, but could not fend off their attackers. Only three Georgians were wounded, but 296 were captured and their commanding officer, Colonel Emory Best, suffered a court-martial for his actions on that day. The Georgia troops were “glad to surrender,” the sharpshooter recalled. Although the skirmish at Catharine Furnace was a temporary setback, Jackson’s flanking maneuver succeeded, and the Battle of Chancellorsville became one of the major Confederate victories in the Civil War.<sup>17</sup>

Although the Army of Northern Virginia moved north to invade Pennsylvania and take the war to the Union, elements of the army lingered in the Chancellorsville area long after the battle. Evelina Wellford returned to the Wellford House on 3 May 1863 to find “everything in great confusion,” as the house had been occupied by both sides during the previous day’s skirmish. The battle continued to rage to the north of Catharine Furnace as a brigade of General Isaac Trimble’s division occupied the area with little incident. Certainly the furnace complex saw damage from the fighting, but the post-battle occupation was the main concern in a damage claim submitted to the Confederate government in August of 1863. Two employees of the Catharine Furnace Company, James Diggs and J.W. Trigg, submitted a formal petition—sanctioned by the local justice of the peace and Catharine Furnace incorporator Charles Wellford—to the War Department for \$5,507.00 in damages incurred by the forces “in large numbers” present at the furnace during the battle and General Trimble’s occupation for

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<sup>16</sup> Evelina Wellford to Frances Ellen Jones, 15 May 1863, BV 135, FRSP Bound Volume Collection.

<sup>17</sup> “The Civil War Diary of Wyman S. White, First Sergeant of Company ‘F’ of the 2nd United States Sharpshooter Regiment (New Hampshire Men) in the Army of the Potomac, 1861-1865,” Typescript of 1920 Memoir, BV 150, FRSP Bound Collection, 75-76; Sears, *Chancellorsville*, 253-57.

“five weeks afterwards.” Most of the lost items were typical of a nineteenth-century industrial workshop; blacksmith and carpenter’s tools, axes, some fencing, and wooden planking. The loss of 150 pounds of bacon, nine pigs, six “coaling” shovels, and two mules reinforces the idea that ironworking had been going on at the time of the battle. The loss of 1,000 pounds of iron and 150 cords of “cut & seasoned” wood offers further evidence that Catharine Furnace was in blast. Diggs and Trigg’s estimate might have seemed high to Confederate officials. After all, they paid only \$1,997.50 in May 1864 to cover the claims. Most notably, the damage claims list the striking amount of \$637 for five adult and four young hogs and \$225 for 150 pounds of bacon. Evelina Wellford’s estimate that corn sold at \$60 a barrel and that Charles Wellford had been shipping bacon down from Richmond offers some perspective on both how far inflated prices had become by 1863 and also how devastating this loss of provisions would be for Catharine Furnace.<sup>18</sup>

Despite these losses, the company repaired the damages and apparently was back in blast in early 1864 when yet another offensive movement by the Army of the Potomac, this time under the leadership of General Ulysses S. Grant, interrupted operations. Company officials had met in February of 1864, decided to liquidate some of their bonded debt, and instructed Charles Wellford to visit the furnace and check on repairs by 1 March 1864. It is unclear whether Charles arrived by that date. What is clear, though, is that the Union cavalry did arrive at Catharine Furnace soon afterward. Although probably undeservedly blamed for creating the unique conditions in which the Battles of Chancellorsville and the Wilderness was fought (see Chapter Three), Catharine Furnace’s role in that campaign resulted in its own destruction. Union cavalry under the command of General George A. Custer clashed with Fitzhugh Lee’s Virginia cavalry in early May of 1864. Custer tersely noted fighting and camping by the furnace in his official report; one of the cavalymen from Custer’s “Michigan Brigade” describes his encounter with the furnace on 6 May 1864 in much more striking terms as he was riding along the Furnace Road on the way to engage Lee’s forces:

In the descent from the upper level, a scene long to be remembered was presented to the vision. Fires had been lighted up by the sides of the roads, which revealed, by their glare, long lines of infantry, cavalry, and artillery, filling up the tortuous ways in all directions, in a wavy motion, like the undulations of some vast serpent. Then, a blast furnace, with its accumulated stores of fuel, broke out in grand conflagration, illuminating a vast extent of country by its lurid light. The black, impenetrable forest spread out in all directions, the central mass of flame, the winding streaks of fire diverging therefrom, and here and there disclosing moving, writhing, sinuous, slender, long-extended forms—all combined to impress upon the mind a preternatural idea of the spectacle, as though the demon of destruction was floundering and belching out tongues and volumes of flames in the murky depths below.

Another Union soldier’s account of the area confirms both the renewed ironmaking at Catharine Furnace from the “heaps of freshly-dug ore” as well as its destruction at the hands of fire. Confederate officials, too, mentioned the destruction of Catharine Furnace in

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<sup>18</sup> Memorandum of Damages and Losses Sustained by the Catharine Furnace Company,” 24 August 1863, FRSP 7629, and “The Claim of the Catharine Furnace Company for the Value of Supplies Consumed by the Army,” 3 May 1864, FRSP 7630, Chancellorsville FRSP Archives; Evelina Wellford to Frances Ellen Jones, 15 May 1863, BV 135, FRSP Bound Volume Collection.

the Wilderness Campaign with the terse notation of “burned by the enemy” in a report of 21 November 1864.<sup>19</sup>

In the early weeks of 1865, the Confederate Mining and Nitre Bureau took note of Catharine Furnace’s destruction in a rather somber report to President Jefferson Davis from 31 January 1865. The entry, “Destroyed by enemy but rebuilt,” offers at least some indication that Catharine Furnace was operating at some point in 1865, most likely with a hastily built smaller stack about a half mile from the original furnace. As Figure 5.1 demonstrates, the firm was still hiring slaves as recently as 1 January 1865, albeit at the inflationary rate of \$600 per year. The preprinted form, moreover, suggests that the company expected to make a number of these hires. Without complete account books of this period, it is difficult to ascertain how many laborers Catharine Furnace had working at the site. Figure 5.1 suggests not only that the company was alive after its destruction during the Battle of the Wilderness, but also that it remained wedded to the hiring of slaves, even when that institution seemed in its death throes throughout the shrinking Confederacy. As late as 25 August 1865, the company still paid the former owner of “Servant George” the small sum of \$2.50 for his hire that year. The actual financial health of the company, indeed of all iron firms dealing with the Confederate War Department, is difficult to ascertain because of rampant inflation. By 1865, the Mining and Nitre Bureau reported that Virginia ironmasters paid \$3 a pound for meat, \$12 a bushel for corn, and \$400 to hire slaves. Government officials were willing to pay \$350 for a ton of iron on contract, but little pig iron could be secured by late 1864. In the Valley, for example, Buffalo Forge’s supply of pig iron could secure only thirty tons as early as March 1864 and raw materials became so scarce that the open market price for the forge’s bar iron reached \$2,240 per ton. By late 1864 and early into 1865, then, the actual value of iron is difficult to ascertain because of the problems with runaway inflation. If Catharine Furnace was restarting operations, it did so in the context of the Confederacy’s fading wartime command economy, where cash and credit transactions were little more than a formality with little stability or credibility.<sup>20</sup>

With the capture of Richmond and surrender of Lee’s Army of Northern Virginia in April 1865, the concern over inflation was rectified, albeit with grave implications for the Confederacy. The Catharine Furnace Company did not survive long after the fall of the Confederacy. Although Charles Wellford provided the genealogical link between his brother’s endeavor and the wartime manifestation of the company, J. Warren Slaughter assumed the leadership role by the end of the Civil War. Slaughter lived to only 1866, but he oversaw the company’s transition from Confederate contractor to independent producer of iron. The incorporators did not seem too bullish on the company’s future prospects, as they authorized

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<sup>19</sup> “Notes on the Annual Meeting of the Catharine Furnace Company,” 9 February 1864, FRSP 7647, Chancellorsville FRSP Archives; US War Department, *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies*, ser. 1, vol. 36, part 1 (Washington: Government Printing Office, 1891), 815-17, *Ibid.*, ser. 4, vol. 3, part 1, 832; Asa B. Isham, “Through the Wilderness to Richmond,” from *Sketches of War History, 1861-1865. Papers Read Before the Ohio Commandery of the Military Order of the Loyal Legion of the United States, 1883-1886*, vol. 1 (Cincinnati: Robert Clarke & Co., 1888), 200, BV 054; William D. Landon, “Letters to ‘Friend Green,’” *Indiana Magazine of History* 34 (March 1938): 93, BV 452, FRSP Bound Volume Collection.

<sup>20</sup> Nitre and Mining Bureau, *Message of the President*, Feb. 15, 1865, Virginia Historical Society, 4, 13; Northington, Jr., “The Revival of the Iron Industry in Eastern Virginia,” 79-80; “Receipt for Hire of Servant George,” 25 August 1865, FRSP 7649, Chancellorsville FRSP Archives; Dew, *Buffalo Forge*, 330-31.

an agent to sell Catharine furnace for \$30,000 cash in the summer of 1865. Despite being on the selling block, this brief phase of the company's history was not without small success. In late August of 1865, Slaughter shipped 100 tons of iron to be retailed by the Philadelphia iron and coal dealers, Cabeen & Company. By September, Cabeen & Company sold a little more than fifty-five tons of the iron at \$50 a ton, netting the Catharine Furnace Company revenues of \$2,596.66. The circumstances of the sale suggest that it was more of a dump of remaining inventory than an attempt to revive the furnace's fortunes in a postwar economy. The authorization of Slaughter to sell off the company's land at \$6 an acre on 26 October 1865 indicates that the incorporators saw little reason to invest heavily in the company's prospects in northern markets. Thus the Civil War career of Catharine Furnace came to a close.<sup>21</sup>

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<sup>21</sup> "Agreement Between Catharine Furnace Company and George Miner," 5 July 1865, FRSP 7666; "Bill of Shipping," 21 August 1865, FRSP 7648; "Statement of Sale of Pig Iron from Cabeen & Company," 25 October 1865, FRSP 7662; "Notes of an Annual Meeting of the Catharine Furnace Company," 26 October 1865, FRSP 7664, Chancellorsville FRSP Archives.



## EPILOGUE

### REMEMBERING CATHARINE FURNACE

In 1936, Oscar F. Northington published the first major study of Catharine Furnace in the *William and Mary Quarterly*. As a junior historian at the Fredericksburg and Spotsylvania National Military Park, Northington wrote with personal familiarity of his subject. He had been involved in the archeological excavations at the Catharine Furnace site in the fall of 1935, which explored not only the “very obvious ruins of the furnace stack” but also uncovered several foundations of the supporting buildings. Artists created a conjectural image of the complex (see Figure 3.2) based on those explorations, thus reconstructing the very image of Catharine Furnace. Northington also interviewed several living members of John Spotswood Wellford’s family, who knew very little about Catharine Furnace, as well as some local residents who provided a skillet and some andirons made there. His portrait of the antebellum and wartime furnace draws upon both these new sources, as well as traditional ones, to provide a rich account of the operation.<sup>1</sup>

On the one hand, Northington delivered a sympathetic account of Catharine Furnace’s attempts to reach northern markets and its ultimate reliance upon government contracts to stay in blast. On the other hand, he ends the article with a negative assessment of the endeavor. After explaining how the Catharine Furnace Company fizzled out in the post-war period, Northington calls the hasty rebuilding of a furnace “the anti-climax of the Company’s history.”

“Their efforts met with little success,” Northington continued, “and the venture is recalled to the reader solely for the sake of presenting a complete story which illustrates the futility of forcing an industrial issue where economic factors are so naturally unfavorable.” The pointlessness of the post-war operations at Catharine Furnace might be obvious; the idea, however, that conditions were “naturally unfavorable” does not hold weight given what we now know about the antebellum and wartime context of Catharine Furnace. If anything made the conditions of this operation unfavorable, those circumstances were manmade.<sup>2</sup>

Indeed, the natural situation of Catharine Furnace and its antecedents formed its main advantage to generations of Virginians. From Alexander Spotswood to John Spotswood Wellford through Charles Wellford, the easy availability of iron ore coupled with the uninhabited “Wilderness” offered the rich materials needed for ironmaking. What else could one do with “poison lands” that seemed, as early as the 1730s, unsuitable for agricultural cultivation? If Catharine Furnace offers a legacy to historians, it is one of the failure of Virginia to live up to its industrial potential. As the proprietors of Tubal Furnace and Catharine Furnace both knew,

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<sup>1</sup> Northington, Jr., “The Revival of the Iron Industry in Eastern Virginia as Exemplified by the History of the Catharine Furnace in Spotsylvania County,” 71-80; Northington, Jr., and Barnette, “Results of the Exploration Excavations at the Catharine Furnace Located on Furnace Road Near Fredericksburg, Virginia” pp. 1, 6-7.

<sup>2</sup> Northington, Jr., “Revival of the Iron Industry in Eastern Virginia,” 79-80.

ironmasters could make their product with slave labor just as easily, and maybe even more cheaply, than their northern competitors. So long as they had an outlet to market and local customers to support their business, the Virginia charcoal iron industry appeared on the verge of great success in the 1830s. As John Spotswood Wellford discovered, however, there was not a local market for his iron nor would it serve well in urban markets of the North. Federal, then Confederate, authorities afforded some profitability to Catharine Furnace. When those sources of business dried up, though, so did ironmaking in Spotsylvania County. But the iron ore still seemed rich, and the trees still produced charcoal long after Catharine Furnace's blast went cold.

In fact, if there was an ultimate reason for the end of all three phases—colonial, antebellum, and wartime—of ironmaking in Spotsylvania County, it was death, not nature, that provided it. When Alexander Spotswood died, his impressive iron plantation faded away with him. John Spotswood Wellford's federal contacts were not the only thing that ended with his passing; the will and desire to keep Catharine Furnace going seemed to perish with him. Finally, the death of the Confederacy and its lucrative contracts for pig iron spelled doom for the final manifestation of Catharine Furnace. These manmade circumstances, not any inherent economic or technological disadvantage, undermined the persistent attempts to cultivate Spotsylvania County's ironmaking potential.

So why blame this failure on natural circumstances? Perhaps Northington was misled by the unsuccessful attempts to revive the iron industry in the area. In 1883 Fredericksburg's *Virginia Star* mentioned that Catharine Furnace would again "melt iron ore, which is abundant in the vicinity, for the purpose of making steel ingots." This venture, called the Marysville Bloomery, was to open in the summer of 1884, and the editors predicted that it would "give employment to quite a number of persons" and wished it great success. It seems, however, that the Marysville Bloomery never quite got off the ground. Little mention of it appears in the usual industrial and business directories of Virginia save the mention of its rich resources. Samples of iron ore from the land of the Marysville Bloomery were sent to an industrial exposition in New Orleans to highlight Spotsylvania County's natural resources. It is telling, however, that the only finished piece of iron sent to New Orleans was a sample of pig iron from the "old 'Catherine' furnace." Two decades after the last Wellford made iron in Spotsylvania County, Catharine Furnace was still shipping pig iron.<sup>3</sup>

As Catharine Furnace moved from the best hope of Spotsylvania County's iron-making potential to a significant military landmark, the memory of the industrial community that lived and labored in its shadow faded. Unfortunately, many of their experiences will be forever obscured to history. With time and effort, though, perhaps telling the many stories of Catharine Furnace will help the furnace assume its place in history.

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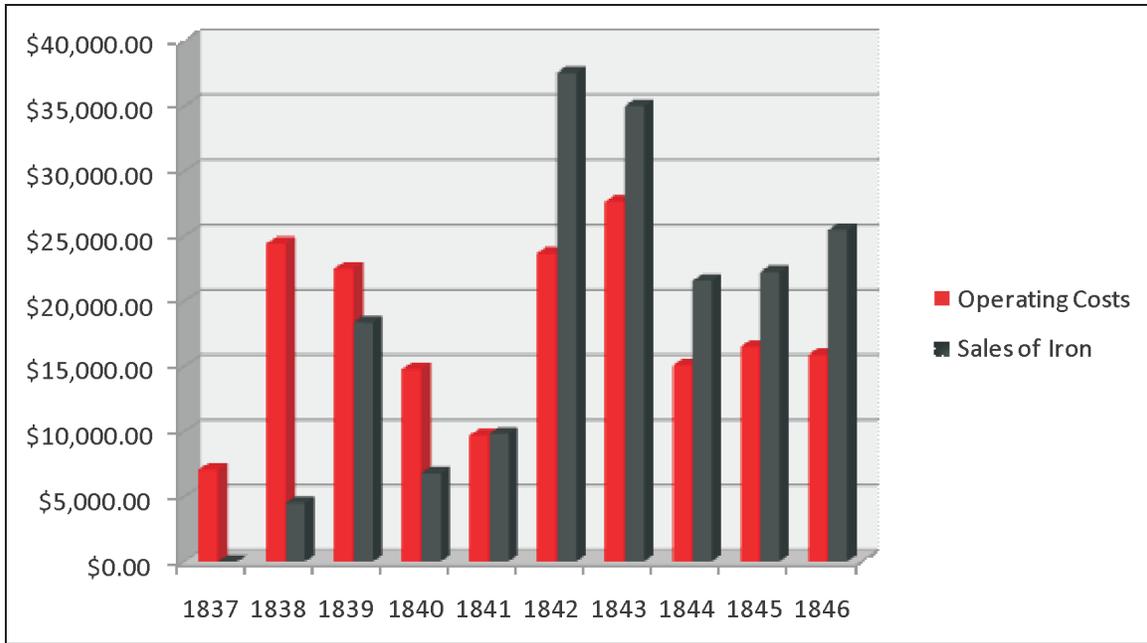
<sup>3</sup> *Virginia Star* (Fredericksburg, VA), 5 May 1883, 26 January 1884; Harrison, *Hand-Book of Virginia*, 83.

APPENDIX A

FIGURES

To Amount Brought Forward			\$ 43
Ed Jacob. Grotr. pr bill and receipt	110	217	69
John Adlow - " " "	111		
Wm B. Roe pr 16 Rhdo Shells	112		
Johnson and Timberlake pr tables	113		
John Coakley pr books	114		
Robert Siskey pr buckets	115		
Tunpike Bill for February	116	162	87
Ramsay pr Shells - - - - -	117	375	84
R. Walker pr 6 chairs pr bill and receipt	118		
Jacob Herndon. Bill of Plank	119		
Tunpike Bill for March	120		
Buck's Bill of Mathias, Bedstead	121		
		15	July
		127	91

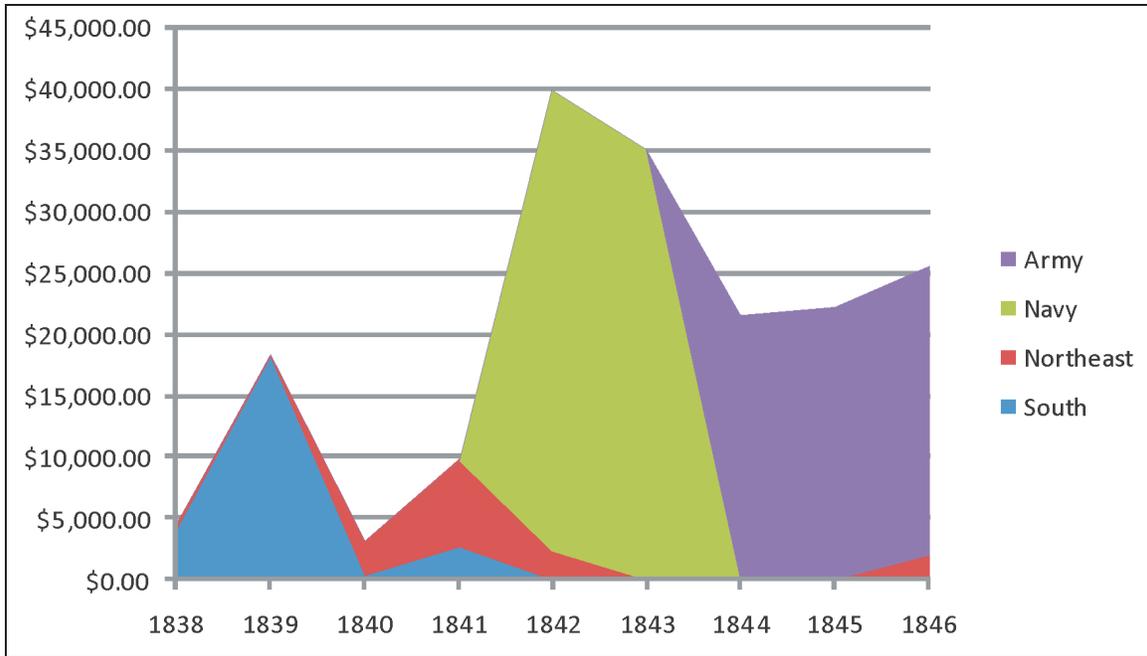
Figure 2.1. Typical Page in John Wellford's Catharine Furnace Account Book  
 Source: Fredericksburg Area Museum and Cultural Center (FAMCC)



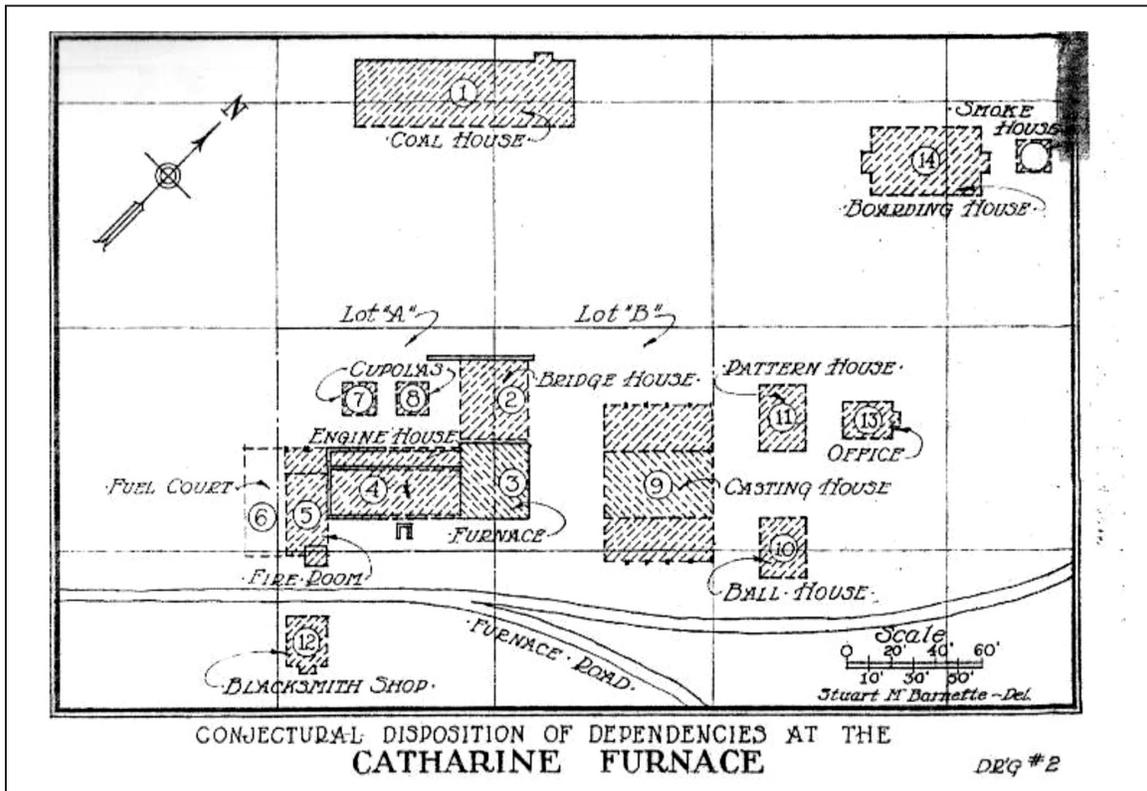
**Figure 2.2.** Estimates of Operating Costs and Sales at Catharine Furnace, 1837-1846  
 Source: *Catharine Furnace Account Book, FAMCC.*

	Amount Received	Estimated Value
22 June 1842	5,250	\$5,040.00
22 June 1842	2,623	\$2,518.08
18 July 1842	3,507	\$3,366.72
4 August 1842	1,692	\$1,624.32
20 August 1842	2,227	\$2,137.92
8 September 1842	2,102	\$2,017.92
22 September 1842	1,401	\$1,344.96
3 October 1842	1,874	\$1,799.04
3 November 1842	3,500	\$3,360.00
<b>Total</b>	<b>24,176</b>	<b>\$23,208.96</b>

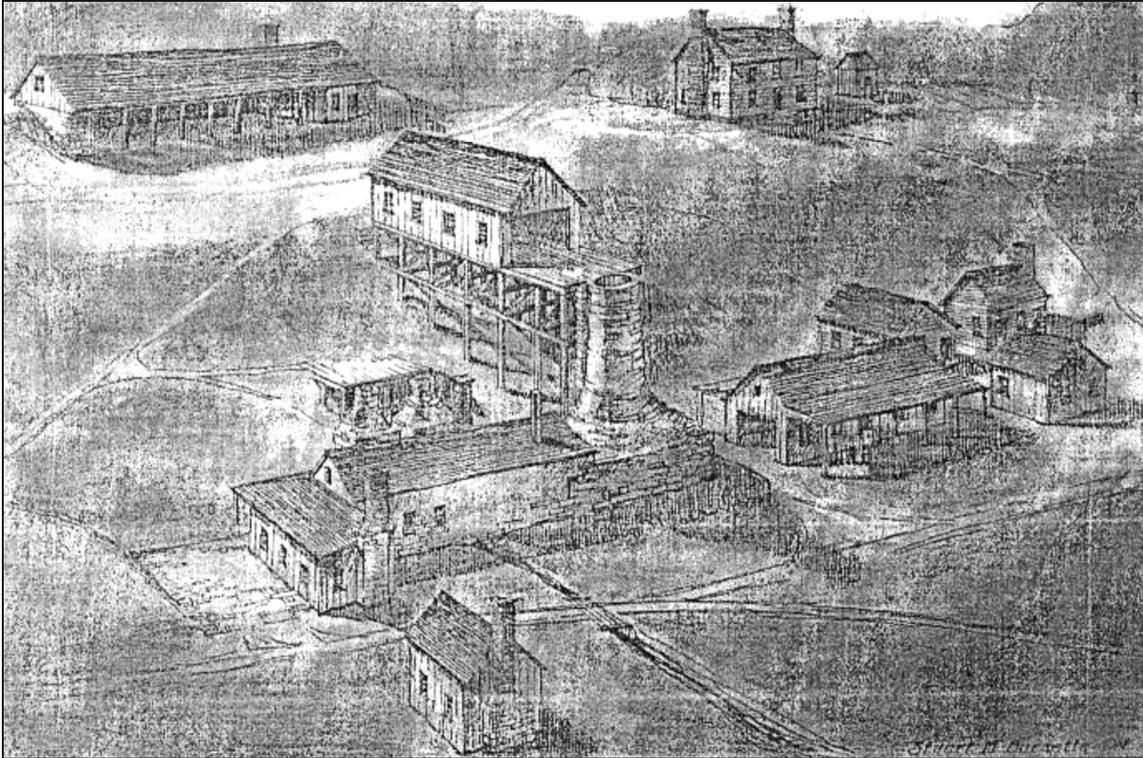
**Figure 2.3.** 32-lb. Solid Shot Shipped to Gosport Naval Yard from Catharine Furnace, 1842



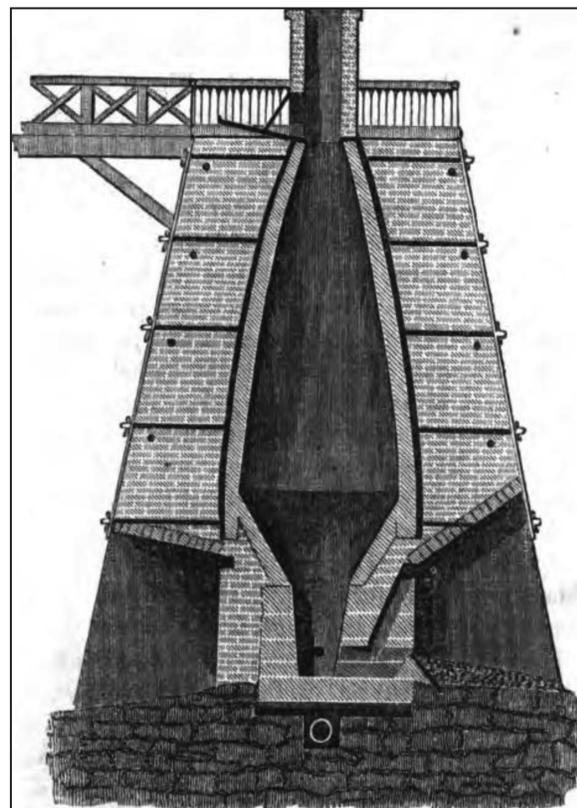
**Figure 2.4.** Receipts of Iron Sales at Catharine Furnace by Location  
 Note: "Northeast" includes Boston, New York, Providence, RI, and Portland, ME; "South" includes Richmond and Fredericksburg, VA, Charleston, SC, and Washington, DC.  
 Source: *Catharine Furnace Account Book, FAMCC, pp. 27-30, 57-58, 61, 63, 71.*



**Figure 3.1.** Conjectural Ground Plan of the Catharine Furnace Complex  
 Source: FRSP



**Figure 3.2.** Conjectural View of Catharine Furnace  
Source: FRSP



**Figure 3.3.** Cross-Section of a Typical Antebellum Charcoal Blast Furnace  
Source: Frederick Overman, *The Manufacture of Iron in All its Various Branches* (Philadelphia: Henry C. Baird, 1854), 152.

	Revenues	Temin Price	Wellford Price	Wellford Est.	Temin Est.	Amt. Carted
1838	\$4,501.91					328.5
1839	\$18,376.00		29.5	623		557
1840	\$6,775.68	32.75	30	226	207	315
1841	\$9,805.99	28.50	26.33	372	344	351

**Figure 3.4.** Pig Iron Production Estimates at Catharine Furnace, 1838-1841

Source: *Catharine Furnace Account Book*; Temin, *Iron and Steel in Nineteenth-Century America*, 283.

Note: Temin price estimates are for charcoal pig iron purchased at Philadelphia, 1840-41.

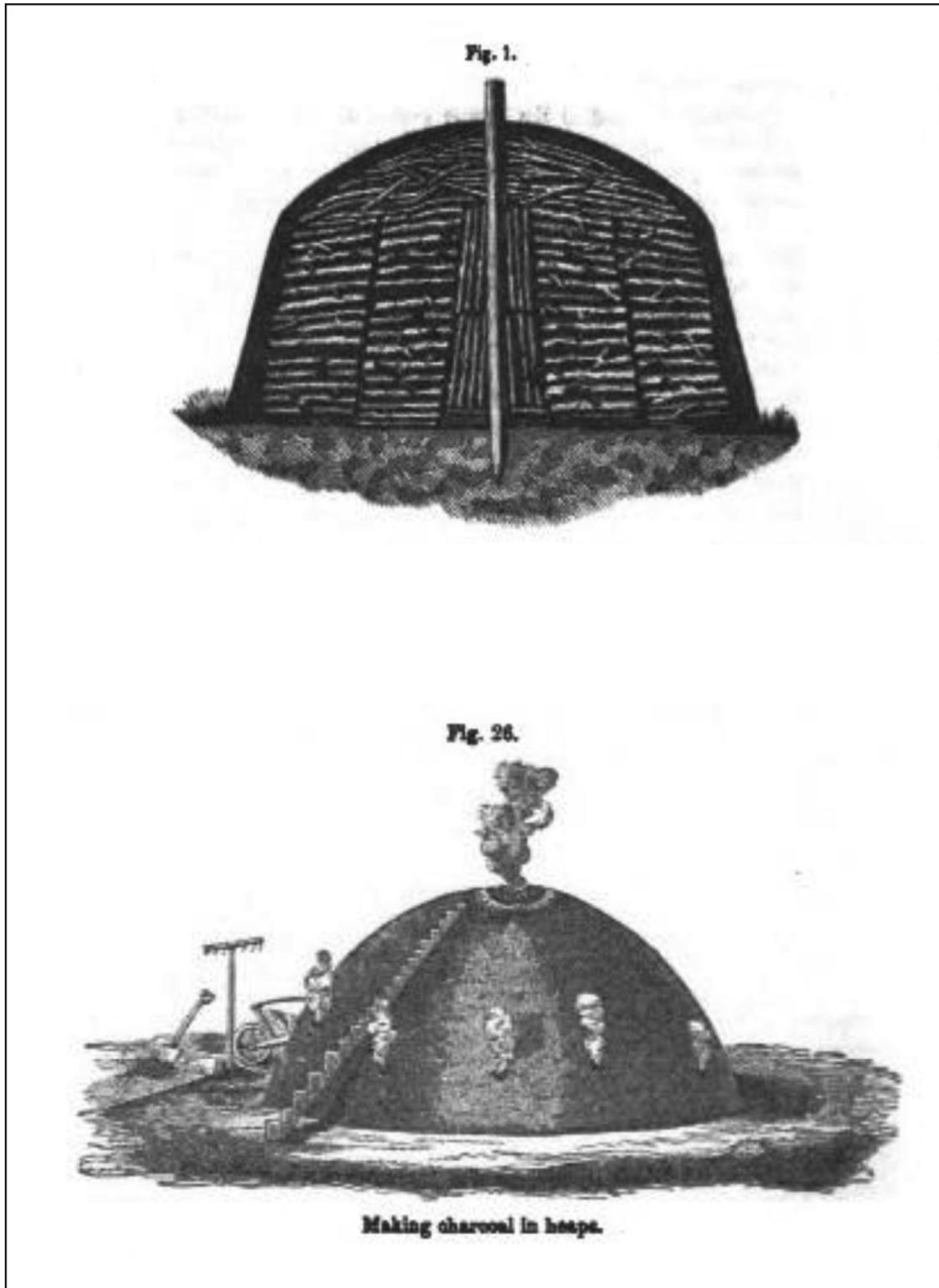
Year	Full and Partial Hires	John Wellford County Tax	Total Estimate	Hiring Cost	Pct. of Operating Cost
1837	48	19	67	\$4,214.00	59.9%
1838	85	15	100	\$6,925.40	28.3%
1839	30	15	45	\$1,776.46	7.9%
1840	72	0 <sup>4</sup>	72	\$5,844.16	40.3%
1841	28	15	43	\$1,713.75	17.7%
1842	80	17	97	\$5,397.61	22.8%
1843	77	22	99	\$4,356.88	15.8%
1844	33	No entry <sup>5</sup>	33	\$1,642.50	10.9%
1845	57	21	78	\$2,973.37	18.0%
1846	52	13	65	\$3,281.50	20.1%

**Figure 4.1.** Slave Hiring at Catharine Furnace, 1837-46

Sources: *Catharine Furnace Account Book*, FAMCC; *Spotsylvania County Personal Tax Records, 1837-1846*, Library of Virginia, Richmond, VA.

<sup>4</sup> No separate account of Wellford's slaves in this year. John Wellford "and others" show up as having paid tax on 75 slaves over the age of 12.

<sup>5</sup> John Wellford does not show up at all in the Spotsylvania County personal tax rolls for 1844.



**Figure 4.2.** Cross-Section and Frontal View of Charcoal Pile  
Sources: *F. Knapp, Chemical Technology; or, Chemistry, Applied to the Arts and to Manufactures, vol. 1 (Philadelphia: Lea and Blanchard, 1848), 54; Overman, The Manufacture of Iron in All its Various Branches, 106.*

*766*  
On or before the 1st January, 1866, the CATHARINE FURNACE COMPANY  
promise to pay (quarterly, at the office of the Company at the Furnace,) to  
*Mrs. Mary S. Pordell* or her assigns,  
*Six Hundred* Dollars, for the  
hire of Negro Man *Madison* for the year 1865. Said  
Negro to be furnished with the customary clothing. Witness the signature of the  
President, this first day of January, 1865.  
*Stann Slaughter*  
President Catharine Furnace Co.

**Figure 5.1.** Catharine Furnace Slave Hire Note, 1865  
Source: FRSP 7656, Chancellorsville Battlefield Visitors Center, FRSP.



## APPENDIX B

### TIMELINE OF IMPORTANT EVENTS

- 1621-22 John Berkeley builds first iron furnace in Virginia.
- 1710 Alexander Spotswood begins service as Lieutenant Governor of Virginia.
- 1711 Governor Spotswood writes for help from England to establish ironworks in Virginia.
- 1712 Governor Spotswood agrees to relocate Palatinate Germans to interior of Virginia to establish ironmaking settlement.
- 1714 Germanna founded on the Rapidan River.
- 1716 Governor Spotswood acquires Germanna Tract.
- 1719 Wilderness Tract created in Virginia.  
Governor Spotswood acquires Mine, Wilderness, and Massaponex tracts.
- 1721 Spotsylvania County organized within Colony of Virginia.
- 1722 Alexander Spotswood steps down as Lieutenant Governor of Virginia.
- 1723 Tubal Furnace constructed.
- 1724 Alexander Spotswood leaves Virginia.
- 1724-26 Tobacco production doubles in Spotsylvania County.
- 1732 William Byrd describes Alexander Spotswood's ironworks.
- 1739 Alexander Spotswood advertises Tubal Furnace and 23,000 acres for lease.
- 1740 Alexander Spotswood dies.
- 1750 Tubal Furnace ships 410 tons of pig iron to England.

*Timeline of Important Events*

- 1777 James Hunter seeks assistance from Virginia to expand Rappahannock Forge and reopen Accokeek Furnace.
- 1779 Virginia Legislature endorses Hunter's expansion of ironmaking capacity.
- 1781 Robert Wellford settles in Fredericksburg, Virginia.
- 1782 James Hunter closes Rappahannock Forge.
- 1783 John Spotswood Wellford (JSW) born in Fredericksburg.
- 1800 JSW moves to Southwestern Virginia to learn salt-making.
- 1803 JSW acts as second in famous duel between William Thornton and Francis Fitzhugh Conway.
- 1807 JSW marries Francis Page Nelson.
- 1811 Rappahannock Company commissioned to improve Rappahannock River.
- 1815 Francis Wellford dies.
- 1820 JSW marries Janet Henderson.
- 1823 JSW attempts to sell Spotsylvania County ore lands to Philadelphia merchant Samuel G. Wright.
- 1826 JSW joins Fredericksburg Auxiliary to American Colonization Society.  
Rappahannock Navigation Company receives first charter.
- 1827 JSW helps form the Fredericksburg Anti-Jackson Committee.
- 1831 JSW elected secretary and treasurer of the Fredericksburg and Potomac Company.
- 1834 Richmond, Fredericksburg, and Potomac Railroad Company (RF&P) chartered by Virginia Legislature.
- 1835 JSW appointed manager of Rappahannock and Blue Ridge Railroad.

*Timeline of Important Events*

- 1836 Virginia Legislature passes charter of the Fredericksburg Iron and Steel Manufacturing Company (FISMC).
- Fredericksburg residents petition Congress to make their town an official port of entry.
- 1837 Main furnace stack at Catharine Furnace completed.
- Tredegar Iron Company formed in Richmond, Virginia.
- RF&P connects Fredericksburg to Richmond.
- 1838 Catharine Furnace in blast for first time.
- 1839 Tredegar Company purchases more than 500 tons of iron from Catharine Furnace.
- 1840 David Thomas uses anthracite coal in iron blast furnace for first time in Pennsylvania.
- 1841 JSW controls majority of shares in the FISMC.
- JSW signs contract with U.S. Navy for 70,000 rounds of 32-lb. shot.
- 1842 Francis Deane resigns from Tredegar Company.
- 1843 JSW signs contract with U.S. Navy for 70,000 rounds of 32-lb. shot.
- 1844 JSW loses U.S. Navy contract for producing shot and shell.
- JSW signs contract with U.S. Army for manufacture of artillery shells and solid shot worth \$24,428.27.
- 1845 JSW signs several small ordnance contracts with U.S. Army.
- 1846 JSW owns controlling shares in FISMC outright.
- U.S. Navy sends contract to JSW for shot and shells.
- Congress reduces tariff on iron to below protective levels.
- JSW dies.

*Timeline of Important Events*

- 1847 Edward Carmichael attempts to take over Navy contract for shot and shells from JSW estate.
- Catharine Furnace property put up for sale.
- 1854 Frederick Overton publishes *The Manufacture of Iron in All Its Various Branches*.
- 1859 J.P. Lesley describes Catharine Furnace as “abandoned” in *The Iron Manufacturers’ Guide to the Furnaces, Forges, and Rolling Mills of the United States*.
- 1861 Charles C. Wellford writes to Francis Deane about reopening Catharine Furnace.
- Group of five investors purchase Catharine Furnace property from William Wellford.
- 1862 George Scott and Charles Wellford receive contract with Confederate Navy for 2,000 tons of pig iron.
- Virginia Senate considers bill to incorporate Catharine Furnace Company (CFC).
- Catharine Furnace in blast after fifteen years.
- Battle of Fredericksburg.
- 1863 Catharine Furnace Company charter goes into effect.
- Battle of Chancellorsville washes over Catharine Furnace; Stonewall Jackson’s flanking maneuver passes by the furnace complex.
- CFC submits damage claim to Confederate officials for damage to Catharine Furnace during Chancellorsville campaign.
- 1864 Catharine Furnace back in blast.
- Union cavalry burns Catharine Furnace complex during the Battle of the Wilderness.
- 1865 Confederate Mining and Nitre Bureau reports Catharine Furnace destroyed.
- CFC dumps remaining iron inventory on market.
- Catharine Furnace property listed for sale.

*Timeline of Important Events*

- 1883      Fredericksburg *Virginia Star* announces reopening of Marysville Bloomery on site of Catharine Furnace.
- 1927      Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park created by act of U.S. Congress.
- 1933      National Park Service acquires park land from War Department.
- 1935      First major archaeological excavation at Catharine Furnace site.
- 1936      Oscar F. Northington publishes account of Catharine Furnace in the *William and Mary Quarterly*.
- 1977      Second major archaeological excavation at Catharine Furnace site.
- 2002      Third major archaeological excavation at Catharine Furnace site.



## APPENDIX C

### SELECTED ANNOTATED BIBLIOGRAPHY

#### MANUSCRIPT COLLECTIONS

**Catharine Furnace Account Book.** Fredericksburg Area Museum and Cultural Center, Fredericksburg, VA.

This extensive ledger contains entries for nearly every facet of Catharine Furnace's operation from 1837 to 1847. It includes expenses, the names of hired slaves and free workers, as well as very raw sales and shipping data. Organized chronologically.

**Chancellorsville Battle Visitor Center Archives.** Fredericksburg and Spotsylvania National Military Park, Chancellorsville, VA.

A miscellaneous collection of letters, legal documents, and forms that document the history of Catharine Furnace. This collection is particularly strong on the wartime manifestation of the furnace.

**Fredericksburg City Personal Property Tax Records (1833-1848).** Library of Virginia, Richmond, VA.

Tax rolls for Virginia's personal property tax that provide data on various items such as watches, horses, clocks, and silver plate among the Wellford Family. The most important data extracted from this collection are the numbers of slaves owned each year.

**Fredericksburg and Spotsylvania National Military Park Bound Collection.** Fredericksburg and Spotsylvania National Military Park Archives, Fredericksburg, VA.

This massive collection contains transcripts and reproductions of primary sources regarding the Fredericksburg, Chancellorsville, and Wilderness campaigns. The reproductions are kept in bound volumes organized by date and subject. Although the strength of this collection is military history, a wide variety of sources can be found here.

**Preston Family Papers.** Virginia Historical Society, Richmond, VA

Contains letter from Dr. Robert Wellford to General John Preston on 12 May 1800 giving an early description of young John Spotswood Wellford as he is being sent out to western Virginia to learn salt-making.

**Records of the Bureau of Ordnance.** RG 74, National Archives, Washington, DC

Contains letters detailing the delivery, receipt, and inspection of shot and shell from Catharine Furnace to the Gosport Naval Yard in Norfolk, Virginia. This RG also includes miscellaneous correspondence and copies of the actual contracts between Wellford and U.S. Navy officials.

Records Collection of the Office of Naval Records and Library. RG 45, National Archives, Washington, DC

Contains a military contract from 1841 between John Spotswood Wellford and the U.S. Navy for \$67,200 worth of 32-lb. solid shot.

Reneau Manuscripts. Fredericksburg and Spotsylvania National Military Park, Fredericksburg, VA

This is a collection of letters and genealogical data held by Mrs. Tomi Reneau of Fredericksburg, who is a direct descendent of John Spotswood Wellford. The Fredericksburg and Spotsylvania National Military Park holds photocopies of these valuable documents, which range mostly from the late antebellum period to the Civil War. This is an invaluable primary source on the personal history of the Wellford family.

John M. Sherrard Papers. Southern Collection, University of North Carolina-Chapel Hill, Chapel Hill, NC

Contains a series of letters from Samuel and John B. Sherrard to their father, John M. Sherrard. Samuel ran the Bath Iron Works in Rockbridge County and his brother, John, worked the Etna Iron Works in Botetourt County. They both invested thousands of dollars in the ventures and complained constantly about the hardships of making iron in Virginia during the late 1840s.

Spotsylvania County Personal Tax Records (1837-1849). Library of Virginia, Richmond, VA

Lists the taxes paid by individuals and corporations on slaves and horses. In listing slaves, the tax rolls differentiate between slaves below 12 years of age, between 12 and 16 years, and 16 and older.

Spotsylvania Land Tax Rolls 1836. Library of Virginia, Richmond, VA

Lists the taxes paid by individuals owning land in Spotsylvania County. John Wellford's entry lists 1,357 acres 14 miles northeast of Spotsylvania Courthouse.

Tredegear Iron Works Business Records. Library of Virginia, Richmond, VA

Contains correspondence between Tredegear officials and Fredericksburg iron-makers and manufacturers during the 1840s. Includes Joseph Reid Anderson's 1841 request that Wellford act as an agent for selling Tredegear iron in Fredericksburg.

William Weaver Papers. Duke University Library, Durham, NC

Weaver was an ironmaker from Rockbridge County, Virginia, most notable in Charles Dew's Buffalo Forge. The correspondence in this collection gives a sense of the market conditions, slave-hiring practices, and technical challenges of ironmaking in a charcoal furnace during the same time that Catharine Furnace appeared. Weaver operated in western Virginia, but many of the challenges he faced were shared by John Spotswood Wellford.

Wellford Family Papers. Virginia Historical Society, Richmond, VA

Contains an 1838 letter from Charles Carter Wellford to Beverly Wellford describing the market conditions in New York City. Also mentions that he is having iron from Catharine Furnace tested in town.

Wright Family Papers. Hagley Museum and Library, Greenville, DE

Contains a series of letters in the 1820s from John Spotswood Wellford to Samuel Wright, a Philadelphia merchant, about investing in Spotsylvania County ore lands.

SELECTED NEWSPAPERS AND PERIODICALS

*African Repository and Colonial Journal* (Washington, DC)

*The American Farmer* (Baltimore, MD)

*The Democratic Recorder* (Fredericksburg, VA)

*The Political Arena* (Fredericksburg, VA)

*United States Telegraph* (Washington, DC)

*Virginia Star* (Fredericksburg, VA)

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Alexander, J.H. *Report on the Manufacture of Iron; Addressed to the Governor of Maryland. Annapolis: William McNeir, 1840.*

A report from Maryland's state topographical engineer sent to study ironworks in Great Britain and compare them to American ones. Most useful in its discussion of the American reliance upon charcoal fuel and the British use of coal fuel in smelting iron.

Beverley, Robert. *The History of Virginia in Four Parts*. Edited by Charles Campbell. Richmond, VA: J.W. Randolph, 1855.

An early account of Virginia's landscape that emphasizes the lush foliage that covered the inland regions and the variety of huge trees that existed prior to European settlement.

Byrd, William. *The Writings of Colonel William Byrd of Westover in Virginia, Esquire*. Edited by John Spencer Bassett. New York: Doubleday, Page & Co., 1901.

A reprint of William Byrd's voluminous writings that includes, most significantly, the narrative account of Byrd's visit to Spotswood's ironworks in 1732 entitled, "A Progress to the Mines."

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Lists military contracts and assesses the state of the southern iron industry at a very late time in the Confederacy's history. Notes that Catharine Furnace is being rebuilt after its destruction in 1864.

French, B.F. *History of the Rise and Progress of the Iron Trade of the United States, From 1621 to 1857*. New York: Wiley & Halstead, 1858.

One of the earliest histories of iron and steel in the United States, French details the early Virginia charcoal iron boom and explains why the industry there was in decline by the late 1850s.

Geier, Clarence R., and Kimberly D. Sancomb. *An Archeological Survey of Selected Sections and Sites on the Chancellorsville Battlefield*. Part II: "The Demon of Destruction was Floundering and Belching Out Tongues and Volumes of Flames in the Murky Depths Below": The Catharine Furnace Project Area, January 2003." Mss. report. Fredericksburg and Spotsylvania National Military Park, Fredericksburg, VA.

This is a very thorough archaeological report that includes detailed maps and descriptions of the extent, structures, and locations of the Catharine Furnace complex. Very useful in reconstructing the physical contours of the operation.

Gruber, Jacob. "A Report on the Excavations at Catharine Furnace in the Fredericksburg National Military Park, March 5-12, 1977." Mss. report. Fredericksburg and Spotsylvania National Military Park, Fredericksburg, VA.

The findings from a brief archaeological dig in 1977 that offers estimates on the size of the original Catharine Furnace complex, as well as some very good perspective on the size and scope of the operation.

Harrison, Randolph. *Hand-Book of Virginia*. Richmond: Johns & Goolsby, 1885.

This collection of facts on Virginia's economic resources very briefly mentions the iron ore in the Catharine Furnace area.

Jones, Hugh. *The Present State of Virginia*. London: J. Clarke, 1724.

An early guidebook to Virginia that highlights the various economic resources of the colony. Mentions Spotswood's iron furnace and predicts that it will be a great success.

Knapp, F. *Chemical Technology; or, Chemistry Applied to the Arts and to Manufactures*. Vol. 1. Philadelphia: Lea and Blanchard, 1848.

A guidebook to several industrial techniques in the antebellum period. Most useful in its detailed description of charcoaling.

*Laws of Virginia*, 1836-37; 1863.

These session laws of Virginia contain the charters of the Fredericksburg Iron and Steel Manufacturing Company and the Catharine Furnace Company.

Lesley, J.P. *The Iron Manufacturers' Guide to the Furnaces, Forges, and Rolling Mills of the United States*. New York: John Wiley, 1859.

This comprehensive guidebook to ironworks both past and present includes a brief entry on Catharine Furnace, in which it is described as "abandoned."

Martin, Joseph, and William Henry Brockenbrough. *A New and Comprehensive Gazetteer of Virginia, and the District of Columbia*. Charlottesville, VA: Joseph Martin, 1835.

Contemporary business and travel guide that gives a brief portrait of the “prosperous port” of Fredericksburg and lists various resources of the community.

*Memorial of the Coal Owners and Iron Masters of Virginia to Congress, January 1847*. Richmond, VA: n.p., 1847.

A pamphlet reproduction of a petition sent to Washington in favor of protective tariffs for iron. Virginia charcoal ironmakers, in particular, blamed low duties for the decline of their trade.

Northington, O.F., and Stuart M. Barnette “Results of the Exploration Excavations at the Catharine Furnace Located on Furnace Road Near Fredericksburg, Virginia.” Fredericksburg & Spotsylvania National Military Park. RG 79, National Archives at College Park, MD.

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Overman, Frederick. *The Manufacture of Iron in All its Various Branches*. Philadelphia: Henry C. Baird, 1854.

A guidebook for ironmakers that includes a comprehensive look at the design and techniques used in iron furnaces and forges. Analyzes the different strategies for making iron and includes helpful illustrations for furnaces, charcoal-making, and most aspects of the trade.

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*Review of the Testimony Given Before the General Court Martial Upon the Trial of Brig. General George Talcott, in June and July, 1851*. Albany, NY: Joel Munsell, 1851.

Contains testimony that reveals Edward Carmichael’s misconduct in dealing with various military contracts. Carmichael used the good reputation of Catharine Furnace to secure contracts, which he then tried to subcontract to other ironworks.

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Smith, John. *The Generall Historie of Virginia, New England & the Summer Isles*. Glasgow: Glasgow University Press, 1907 [1624].

One of the earliest descriptions of the Virginia landscape; emphasizes the thick forests and uncleared areas west of the Tidewater.

Spotswood, Alexander. *The Official Letters of Alexander Spotswood, Lieutenant-Governor of the Colony of Virginia, 1710-1722*. Edited by R.A. Brock. 2 vols. Richmond: Virginia Historical Society, 1882.

This collection of letters includes Governor Spotswood's various pleas for aid in constructing an ironworks in Virginia.

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A comparative study of the Virginia and Pennsylvania coal trade from the Early Republic through Reconstruction. Examines the impact of slavery upon industrial development in Virginia and demonstrates both the economic efficiencies and political limitations of Virginia's coal trade over that period.

[Bensel, Richard, *Yankee Leviathan*, MS page 15]

Bezís-Selfa, John. *Forging America: Ironworkers, Adventurers, and the Industrious Revolution*. Ithaca, NY: Cornell University Press, 2004.

Chronicles the struggle of iron "adventurers" in the colonial, Revolutionary, and Early Republic eras to secure workers at their furnaces and forges. Argues that the lines between "free" and "slave" labor often blurred as managers provided restrictions to the former and incentives for the latter throughout this period.

Bruce, Kathleen. *Virginia Iron Manufacture in the Slave Era*. New York: The Century Company, 1931.

A classic work of economic and political history that traces Virginia ironmakers from the Jamestown Colony through the end of the Civil War. Good narrative history, although mainly focuses on the Tredegar Works of Richmond, Virginia. The most thorough account of Virginia's early iron trade to date.

Cappon, Lester J. *Iron Works at Tuball*. Charlottesville: University of Virginia Press, 1945.

A combination of printed primary sources and an overview of Governor Alexander Spotswood's first ironworks in the Virginia colony.

Craven, Avery. *Soil Exhaustion as a Factor in the Agricultural History of Virginia and Maryland, 1606-1860*. Urbana: University of Illinois Press, 1926.

The classic work outlines the problems faced by eighteenth and nineteenth-century farmers in the Chesapeake. Lays most of the blame on the enervating effect of tobacco on the region's soil.

Dew, Charles. *Bond of Iron: Master and Slave at Buffalo Forge*. New York: W.W. Norton, 1994.

A detailed case study of an iron furnace and forge in the Valley of Virginia. Concentrates mostly on the career of William Weaver and the master-slave relationship that developed in that industrial setting.

———. *Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works*. New Haven: Yale University Press, 1966.

Still the classic work on JR Anderson and the fortunes of Tredegar during the Civil War. Dew rushes through the antebellum period a bit, but the material on Virginia's wartime iron industry is invaluable and a nice update of Kathleen Bruce's work on the subject.

Dodson, Leonidas. *Alexander Spotswood, Governor of Colonial Virginia, 1710-1722*. Philadelphia: University of Pennsylvania Press, 1932.

A traditional biography of Governor Spotswood that provides the basic narrative of his life and career in Virginia.

[Dunaway, Wayland, History of James River, MS page 62]

Eby, Jerrilyn. *Laying the Hoe: A Century of Iron Manufacturing in Stafford County*. Westminster, MD: Hermitage Books, 2003.

A rich local history that provides a great deal of detailed information on the attempt to revive ironmaking in eastern Virginia during the Revolutionary War.

[Escott, Paul, After Secession, MS page 14]

Felder, Paula. *Forgotten Companions: The First Settlers of Spotsylvania County and Fredericksburgh Town (With Notes on Early Land Use)*. Fredericksburg, VA: Historic Publications of Fredericksburg, 1982.

A dense and rich account of the early settlement of Spotsylvania County that provides critical data in terms of tobacco production and taxes; reproduces a number of vital primary sources within the text.

Fischer, David Hackett, and James C. Kelly. *Away I'm Bound Away. Virginia and the Westward Movement*. Richmond: Virginia Historical Society, 1993.

Studies the out-migration of significant numbers of Virginians to the American West during the antebellum decades and finds that soil exhaustion and limited economic prospects triggered much of the movement.

Goldfield, David. *Urban Growth in the Age of Sectionalism: Virginia, 1847-1861*. Baton Rouge: Louisiana State University Press, 1977.

Case study of antebellum Richmond that argues the city was on the verge of rapid growth by the time of the outbreak of the Civil War. Studies the impact of slavery on urban development.

[Gooch, Iron in Virginia, MS page 72]

[Goodrich, Carter, Government Promotion, MS page 13]

Gordon, Robert. *American Iron, 1607-1900*. Baltimore: The Johns Hopkins University Press, 1996.

A historical archaeologist's reconstruction of the colonial and nineteenth-century iron trade. Encyclopedic in coverage and provides excellent descriptions of the materials and techniques used by iron furnaces and forges throughout the period. Heavy emphasis on material culture and production process.

[Grizzard and Smith, Jamestown Colony, MS page 23]

[Hardy, Michael, The Thirty-Seventh North Carolina, MS page 127]

Harrison, Noel G. *Chancellorsville Battlefield Sites*. Lynchburg, VA: H.E. Howard, 1990.

A thorough cataloguing of the various historical locations on the Chancellorsville Battlefield. Invaluable in providing detailed background information on Catharine Furnace, the Wellford homestead, and various other significant antebellum and wartime locations.

Havighurst, Walter. *Alexander Spotswood: Portrait of a Governor*. Williamsburg, VA: Colonial Williamsburg, 1967.

Another rather traditional biography of Spotswood that provides a basic narrative of his life.

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Chronicles the ironmaking affairs of the Tayloe Family of Virginia, who operated furnaces over several generations in the Old Dominion.

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A sweeping work on the environmental history of the American South. Describes the ravages of cash crops such as tobacco and cotton on the fertility of the soil, the landscape, and the quality of life for southerners across two centuries.

Lewis, Ronald. *Coal, Iron, and Slaves: Industrial Slavery in Maryland and Virginia, 1715-1865*. Westport, CT: Greenwood Press, 1979.

Analyzes the use of slave laborers in eighteenth and nineteenth-century iron-works. Concludes that slave laborers could be employed profitably at furnaces, but that the network of incentives and restrictions placed limitations on their efficiency.

Lindstrom, Diane. *Economic Development in the Philadelphia Region, 1810-1850*. New York: Columbia University Press, 1978.

Case study of Philadelphia that makes strong case for significance of immediate hinterland in a city's economic development.

Majewski, John. *A House Dividing: Economic Development in Pennsylvania and Virginia Before the Civil War*. New York: Cambridge University Press, 2000.

Compares funding structures and popular enthusiasm for turnpikes, canals, and railroads in eastern Virginia and Pennsylvania. Argues that the paucity of urban capital ruined Virginia's attempt to build a strong statewide system of internal improvements.

—. *Modernizing a Slave Economy: The Economic Vision of the Confederate Nation*. Chapel Hill: University of North Carolina Press, 2009.

Looks at Confederate political economy to explain the strong presence of a national state during wartime. Argues that the South had always had a strong presence in economic affairs; the Civil War exacerbated that tendency.

Mathew, William M. *Edmund Ruffin and the Crisis of Slavery in the Old South. The Failure of Agricultural Reform*. Athens: University of Georgia Press, 1988.

Examines the career of political economist and agriculturalist Edmund Ruffin, who was the longtime editor of the *Farmers Register* and an advocate of slave-based agriculture. Ruffin championed the use of fertilizing manures and minerals to revitalize Virginia's tobacco-depleted soil.

[McCarty, Clara, Duels in Virginia, MS page 32]

Meyer, David R. *The Roots of American Industrialization*. Baltimore: The Johns Hopkins University Press, 2003.

Study of New England's industrial development that emphasizes the significance of a vibrant agricultural sector in developing manufacturing enterprises.

[Morgan, Chad, Planters' Progress, MS page 15]

Mulholland, James. *A History of Metals in Colonial America*. Tuscaloosa: University of Alabama Press, 1981.

A broad survey that attempts to provide a comprehensive account of ore mining, smelting, and metalworking in the American Colonies. Slights Spotswood's iron furnace by mentioning that it had no lasting legacy.

[Quinn, History of City of Fredericksburg, MS page 119]

[Rorabaugh, Alcoholic Republic, MS page 106]

Sears, Stephen W. *Chancellorsville*. Boston: Houghton Mifflin, 1996.

A very accessible account of the Battle of Chancellorsville in 1863. Well-written and compelling narrative.

Starobin, Robert. *Industrial Slavery in the Old South*. New York: Oxford University Press, 1970.

A comprehensive account of industrial slave labor in the antebellum South that includes fairly detailed accounts of slaves in ironmaking.

Stoll, Steven. *Larding the Lean Earth: Soil and Society in Nineteenth-Century America*. New York: Hill and Wang, 2002.

Provides an interesting historical perspective on the fertility of the soil during the Early Republic and the various political, social, and economic factors that led to its change in composition.

Swank, James. *The Manufacture of Iron in All Ages*. Philadelphia: The Iron and Steel Association, 1892.

One of the earliest comprehensive histories of the American iron industry. Contains a very brief section mentioning Virginia iron; more significant for mentioning the business environment of the early nineteenth century for ironmakers, attitudes towards tariffs, and other items of interest to the trade.

Temin, Peter. *Iron and Steel in Nineteenth-Century America: An Economic Inquiry*. Cambridge, MA: The MIT Press, 1964.

An econometric study of the American iron and steel industries. Focuses on cost inputs and changes in fuel technology as major factors in the efficiency of ironmaking. Voluminous charts, tables, and other quantitative data.

[Temin, Peter, *The Jacksonian Economy*, MS page 37]

[Thomas, Emory, *Confederacy*, MS page 14]

[Thornton, J. Mills, *Politics and Power*, MS page 13]

Walker, Joseph E. *Hopewell Village: A Social and Economic History of an Iron-Making Community*. Philadelphia: University of Pennsylvania Press, 1966.

A rather detailed community study of Hopewell Village, a nineteenth-century iron furnace community in Pennsylvania. Includes the social and cultural history of the area in an attempt to completely reconstruct what life was like in Hopewell Village. Very useful in understanding the day-to-day rhythms of ironmaking.

[Watson, Thomas, *Mineral Resources of Virginia*, MS page 74]

[Wilentz, Sean, *Rise of American Democracy*, MS page 37]

Williams, Michael. *Americans and Their Forests: A Historical Geography*. New York: Cambridge University Press, 1989.

The standard work of American forest history that touches upon Virginia's early settlement and its impact on the environment, albeit briefly.

[Wilson, Harold, *Confederate Industry*, MS page 15]

### *Dissertations*

Bradford, Samuel Sydney. "The Ante-Bellum Charcoal Iron Industry of Virginia." PhD thesis, Columbia University, 1958.

Provides a thorough account of the industry and argues that Virginia charcoal ironworks were at a disadvantage because they failed to implement new measures of iron-working, they had little tariff protection, and they had no transportation net that allowed them to compete with northern ironworks.

Crothers, A. Glenn. "The Projecting Spirit': Social, Economic, and Cultural Change in Post-Revolutionary Northern Virginia, 1780-1815." PhD thesis, University of Florida, 1998.

Examines the emerging commercial culture in northern Virginia and finds greater enthusiasm for internal improvements and manufactures than earlier studies of Virginia have portrayed.

Hunter, Robert F. "The Turnpike Movement in Virginia, 1816-1860." PhD thesis, Columbia University, 1957.

A comprehensive look at the Old Dominion's turnpike network. Emphasizes the stops and starts in internal improvements and the lack of an integrated statewide system.

Littlefield, Keith Edward. "Economic Challenge and Mercantile Enterprise in a Southern Urban System: A Case Study of Fredericksburg, Virginia, 1835-1880." PhD thesis, University of Maryland, 1999.

Looks at the economic development of Fredericksburg and makes an argument based on the failure of the town to develop ties with its "commercial hinterland." Instead, larger regional centers such as Richmond seemed to gain at Fredericksburg's expense during the nineteenth century.

Smith, James Larry. "Historical Geography of the Southern Charcoal Iron Industry, 1800-1860." PhD thesis, University of Tennessee, 1982.

Provides a geographical perspective on Virginia's charcoal iron trade. Stuffed with useful maps, charts, and tables on the economic history of ironmaking in the Old Dominion. Breaks down the industry by district and provides both quantitative and narrative evidence to look at how the industry was limited, not necessarily by slavery, but by other factors in terms of its impact on the national iron trade.



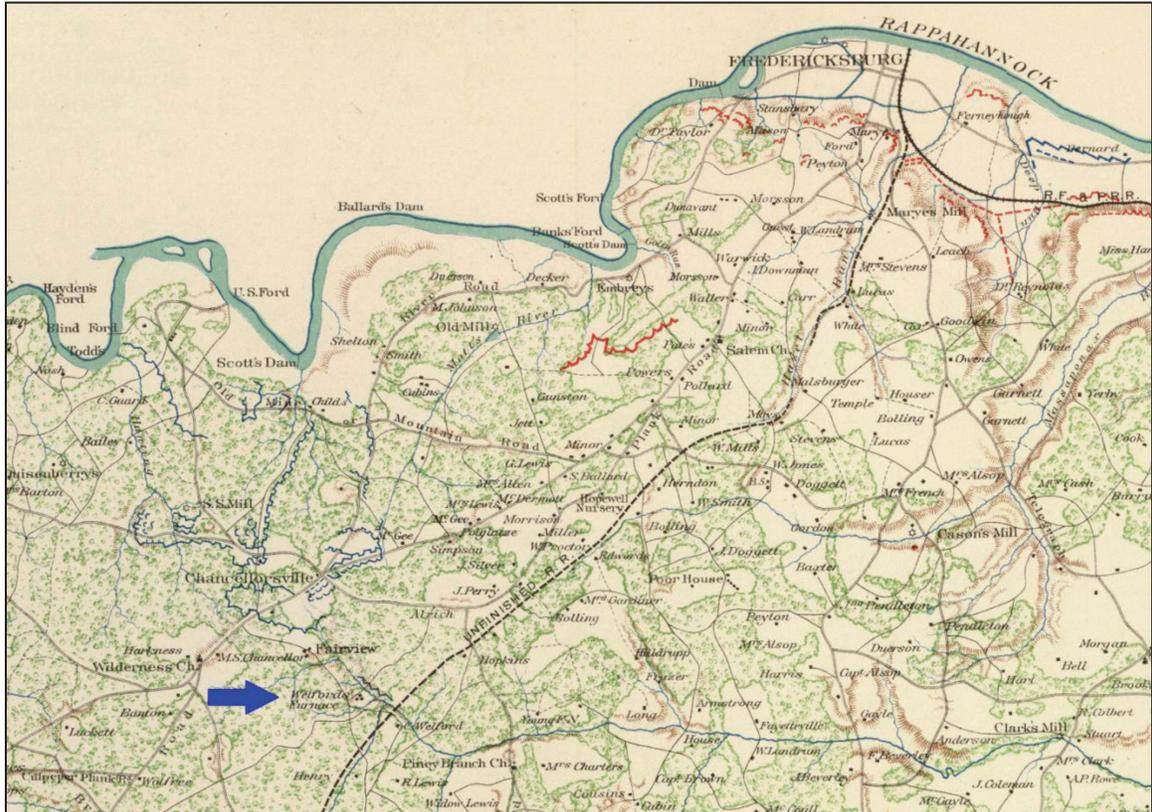
## APPENDIX D

### MAPS

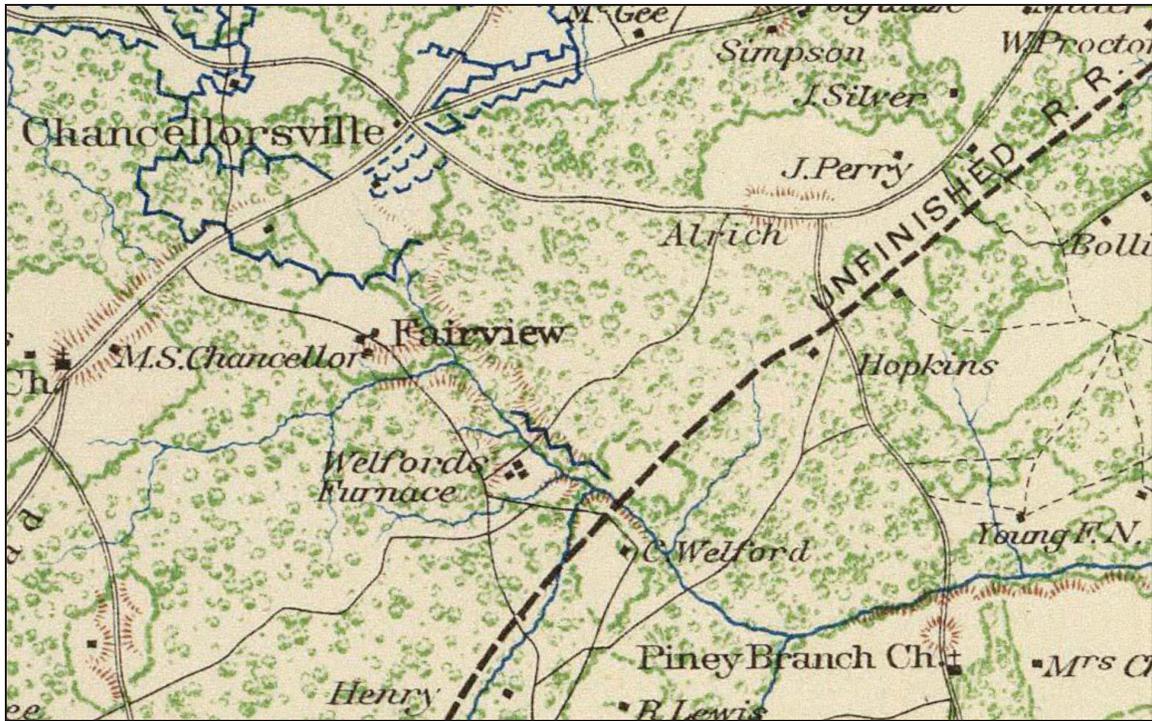


**Map 1.** Spotsylvania County in Colonial Virginia

Source: Carte de la Virginie et du Maryland. Dressee sur la grande carte Angloise de Mrs. Josue Fry et Pierre Jefferson, par le Sr. Robert de Vaugondy Geographe ordinaire du Roi (1755). From the David Rumsey Historical Map Collection, <http://www.davidrumsey.com/>

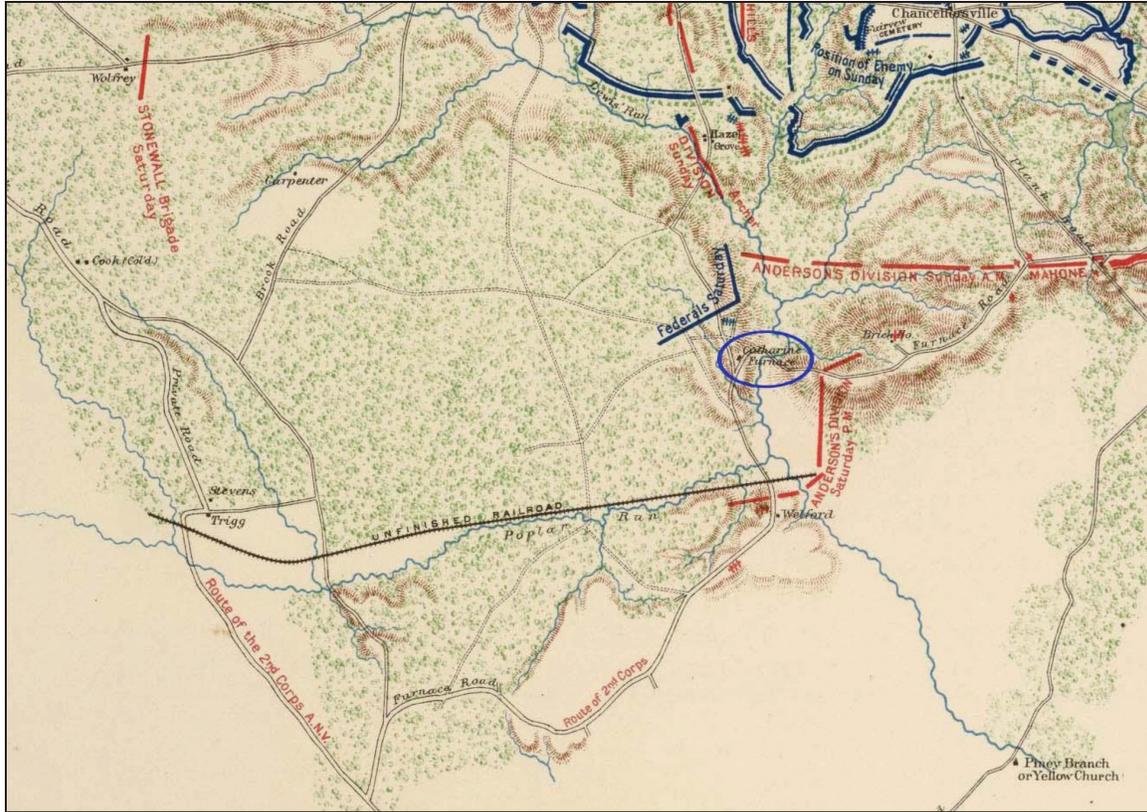


**Map 2.** Catharine Furnace and Wellford House in Relation to Fredericksburg  
*Source: Chief Engineer's Office, D.N.V. Maj. Gen. J.F. Gilmer, and Chief Engineer. Map of Spotsylvania County. Made under direction of A.H. Campbell, Capt. Engrs. in chg. Topl. Dept. General map. The vicinity of Hanover Junction, Va. and its defenses. Made under the direction of Capt. A.H. Campbell ... by Lieut. D.E. Henderson, Provl. Engrs., C.S. Army. (with) Sketch showing route pursued in the advance to Goldsborough, N.C. in December 1862. (with) Sketch showing position of Boyd's Neck, Honey Hill and Devaux's Neck, S.C. in December 1864. (with) Sketch of Spanish Fort defenses made during the siege by Lieut. J.A. Chaloron. Julius Bien & Co., Lith., N.Y. (Washington, DC: Government Printing Office, 1895). From the David Rumsey Historical Map Collection, <http://www.davidrumsey.com/>*



**Map 3.** Close-up of Civil War-era Catharine Furnace Location

Source: Chief Engineer's Office, D.N.V. Maj. Gen. J.F. Gilmer, Chief Engineer. Map of Spotsylvania County. Made under direction of A.H. Campbell, Capt. Engrs. in chg. Topl. Dept. General map. The vicinity of Hanover Junction, Va. and its defenses. Made under the direction of Capt. A.H. Campbell ... by Lieut. D.E. Henderson, Provl. Engrs., C.S. Army. (with) Sketch showing route pursued in the advance to Goldsborough, N.C. in December 1862. (with) Sketch showing position of Boyd's Neck, Honey Hill and Devaux's Neck, S.C. in December 1864. (with) Sketch of Spanish Fort defenses made during the siege by Lieut. J.A. Chalaron. Julius Bien & Co., Lith., N.Y. (Washington, DC: Government Printing Office, 1895). From the David Rumsey Historical Map Collection, <http://www.davidrumsey.com/>



**Map 4.** Catharine Furnace in the Battle of Chancellorsville, May 1863

Source: *Hotchkiss, Jed. Sketch of the battles of Chancellorsville, Salem Church and Fredericksburg, May 2, 3 and 4, 1863.* Prepared by order of General R.E. Lee, by Jed. Hotchkiss, Topogr. Engr., 2d. Corps, A.N.V. (with Map of the action at Dranesville, Va., December 20th, 1861. U.S. forces commanded by Brig. Gen. E.O.C. Ord. Drawn by H.H. Strickler ... 1875. (Washington: Government Printing Office, 1895). From the David Rumsey Historical Map Collection, <http://www.davidrumsey.com/>

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