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Farm, Factory, and Mine: Worcester Coal and the Role of Extractive Industries in Early 19th-Century New England

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"A man of your age to be suffering with poverty & holding on to a coal bed which he cannot use himself – worth $300,000 – it is insanity[.] Get enough if you can to make your own days comfortable & let the future go."[1] This was the hard advice William Elijah Green of Worcester, Massachusetts, received from the Hon. James Tallmadge of Troy, New York, in May 1833. Green had known Tallmadge for more than three decades since their days at Brown College; recently, he had asked the former Congressman and state lieutenant governor to use his influence to raise capital for the Worcester Coal Company. Although Tallmadge had shared Green's request with others, he professed to have "no gift as a subscriber." Despite this lukewarm support and pointed advice to sell his holdings outright, William Elijah Green was not one to "let the future go."

A vision of progress marked by industrialization and greater domestic comfort was rapidly unfolding in New England in the two decades following the War of 1812.[2] Although rural

[1] Hon. James Tallmadge to William Elijah Green, May 31, 1833, Green Family Collection, Worcester Historical Museum, Worcester, Mass. (hereafter WHM).
[2] Scholars of material culture and historians studying the expansion and specialization of domestic spaces have led the way in exploring the notion of "comfort." See, e.g., David Jaffe, *A New Nation of Goods: The Material Culture of Early America* (Philadelphia: University of Pennsylvania Press, 2010) on the intersection of early manufacturing and consumers' aspirations. The work of Fernand Braudel offers a foundation for this scholarship. See, e.g., *Capitalism and Material Life, 1400-1800* (New York: Harper and Row, 1967).

efforts to exploit local coal as well as stones, ores, and minerals lay at the nexus of these developments, historians have too long overlooked the extractive industries. Instead, they have cast the changes in the landscape during this period as a transition from "farm to factory."[3] Scholars have explained how New England farmers developed markets for their agricultural products, how the growth of manufacturing drew them into negotiations over water rights, and the opportunities that manufacturing offered to farm families to supplement their incomes.[4] Yet farmers also chose to extract resources that lay beneath the soil, including in ways that preserved some portion of the land for agricultural use.

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[3] Scholars, from social and labor historians such as Thomas Dublin to the sociologist and geographer David R. Meyer, have adopted this framework and popularized the phrase. Dublin, *Farm to Factory: Women's Letters, 1830-1860,* 2d ed. (New York: Columbia University Press, 1993). Meyer, "From Farm to Factory to Urban Pastoralism: Urban Change in Central Connecticut," in *Contemporary Metropolitan America,* Vol. 1, *Cities of the Nation's Historic Metropolitan Core,* ed. John S. Adams (Cambridge, Ballinger Publishing Company, 1976).

Historians of capitalism and environmental historians have also overlooked the prevalence of the extractive industries. See, e.g., Christopher Clark, *The Roots of Rural Capitalism: Western Massachusetts, 1780-1860* (Ithaca: Cornell University Press, 1990); Daniel Vickers, *Farmers and Fishermen: Two Centuries of Work in Essex County, Massachusetts, 1630-1850* (Chapel Hill: University of North Carolina Press, 1994); Richard Judd, *Second Nature: An Environmental History of New England* (Amherst, Mass.: University of Massachusetts Press, 2014); and John Lauritz Larson, *Laid Waste! The Culture of Exploitation in Early America* (Philadelphia: University of Pennsylvania Press, 2019).

Concurrently, the story of America's economic growth is often presented as a narrative that transitions from commerce to manufacturing. Some exceptions are John Bezis-Selfa, *Forging America: Ironworkers, Adventurers, and the Industrious Revolution* (Ithaca, N.Y.: Cornell University Press, 2004); Ann Knowles, *Mastering Iron: The Struggle to Modernize an American Industry, 1800-1868* (Chicago: University of Chicago Press, 2013); and Sean Patrick Adams, *Old Dominion: Industrial Commonwealth: Coal, Politics, and Economy in Antebellum America* (Baltimore: The Johns Hopkins University Press, 2004).

[4] See, e.g., Clark, *Roots of Rural Capitalism;* Theodore Steinberg, *Nature Incorporated: Industrialization and the Waters of New England* (New York: Cambridge University Press, 1991); Thomas Dublin, *Women at Work: The Transformation of Work and Community in Lowell, Massachusetts, 1826-1860* (New York: Columbia University Press, 1979; 2d ed., 1994); and Jonathan Prude, *The Coming of Industrial Order: Town and Factory Life in Rural Massachusetts, 1810-1860* (1983, rev. ed. Amherst: University of Massachusetts Press, 1999).

There is an appealing dramatic shift in the "farm to factory" narrative of a Virgilian pastoral ideal disrupted by technology that offers scholars a clear "before" and "after."[5] Of course, for earlier generations, keeping the focus on a Northern agricultural landscape cultivated by free white families and wage laborers served another purpose, as a favorable comparison to the Southern plantation system and the evils of slavery. New England had produced its own "dark Satanic mills," which had come under criticism in the antebellum period for their treatment of workers and their dependence on Southern cotton. It would have been too much to admit the earlier presence of dangerous, even explosive, mines and quarries that forced men to stoop and crawl and blackened their skin in what was supposed to have been a bucolic rural landscape.

Yet mines and quarries did proliferate throughout New England beginning in the colonial period. As Americans sought to secure their independence, promote domestic manufacturing, and pursue an aggressive building program, they scoured the landscape for the raw materials that would allow them to fulfill their goals independent of foreign imports.[6] Coal was just one

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[5] The pastoral ideal is a condition that may include human improvements but has not been adversely affected by man, and that elicits some feelings of escape from a civilized environment. See Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (New York: Oxford University Press, 1964) on this and the "technological sublime." As John Kasson has noted, by the first quarter of the nineteenth century, "technology came to be regarded as essential to American democratic civilization," and even into the mid-nineteenth century, it "represented both socially and aesthetically a welcome source of excitement, an addition but not a fundamental disruption of the natural order." Kasson, *Civilizing the Machine: Technology and Republican Values in America, 1776-1900.* (New York: Grossman Publishers, 1976), 1, 174.

John Lauritz Larson traces the early American culture of exploitation that "set the stage for industrialization." As he explores this concept, he notes the importance of mineral resources but does not discuss the extractive industries, focusing instead on Americans' "impetus to improve" the landscape to aid transportation in this era. Larson, *Laid Waste!,* 3, 31, 111, 124.

[6] See, e.g., David Hsiung, "Environmental History and the War of Independence: Saltpeter and the Continental Army's Shortage of Gunpowder," in *The American Revolution Reborn* (Philadelphia: University of Pennsylvania Press, 2016), 205-230; Robert Martello, *Midnight Ride, Industrial Dawn: Paul Revere and the Growth of American Enterprise* (Baltimore: The Johns Hopkins University Press, 2010), which recounts efforts to mine copper in

product among many minerals, metal-containing ores, and building stones that were the focus of early extractive industries.[7] The U.S. was also undergoing more than one energy transition in this period: from a reliance on firewood to using coal for home cooking and heating, and from waterpower to wood- or coal-fired steam power in industrial settings.[8] Alongside manufacturing, the extractive industries also supported improvements in transportation technology and networks. These new turnpikes, canals, and railroads were essential to fulfilling the promise of industrialization as the catalyst for a stronger domestic economy and a higher standard of living.

No, William Elijah Green was not going to let the future go—and neither should historians dismiss his story as the futile effort of yet another petty rural entrepreneur. Like many small corporations in this era, Green's business never got off the ground.[9] Although he dug coal in small quantities, he was too burdened by debt to expand the operation, and the investors he encountered were themselves constrained by a tight money market. Capitalists were reluctant to commit to the quality of New England coal, and all were stymied by the shifting futures for this commodity. Rather than residing in a success story, Green's importance lies in the historical record he left behind, which, in the context of Worcester coal and the extractive industries more broadly, reveals the scope and depth of rural landowners' engagement in these activities.

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the MidAtlantic; and Lindsay Schakenbach Regele, *Manufacturing Advantage: War, the State, and the Origins of American Industry, 1776-1848* (Baltimore: The Johns Hopkins University Press, 2019).

[7] Because coal is formed from organic plant matter, it is not considered a mineral. The U.S. Geological Survey describes it as a "sedimentary deposit." https://www.usgs.gov/faqs/what-coal, accessed November 21, 2023. Due to its metamorphosis over time, however, it is classified as a fossil fuel rather than as a biomass fuel.

[8] Sean Patrick Adams has called the transition away from firewood "the first mineral fuel revolution." Adams, *Home Fires: How Americans Kept Warm in the 19th Century* (Baltimore: The Johns Hopkins University Press, 2014), viii.

[9] Many histories of Worcester conflate the Worcester Coal Company, which Green established, with another local coal mine that operated either as a partnership or a sole proprietorship with outside investment. Both will be discussed below.

Green is instructive because, as a man of great ambition, he pursued numerous strategies to attain his goals. Other Massachusetts landowners farmed and marketed their products widely, traded real estate, acquired credit, and adopted new forms of business organization. They built on their traditional knowledge of the landscape and embraced new forms of inquiry.[10] Studying Green allows us to see all of these processes at work in multiple settings. With farmland as far away as Royalston, more than 30 miles from Worcester, Green appears as a grantee in more than a dozen other deeds from this period. Even in a tight market for money and credit, he was not averse to the risk of debt.

Green also sought to take advantage of the benefits that the corporate form of business organization conferred. With several associates, he created the Worcester Coal Company (1828) and the Worcester Rail Road (1829), thus becoming an "early adopter" of rail technology in the U.S.[11] Green also proved that one could cultivate a wide social network of useful connections in regard to the extractive industries. Over a decade from 1824 to 1833, correspondents from New York City, Albany, Providence, and Boston informed Green of the market for coal, the state of

[10] By tradition, natural history, which included geology, and natural philosophy, which included chemistry, were considered the purview of academics and urban elites, while "scientific agriculture" (including the applied chemistry of soil improvements) was most often limited to well-to-do gentlemen farmers. On the latter, see Tamara Plakins Thornton, *Cultivating Gentlemen: The Meaning of Country Life among the Boston Elite, 1785–1860* (New Haven and London: Yale University Press, 1989), 4, 25–26, 29-30. Here I argue that the extractive industries demanded a similar scientific understanding that found practical application among a greater proportion of the rural population.

[11] 1828 Chap. 93, "An Act to Incorporate the Worcester Coal Company," and 1829 Chap. 26, "An Act to Incorporate the Worcester Rail Road Company," *Acts and Resolves of the Commonwealth,* online in the DSpace database at https://archives.lib.state.ma.us/handle/2452/2.

The Worcester Rail Road was only the second line to be chartered in the state. In labeling Green an "early adopter," I am locating him on a continuum that includes early British railroad investors. According to Everett Rogers, the first 2.5% of potential users who adopt a new technology are described as "innovators," while "early adopters" round out the first 16%. Rogers, *Diffusion of Innovations*, 4th ed. (New York: The Free Press, 1995).

canal and rail projects that would transport, if not purchase, the product, and sources of capital. Moreover, with every letter Green wrote—as he promoted his interests, sought financing and buyers, and pressed his correspondents for answers—he also engendered conversations about Worcester coal in offices, coffee houses, and legislatures throughout the Northeast. In so doing, despite his own failures, he moved the extractive industries forward.

Studying Green as a representative of the many Massachusetts farmers who dedicated their energies to mining and quarrying improves our understanding of key aspects of New England industrialization including the role of lived experiences, knowledge and technology transfer, legal and business acumen, and social networking focused on markets and capital. Moreover, because these activities played out among rural farmers across a landscape that was predominately agricultural, they demonstrate that the extractive industries are integral to the narratives of farm and factory alike.

H[eman] Stebbins, *A Map of Worcester: Shire Town of the County of Worcester* (Worcester, Mass.: C[larendon] Harris, 1833), annotated detail. Map courtesy of the Worcester Historical Museum.

A farmer and attorney, William Elijah Green (1777-1865) was a 1798 graduate of Brown College who by 1833 had survived four of his five elder brothers and inherited the estate of their father, Dr. John Green. By steadily making acquisitions, the family had increased its holdings to include fifty acres of the Crawford Farm to the northeast of the estate as well as the southern half of Mill Stone Hill.[12] Before 1819, Green purchased the northern half of Mill Stone Hill, which contained a granite quarry that had been in public use since the 1730s. He then tested the legal system in an attempt to protect his investment by restricting access, a gamble he lost in 1824.[13] In that year his holdings included the 190-acre "Old Farm," the 53-acre Crawford Farm, 100 acres of Mill Stone Hill, and the "mine lot" of 22 acres.[14]

Since an average family could subsist on about sixty acres, Green was a major landowner.[15] Even so, his ownership of a mine was not exceptional. Mines and quarries could be found throughout rural Massachusetts in the early 19th century, and their open pits and shafts were just one feature of a landscape that had already been exposed to erosion, flooding, and

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[12] Robert Antonelli Jr., "A History of Green Hill Park in the City of Worcester, MA," (Worcester, Mass.: Green Hill Park Coalition, 2015), link online at https://www.parkspirit.org/parchive-archive/2021/3/13/green-mansion, accessed January 4, 2024.

[13] Antonelli, "History of Green Hill Park." After Green's purchase, the quarry remained accessible to the public through an 1824 court order. *Green Hill, 1754-1905* (Worcester, Mass.: privately printed for the family, 1906), [4], WHM collection.

[14] Rejoice Newton, report of an assessment of the value of Green's real estate, September 9, 1824, Green Family Collection, WHM.

[15] The sixty acres needed for subsistence would have to contain the necessary proportions of tillage, pasture, meadow, orchard, and woodlot. Mary Babson Fuhrer, *A Crisis of Community: The Trials and Transformation of a New England Town, 1815-1848* (Chapel Hill: University of North Carolina Press, 2014), 19-20.

In Massachusetts, most Essex County farms were less than 100 acres. Vickers, *Farmers and Fishermen,* 298. More than 50% of Northampton and Hatfield farms in the Connecticut Valley were 50 acres or less; another third were between 50 and 150 acres. Clark, *Roots of Rural Capitalism,* 62 Table 1, "Distribution of farms by size, Northampton, 1798, and Hatfield, 1800."

pollution. Forests had been cleared to harvest timber and for grazing and farming. Alongside "nuisance" industries such as tanneries and gunpowder mills, furnaces and kilns dotted the countryside. Mines and quarries were integral to this landscape.

Two examples illustrate this point. Eastern Massachusetts had a thriving iron industry that began in the 17th century with the digging of "bog iron" from freshwater swamps in locations as various as Lynn, Braintree, and Taunton.[16] Ironmaking required limestone as well as enormous quantities of charcoal, whose production further scarred the landscape.[17] By the early 1800s in the western part of the state, residents quarried veins of limestone and marble that run north/south from Vermont to Long Island Sound. In the mid 1820s, Berkshire County produced roughly $40,000 worth of marble annually[18]

As this valuation suggests, these industries not only served local needs; prior to the canal era, producers sent their output over the best roads and waterways available in order to meet a wider demand. The Lanesborough quarries supplied much of the marble for the first New York State capitol building in Albany (1804-1809).[19] Taunton potters received shipments of Gay Head clay delivered by the Wampanoag from Martha's Vineyard. An ironworks in Carver received ore from the Vineyard via Wareham to cast shot for the *U.S.S. Constitution* during the War of 1812.

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[16] William F. Hanna, *A History of Taunton, Massachusetts* (Taunton, Mass.: Old Colony Historical Society, 2007), 24-28. See also Bezis-Selfa, *Forging America,* 49-54.
[17] Adams, writing of the pre-Civil War period, says an average iron furnace might consume 150-500 acres of woodland a year. Adams, *Home Fires,* 26. On the scale of deforestation in southern New England, see Katharine M. Johnson, *Investigating Historic Human-Land Use Dynamics in Southern New England Using LiDAR and Geospatial Analysis* (Ph.D. diss., University of Connecticut, 2016).
[18] [David Dudley Field and Chester Dewey], *A History of the County of Berkshire, Massachusetts, in Two Parts* (Pittsfield, Mass.: Samuel W. Bush, 1829), 193.
[19] Henry B. Hooker, "A History of the Town of Lanesborough," in Field and Dewey, *History of the County of Berkshire,* 388.

Also as early as 1812, graphite called "black lead," also known as plumbago, from Worcester was processed in Sutton and shipped to New York to paint roofs and coat ship bottoms.[20]

These industries were in operation throughout Massachusetts; however, no state or federal census exists to document their locations, ownership, and output. The federal government first attempted to determine the scope of American industry by ordering a Census of Manufactures in 1820, yet the Massachusetts returns indicate confusion over exactly what constituted a "manufactory."[21] Census takers recorded all kinds of local businesses: saw and grist mills, retail stores, craft shops, and even outwork. While the iron industry is represented in the returns from several counties, only a single quarry appears, Caleb Boynton & Sons of West Stockbridge.[22]

Although most businesses in this era were sole proprietorships or partnerships, eight mining corporations were chartered in Massachusetts before 1830, and this legislation offers additional insight into the extractive industries. The two earliest acts, in 1800 and 1805, authorized companies in Newfield in the District of Maine to excavate ores, minerals, metals, fossils, and fuller's earth, a clay used in processing wool. Other corporations were chartered to quarry marble and to mine coal, lead, and silver.[23]

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[20] Charles Hine, *The Story of Martha's Vineyard* (New York: Hine Brothers, 1908), 161-62. Hanna, *History of Taunton,* 24-28, 67; Harry B. Chase, *Graphitic Coal Mines in Rhode Island and Massachusetts* (Mansfield, Mass.: privately printed, 1987; rev. ed 1992), 52; William Lincoln, *History of Worcester, Massachusetts,* vol. 1. (Worcester, 1862), 295.

[21] As a result of "negative reaction to the apparent inaccuracies," the manufacturing census was not repeated until 1840. Lee Ann Potter and Wynell Schamel, "Teaching with Documents: The 1820 Census of Manufactures," *Social Education* vol. 63, no. 5 (Sept. 1999), 312.

[22] U.S. 1820 Census of Manufactures, microfilm series M-279; see roll 2, doc. 128 for West Stockbridge.

[23] See 1810 Chap. 97, "An Act to incorporate Ebenezer Burt and others, by the name of The Ware Mining Company"; 1817 Chap. 114, "An Act to incorporate the Thomastown Coal and Mineral Company"; 1824 Chap. 96, "An Act to Establish the Easton Lead and Silver Mining and Manufacturing Company"; 1826 Chap. 19, "An Act to incorporate the Wolf Hill Lead Mine and

The absence of a comprehensive overview of the extractive industries was a hindrance to the young nation. In 1830, Professor Edward Hitchcock of Amherst College was so inspired by Denison Olmsted's *Report on the Geology of North Carolina* (1824) that he suggested a similar project in Massachusetts: a geological survey to accompany the topographical survey of potential transportation routes that the General Court had recently authorized. Hitchcock, who taught geology, mineralogy, and chemistry, was well qualified to carry out the project, which Gov. Levi Lincoln Jr. of Worcester enthused would investigate "especially the presence of valuable ores, with the localities and extent of quarries, and of coal and lime formations, objects of inquiry so essential to internal improvements, and the advancement of domestic prosperity."[24]

Hitchcock journeyed throughout Massachusetts over four summers from 1830 to 1833. He submitted a preliminary report in 1832, a 700-page final version in September 1833, and a revised report in 1835. More than 1200 copies of the final report were published, and more than 500 copies of the revised edition.[25] Throughout, Hitchcock dutifully commented on the potential to exploit the state's natural resources. He named the first section "Economical Geology," as it was "an account of our rocks, soils, and minerals, that may be applied to useful purposes, and thus become sources of pecuniary profit."[26]

Manufacturing Company"; 1827 Chap. 21, "An Act to Incorporate the Boston and Stoneham Marble Company" *Acts and Resolves of the Commonwealth*.

[24] Robert T. McMaster, *All the Light Here Comes from Above: The Life and Legacy of Edward Hitchcock* (Williamsburg, Mass., Unquomonk Press, 2021), 113, 142, 153-57. Also see David I. Spanagel, *DeWitt Clinton and Amos Eaton: Geology and Power in Early New York* (Baltimore: The Johns Hopkins University Press, 2014), which describes Eaton's investigations and lectures in Massachusetts.

[25] McMaster, *All the Light,* 157, 170, 183.

[26] Edward Hitchcock, *Report on the Geology of Massachusetts; examined under the direction of the Government of that State, during the years 1830 and 1831,* published as *American Journal of Science and Arts* 22:1 (July 1832), [3].

In addition to documenting natural landscapes, Hitchcock described the location and productivity of a staggering number of mines and quarries that he visited. This gave readers their most comprehensive overview to date of the extent of the state's extractive industries. Granite for construction was particularly valuable. It was quarried extensively in an arc from Cape Ann on the North Shore to Quincy and Cohasset, south of Boston; on the South Coast in Troy (Fall River); and on the New Hampshire line in Tyngsborough.[27] Factories, forts, and monuments were massive structures that consumed large quantities of granite, but a steady supply was also required for lesser projects. The stone's geological range was extensive, and the ring of hammers striking iron wedges sounded in every town where the range lay.

Other stones, ores, and minerals met a variety of specialized needs. Due to its heat resistance, Washington quartz was carried to Bennington, Vermont, to be used in the iron works there, but several other stones were also valued for this thermal property. Steatite, or soapstone, was used for fireplaces, furnaces, crucibles, and small cooking furnaces. From Middlefield, the stone was carried east to Northampton and Boston. Mica slate, quarried in large amounts in Goshen and Chesterfield, was good for hearths and other places that were exposed to moderate heat; it was also turned into whetstones. At Hitchcock's writing, a mine in Sturbridge had recently produced more than 100 tons of graphite, used for pencils, crucibles, and in lubricating machinery.[28]

As these uses suggest, New England's industrial development required not just factory sites, waterpower, and machinery; across the countryside, workers labored in mines and quarries to furnish a wide range of materials essential to the industrial project. This represented nothing

[27] Hitchcock, *Report on the Geology of Massachusetts,* [15-16].
[28] Hitchcock, *Report on the Geology of Massachusetts,* [22-23, 31-32, 47].

less than the remaking of the landscape. Bog ore for producing cast iron "was so common," according to Hitchcock, that as he journeyed from town to town, "at length, I ceased to inquire for it." Not only was it dug throughout the state, however; it could form the basis for a large industrial enterprise. Gen. Shepard Leach of Easton employed almost 500 men at nearly a dozen furnaces that he owned in four eastern Massachusetts towns.[29]

As the Hitchcock report also demonstrates, these products were widely distributed. Although Massachusetts exported the wealth of its extractive industries, other New England states also supplied parts of Massachusetts. After granite and gneiss, the most valuable rock in the state, according to Hitchcock, was limestone. When burned, it becomes quicklime (calcium oxide), used in mortar, as a soil supplement, and as a flux in iron furnaces. The Connecticut Valley received quicklime from Berkshire County, but in eastern Massachusetts, it was cheaper to import it from Maine and Rhode Island. Quarries in Vermont supplied Massachusetts with writing slates and roofing tiles. Vermont and New Hampshire also supplied "the Boston shops" with soapstone, and according to Hitchcock, "As the facilities for transportation are multiplied, and particularly in the mountainous part of the state, its use will undoubtedly be greatly expanded."[30]

Transportation improvements would thus continue to be crucial to the state's economic development, and not just for shipping raw materials and finished goods for manufacturing industries. Massachusetts was already engaged in an active program of turnpike and canal building, and the 1827 act authorizing a canal from Northampton to the Vermont border set rates

[29] Hitchcock, *Report on the Geology of Massachusetts,* [55-56].
[30] Hitchcock, *Report on the Geology of Massachusetts,* [24-26, 32, 34].

for carrying lime, copperas, iron ore, and mineral coal, among other products.[31] Quicklime entered Massachusetts from Rhode Island via the Blackstone Canal. As of Hitchcock's writing, not only was the three-mile Quincy Granite Railway in operation; early railroads had been chartered to serve industries in Worcester, Taunton, and West Stockbridge.[32] Perhaps with the latter project in mind, Hitchcock opined, "There can be no doubt that greater facilities for the transportation of the Berkshire marble—such as a rail road to the Hudson—would greatly increase the demand for it, by reducing the price. Such facilities will undoubtedly be provided at some future time."[33]

In his report Hitchcock paid particular attention to sources of coal in the Commonwealth. Visiting various mines, he followed the state's anthracite coal seams in Worcester and Mansfield and made four trips into Rhode Island's northeast corner and Aquidneck Island.[34] He also made a point of comparing New England anthracite to deposits along the Susquehanna, Lehigh, and Schuylkill rivers. While Pennsylvania contained the most extensive deposit of anthracite in the Unites States, the next largest was in Rhode Island, and the smallest in Worcester. However, together they represented "a great national blessing." Hitchcock continued, "I predict, that ere long…the anthracite of Rhode Island, and even that of Worcester, will be considered by posterity, if not by the present generation, as a treasure of great value."[35]

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[31] 1827 Chap. 128, "An Act to authorize the Hampshire and Hampden Canal Company to construct a Canal from Northampton to the North Line of this Commonwealth," *Acts and Resolves of the Commonwealth.*

[32] 1825 Chap. 183, "An Act to incorporate the Granite Railway Company"; 1829 Chap. 26, "An Act to Incorporate the Worcester Rail Road Company"; 1829 Chap. 95, "An Act to Establish the Boston, Providence, and Taunton Rail Road Corporation"; 1831 Chap. 27, "An Act to Incorporate the West Stockbridge Rail Road Company," *Acts and Resolves of the Commonwealth.*

[33] Hitchcock, *Report on the Geology of Massachusetts,* [25, 29].

[34] McMaster, *All the Light,* 157, 160.

[35] Hitchcock, *Report on the Geology of Massachusetts,* [42, 44, 45].

Hitchcock's preoccupation with coal makes sense in the context of the powerful steam-driven mills, steamships, and railroads of the late 19th-century. In 1830, however, the scale of New England's future industrialization could only be imagined, and the imperative to develop coal mining sprang from a different quarter: urban homes and businesses that were facing an acute shortage of firewood for cooking and heating. Shortages and the concurrent rising costs of fuel had plagued eastern Massachusetts since the colonial period, but the problem had become more widespread, extending to all of the older, more settled towns. An average household consumed ten or more cords of wood a year, but not every family had access to a woodlot, land for a woodpile, or the labor to cut and split the logs. There was a large market for cordwood, and in Boston the price of hardwood more than doubled in the 1790s; by 1800 it cost up to $10 a cord.[36]

Several factors exacerbated the crisis, including urban poverty, seasonal unemployment, unethical sellers marketing less than full cords, and price gouging. Fuel conservation was also difficult to achieve. Ordinary homes and businesses tended to be low, rather than multi-story, structures; they were often cheaply constructed, and they housed boarders and tenants who were responsible for heating their own spaces. Moreover, these buildings relied on fireplaces, which are notoriously inefficient, since they draw most of the heat they produce up the chimney. Even cultural biases undermined conservation. New Englanders subscribed to two traditional English notions: the fireplace was the symbolic heart of the home, and rooms should be cool and well-ventilated.[37]

[36] Adams, *Home Fires,* [1], 16-17, 22.
[37] Adams, *Home Fires,* 2-3, 18-19, 25.

When the market for coal emerged in the early 1800s it was thus more driven by domestic needs than by the demands of transportation and industry. Although the first commercial steamboats were in use beginning in 1807 on the Hudson River, the danger of early steam boilers gave the traveling public pause. For their part, New England mill owners continued to rely on the known technology of cheap and available waterpower. As late as 1838, steam was used in only five to eight percent of Massachusetts and Rhode Island cotton and woolen mills.[38]

There were precedents for replacing fireplaces and using coal as a fuel source. As firewood became prohibitively expensive in urban settings, slowly these examples began to have an impact on households in the first decades of the 19th century. New Englanders were aware of Benjamin Franklin's "Pennsylvanian FirePlace" insert, his cylindrical freestanding stove, and the six-plate European stoves used by German immigrants. As early as 1808, steam heating could be found in public buildings where skilled tenders were available.[39]

Wealthy families and private institutions led the way to a general acceptance of cast iron stoves, yet demand remained limited. The cost of transporting iron from rural furnaces kept prices high, which depressed the market for stoves and discouraged their manufacture. As turnpike and canal construction drove down shipping rates, stoves became more affordable. Improvements in the technology of iron furnaces and the use of anthracite to fuel them further reduced manufacturing costs, and sales increased. Between 1824 and 1832, the number of stores

[38] Marti Jaye Frank, *Carrying the Mill: Steam, Waterpower, and New England Textile Mills in the 19th Century* (Ph.D. diss. Harvard University, 2008), 40-42. See also Jeremy Atack, Fred Bateman, and Thomas Weis, "The Regional Diffusion and Adoption of the Steam Engine in American Manufacturing," *Journal of Economic History* 40:2 (June 1980), 281-308.
[39] Adams, *Home Fires,* 4-6, 14, 21-25.

in Providence, Rhode Island, selling stoves grew from two to thirteen.[40] The future was clear to those with a vision: Americans would soon cook and heat their homes and businesses using coal.

Poised to take advantage of this situation were a group of capitalists known as the "Boston Associates": affluent, well-traveled, and keen to learn about the newest technologies in search of future investment opportunities.[41] Some, like Thomas Handasyd Perkins, were no stranger to the extractive industries. Perkins was a founder of the Monkton Iron Company in Vergennes Falls, Vermont, and the Quincy granite quarry. On trips abroad, he visited other mines. In 1812, he toured the Hollywell lead mine in Wales, and in 1826, he visited English and Welsh coal beds to learn about the new steam and rail technologies in use there.[42] Perkins was serious about investigating the coal industry first-hand. Following his tour of a mine in Wales, he wrote, "When I found myself again in the day-light, my dress was sorely bedaubed with mud & coal and to my astonishment I found I had been between 5 and 6 hours in my subteranean excursion."[43]

It is little wonder that Perkins led an effort to mine coal in his home state. On February 19, 1824, he and other Boston capitalists issued a public broadside to announce that they had petitioned the legislature for a charter to build a canal or railway from Boston to Worcester, and to sell shares in the "Massachusetts Coal Company." Several Worcester men were also named in the broadside, including then Lieutenant Governor Levi Lincoln Jr. Their stated goal was to help Worcester exploit its coal deposits by providing transportation to a large and ready market. As

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[40] Adams, *Home Fires,* 26-38.
[41] On the Boston Associates, see Robert F. Dalzell, Jr., *Enterprising Elite: The Boston Associates and the World They Made* (Cambridge: Harvard University Press, 1987).
[42] Carl Seaburg and Stanley Paterson, *Merchant Prince of Boston: Colonel T. H. Perkins, 1764-1854* (Cambridge: Harvard University Press, 1971), 221-31.
[43] Thomas Handasyd Perkins, travel diary, June [?] 1826, Thomas Handasyd Perkins Papers, reel 3, vol. 14, pages 41 and [49], Massachusetts Historical Society, Boston.

the broadside explained, "The first object is, to ascertain, by a satisfactory experiment, the quality and probable quantity of coal." If further investment was warranted, the group would commission surveys to determine the best means of transporting the fuel to Boston.[44]

Possibly because separate charters were required for a coal company and a canal or railroad, the legislative petition mentioned in the broadside did not discuss coal; it stated only that the thirty-eight signers were "desirous of opening a more easy and convenient communication between Boston and the Town of Worcester, by means of a canal, or railway."[45] Perkins's role in advancing the legislation is readily apparent. He wrote his name boldly, squeezing it in at the top of the second column of names.[46] The effort was successful. The House and Senate issued an Order of Notice that the petition be published in the Boston *Columbian Centinel* and in the Worcester papers for three successive weeks prior to being considered in the next session of the General Court, which began on May 26. But here the story ends. There is no indication that the petition was published, and the legislature took no further action.[47]

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[44] "Application has been made to the legislature, for an act of incorporation to certain persons…: for the purpose of making a canal or railway from Worcester to Boston" [Worcester or Boston: 1824], AAS collection.

[45] "Petition of Thomas H. Perkins & al.," No. 7041, Senate unpassed legislation, 1775-2016, SC1/series 231, Massachusetts Archives. The signers were among the most wealthy and influential men in Massachusetts—including three Appletons, two Amorys, a Lyman, a Codman, a Sears, the Salem merchant Richard C. Derby, and Boston mayor Josiah Quincy.

[46] Worcester residents had no illusions about the project. William N. Green wrote to his father, "the communication will probably be by railway. The gentlemen who have started this project will not be alarmed at any trifling difficulty which may occur, or deterred (if the project is practicable) by pecuniary considerations...[they] are Messrs Perkins, Thorndike, and other gentlemen of equal wealth & influence in Boston." William N. Green to William E. Green, February 8, 1824, Green Family (of Worcester, Mass.) Additional Papers (Series II) [manuscript], 1787-1958, AAS.

[47] "Report of petition of Thomas H. Perkins & others, Feb. 1824. Order of Notice…" Finding Aid 674/3 on petition No. 7041, Senate unpassed legislation, SC1/series 231, Massachusetts Archives. The General Court required that the third publication occur at least 30 days before the first Wednesday of its next session. A review of the *Columbian Centinel* published between February 25 and April 28, 1824, finds no such notice, and there is no mention of the petition in

Why did the project founder? In 1824, the plan to build a canal or railway from Boston to Worcester was controversial, although there were reasons to advocate for such a project. If proposed canals in the hinterland that led to other states, including the Blackstone Canal to Rhode Island, came to fruition, they would draw commerce away from Boston.[48] Other forces worked against the legislation. Rural representatives, who exceeded Bostonians in the General Court, may have concluded that a canal or railroad to Worcester represented the first leg of an expensive project to reach upstate New York that offered many communities little benefit.[49] Meanwhile, the advocates of such a project could not agree on whether to promote a canal or a railroad and even disagreed over which route it ought to take.[50] The petition itself was altered to assuage critics. First entitled "for a canal or railway from Boston to Worcester," those words were struck through; the document was then simply labeled "Petition of Thomas H. Perkins & al."

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the Senate journal for the following session. Senate Journal, 1825, SC1/series 531, Massachusetts Archives.

[48] The Blackstone Canal, which connected Worcester with Providence along the route of the Blackstone River, had been chartered in both states less than a year earlier. In the spring of 1822, while the project was under consideration, Boston newspapers ran articles stating that the canal would be detrimental to Boston's growth and the interests of the state, and many prominent urban merchants and manufacturers were concerned that trade would be diverted toward Narragansett Bay. Worcester newspapers reprinted these. Christopher Pastore, *Between Land and Sea: the Atlantic Coast and the Transformation of New England* (Cambridge, Mass.: Harvard University Press, 2014), 202, including 278 n. 26 and n. 27.

[49] As scholars have pointed out, the number of voting members fluctuated depending on how many towns chose to send representatives to the General Court. See esp., Ronald P. Formisano, *The Transformation of Political Culture: Massachusetts Parties, 1780s-1840s* (New York: Oxford University Press, 1983), 35-36. For more on rural legislators' calculus, see Stephen Salsbury, *The State, the Investor, and the Railroad: The Boston and Albany, 1825-1867* (Cambridge: Harvard University Press, 1967), 35.

[50] Salsbury, *The State, the Investor and the Railroad,* 42-43. See also *Report of the Commissioners of the State of Massachusetts: On the Routes of Canals from Boston Harbour to Connecticut and Hudson Rivers* (Boston: True and Green, 1826).

With the transportation project dependent on having coal to ship, the local product's mixed reputation may also have dampened enthusiasm. Among positive reports, the *Massachusetts Spy* declared Worcester coal to be as good as that from Rhode Island or Pennsylvania. The paper observed that the coal had already been tested at the Trumbull & Ward brewery in Worcester. It was also being used to heat a tavern and several homes, where "It makes a most brilliant fire, producing an intense heat, and burns without any smoke or offensive smell whatever." Around the time that they petitioned the legislature, Perkins, Lincoln, and their associates sent a man named Mr. Alger, who owned a furnace in Boston, to view the Worcester mine. He, too, offered a positive assessment of the quantity and quality of the coal he found. [51]

Yet William E. Green's son William reported that the coal used at the brewery was thought to be "of a poorer quality and [it] will not answer for a small fire." He further informed his father that the Bostonians' earlier, initial attempt to examine coal from a new mine resulted in "about one bushel which came up in so small pieces that they will hardly be able to use it." Noting that an older mine furnished coal that would burn better, the younger Green made a savvy observation. Because first impressions were so important, he said, "it would be inexpedient to send any but the best [coal], which at present, it is doubtful if it can be obtained." The coal being mined "would by no means answer so well the purpose of an experiment to determine the merit of the coal, as that obtained from the bottom of the old pit."[52]

These distinctions regarding the quality of the fuel that came from different sites would remain an important part of the story for two reasons. First, the public was still learning to burn

[51] *Massachusetts Spy* [Worcester], January 21, 1824. William N. Green to William E. Green, February 8, 1824, Green Family Additional Papers, AAS.
[52] William N. Green to William E. Green, January 22, 1824, Green Family Additional Papers, AAS.

coal, which is more difficult to ignite and needs to be tended differently from wood; poking at or blowing on a coal fire will extinguish it. The ashes, which are a by-product of impurities in the coal, need to be removed daily; any unburned fuel should be saved and consumed in a second fire.[53] The Worcester product was mocked for leaving "a damned sight more coal after burning than there was before."

Yet the public tended to overlook variations in the quality of fuel that could be found in the same seam. In 1824, the Trumbull & Ward brewery apparently used coal that came from the mine the Bostonians had explored, and half the fuel remained after its initial burning. In 1827, the brewery switched to Green's coal, and it was found to be of better quality.[54] The presence of graphite, also known as "meta-anthracite," in Worcester reflects the range of coal available, while the seam was also stratified with mica schist and slate.[55]

Green's product would also be judged in the context of a long tradition of mining in nearby Rhode Island. An 1808 pamphlet enthused, "The inhabitants of the eastern States, and of Boston in particular, are much indebted to the genius and perseverance of one of their own countrymen, for the discovery of a Coal Mine at Rhode Island," and in 1814 the state sponsored a lottery that helped to capitalize the Rhode Island Coal Company. Yet several factors adversely affected the market for their product. Not only was it considered less pure than Pennsylvania anthracite. Rhode Islanders measured their coal not by weight but by volume in chaldrons that

[53] Adams, *Home Fires,* 46, 54-56.
[54] Henry Dwight Sedgwick quoted in D. Hamilton Hurd, *History of Worcester County, Massachusetts,* vol. 2 (Philadelphia: J. W. Lewis & Co., 1889), 1604-1605.
[55] Paul C. Lyons and Harry B. Chase, "Rank of Coal Beds of the Narragansett Basin, Massachusetts and Rhode Island," *International Journal of Coal Geology,* vol. 1, no. 2 (1981), 155-168. Chase, *Graphitic Coal Mines in Rhode Island and Massachusetts,* 54. Meta-anthracite is more than 98% carbon and is considered the highest form of coal, but with this value it is not very combustible. The Worcester graphite itself was of varying quality.

could weigh anywhere from 2,000-3,000 pounds—a nightmare for shippers. By the mid to late 1820s, Rhode Island coal had become "a proverb, a by-word, and a reproach," and the mines had closed.[56]

Under these circumstances, the Bostonians' plans also collapsed. Before the end of January 1824, the local men who had excavated the first bushel of Worcester coal for inspection had decided to stop digging until the spring due to excessive water in the pit and the cold weather. By then, the legislative petition had been abandoned.[57] Yet the investors' foray into central Massachusetts nonetheless inspired local residents, who were already engaged in mining, if not to produce fuel. Carter Elliot owned the Worcester graphite mine that supplied the Sutton mill he and his brother David owned. He was almost certainly the "Mr. Elliot" who assisted the Bostonians with their investigations.[58] Elliot soon proceeded to dig for coal, and his attempts to market the fuel would intersect with and complicate Green's efforts in the coming years.[59]

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[56] Adams, *Home Fires,* 45-49. The market for coal was changing rapidly. In Pennsylvania, the Lehigh Coal and Navigation Company began shipping coal in 1820, when it sent 325 tons to Philadelphia. The Schuylkill Navigation Company shipped 5,306 tons in 1825, its first year of operation. In the 1820s, a Rhode Island Coal Company booster would criticize Bostonians for their preference for coal from the Lackawanna region. On the urban coal trade, also see Allan Pred, *Urban Growth and the Circulation of Information: The United States System of Cities, 1790-1840* (Cambridge: Harvard University Press, 1973), 117.

[57] William N. Green to William E. Green in Providence, January 22, 1824, Green Family Additional Papers, AAS.

The Bostonians soon turned their attention to other projects. Perkins developed the Quincy granite quarry, which supplied the Bunker Hill Monument, and incorporated the Granite Railway to carry the stone to Dorchester Bay. In 1833, he joined other Bostonians as an incorporator of the Lycoming Coal Company, authorized to mine and sell coal from Farrandsville, Pennsylvania. 1825 Chap. 183, "An Act to incorporate the Granite Railway Company" and 1833 Chap. 25, "An Act to incorporate the Lycoming Coal Company," *Acts and Resolves of the Commonwealth.* See also Seaburg and Paterson, *Merchant Prince,* 329-33.

[58] William N. Green to William E. Green, January 22, 1824, Green Family Additional Papers, AAS. *Centennial History of the Town of Millbury, Massachusetts* (Town of Millbury, 1915), 261-62.

[59] Many published works have conflated Elliot's working mine and Green's corporations. John Nelson writes, "Work at the mine proceeded with vigor for a number of years. The Worcester

William Elijah Green, meanwhile, had his own designs on Worcester coal, which he could expect to find on his mine lot, if not elsewhere around Mill Stone Hill. As soon as he heard of the Bostonians' interest in Worcester coal, he tried to involve himself in their endeavor. Prior to the investors' first dig in January, he asked his son to approach Levi Lincoln Jr. and his law partner, Isaac Davis, with some "request respecting the coal." Lincoln replied that in their view, the excavation had superseded it.[60] A short time later, Green suggested that the Bostonians obtain an auger in order to mine the coal more efficiently, but Lincoln demurred.[61]

Lincoln's reluctance to involve Green in the project may be explained by the history between the two men. Although both came from Worcester, their wealth and social capital differed. Lincoln's father had served in the Jefferson administration, while Green's father had been a local physician. Lincoln and his father had attended Harvard, while Green was a graduate of Brown. Yet the two also sparred professionally. Lincoln was chairman of the 1819 Worcester town committee that recommended suing Green to maintain public access to the Mill Stone Hill quarry—a case not decided until 1824. In 1822, Green had been one of seven men chosen to serve on a committee representing Worcester's interests in the Blackstone Canal. However, a year later, the committee was discharged and a new one chosen of which Green was not a part. At about the same time, Lincoln rebuffed Green's efforts to stop him and Davis from taking legal action against Green's friend Abel Wesson and his father. Wesson's outburst on receiving the

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Coal Company was organized to operate the property." Nelson, *Worcester County: A Narrative History,* vol. 1 (New York: The American Historical Society, Inc., 1934), 351. Harry Chase writes, "In 1829 the Worcester Railroad Company was incorporated to build two horse railroads from the mine." Chase, *Graphitic Coal Mines in Rhode Island and Massachusetts,* 53.

[60] William N. Green to William E. Green in Providence, January 22, 1824, Green Family Additional Papers, AAS. The Green family correspondence does not specify the nature of the request.

[61] William N. Green to William E. Green in Providence, February 1, 1824, Green Family Additional Papers, AAS.

news may have echoed Green's attitude toward Lincoln: "dam them let them go to hell in welcom, with the rest of the damb'd Raceskles [rascals]."[62]

Green's interest in the coal obviously outweighed any reservations he may have had about approaching Lincoln. He may have hoped that if the scheme were successful, it would increase the value of his own holdings. While the Crawford Farm was worth more than $47 an acre, the property containing the mine was assessed at just over $22 an acre, and Green was struggling financially.[63]

Letters from the early 1820s show the extent of Green's agricultural activity as well as his indebtedness. In the spring of 1820, the manager of his farm in Royalston, Parley Holman, asked for onion, carrot, and beet seed as well as hay, noting, "It seems as though the cattle would eat a world of hay in this cold country. I hope that you will have the good luck to sell the farm bee fore a nother cold winter." By May, Holman was warning Green that he had sent up much more livestock than could be kept that year; the season was so dry there was no food for them.[64]

Yet even a good season presented challenges. By June 1820, Holman was begging for cash to pay taxes and hire a hand to tend the now promising grasses and grain, noting that labor

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[62] Supreme Judicial Court case 2 Pickering, 425. *Green Hill,* [4]. "Abstract from minutes of an 1822 canal meeting" and "To study the feasibility and drafting a petition for an act of incorporation," Green Family Collection, WHM. Abel Wesson Jr. to William E. Green, December 19, 1823, Green Family Additional Papers, AAS. In Massachusetts, see 1822 Chap. 27, "An Act to Incorporate the Blackstone Canal Company," and subsequent legislation, 1823 Chap. 77, 1825 Chap. 144, and 1826 Chap. 74, *Acts and Resolves of the Commonwealth.*

[63] Rejoice Newton, report of an assessment of the value of Green's real estate, September 9, 1824, Green Family Collection, WHM.

[64] Parley Holman to William E. Green, April 3 and May 10, 1820, Green Family Additional Papers, AAS.

In the 1820s, Massachusetts farmers responded to land and labor shortages by increasing livestock production and remaking the landscape to rationalize land use. Farmers in hill towns made pastures out of unimproved land and arranged to take cattle from river valleys during the summer. Meanwhile, those in the intervale converted pastureland to tillage on which they grew corn and hay for winter feed. Clark, *Roots of Rural Capitalism,* 79-82.

cost more in Royalston than in Worcester. The following year, he apologized to Green for not driving his stock into the hills yet because he had had to "work out" the highway taxes. By February 1823, Green's debts had grown to the extent that two men came to his Worcester home to attach the horses, cattle, and hay as security and leave four summonses in regard to debts he owed to three men. Their visit set Green's sister Mary and his son William on a hunt for the bills of sale for Green's cattle, grains, and furniture.[65]

Over the following decade, Green made numerous attempts to turn a profit through schemes to sell his mine lot, attract partner investors, or find a guaranteed buyer for his coal. The social and business relationships that he treasured most were to be found in Providence, yet at first Boston and New York seemed to offer a better prospect.[66] Although Perkins's plan had been abandoned, J. B. Quinby of Boston remained interested in Worcester coal. He was developing an iron furnace in Saco, Maine, and told a colleague that if other Bostonians should invest in Green's coal bed, "I should be willing to take a small interest and give my personal services in the explorations."[67] Quinby also urged Green to trade his product for stock in one or more of the New York coal companies, which he believed might aid the construction of the Blackstone Canal in order to obtain the fuel on better terms. He gave Green a letter of introduction to use in New

[65] Parley Holman to William E. Green, June 18, 1820, and June 17, 1821, and William N. Green to William E. Green, February 5, 1823, Green Family Additional Papers, AAS.
[66] Green spent a great deal of time in Providence; he had friends and business associates there. Going elsewhere introduced the challenge of learning whether or not to trust new contacts at a physical remove, a common problem as the era's social and economic networks expanded. See Karen Halttunen, *Confidence Men and Painted Women: A Study of Middle-class Culture in America, 1830-1870* (New Haven: Yale University Press, 1982).
[67] J. B. Quinby to William E. Green, January 26, 1825, Green Family Collection, WHM.

York City that described Green as "principal proprietor" of the Worcester coal mines, and he urged him to go there and to Albany to make a deal.[68] Green obliged, without success.

Notably, Quinby did not offer to invest in Green's mine directly. He was also in contact with Elliot, who had brought some of his own fuel to Boston to be tested. Elliot led Quinby to believe that he and Green had merged their interests in the Worcester coal beds. While there is no further evidence of this, in the summer of 1825 Green wrote a letter introducing Elliot to Quinby's brother in New York. Yet when Quinby informed one of the Boston Associates, Patrick Tracy Jackson, that "the whole of [Green's] & Mr. E.'s interests are now associated & that a Co. may purchase on advantageous & desirable terms," he learned that their interest in Worcester coal remained cool.[69]

Green's preference was to strike a deal in Rhode Island, and Quinby also represented him there. After speaking with a Providence canal investor, he informed Green, "coal appears to be their next object, and whilst the fever is high you may, & I think you can, realise something handsome."[70] Quinby's brother had recently become manager of the Rhode Island Coal Company, which aimed to reopen its mine with Boston and New York backing. Quinby hoped one day to combine the business with his iron company. Quinby suggested that Green make use

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[68] J. B. Quinby to John W. Wyman, January 24, 1825, and J. B. Quinby to William E. Green, February 6, 1825, Green Family Collection, WHM.

Although Green pursued legislation in New York that came to naught (perhaps an act of incorporation), Quinby congratulated him on his "partial" success in Albany, adding that he was pleased Green had been "received by Mr. Clinton in so handsome a manner." John F. Bacon to William E. Green, April 25, 1825, and J. B. Quinby to William E. Green, May 24, 1825, Green Family Collection, WHM. Bacon wrote on behalf of the New York Assembly but did not describe the nature of the bill; he only noted that it had died in the House. "Mr. Clinton" may have been Gov. DeWitt Clinton.

[69] J. B. Quinby to William E. Green, May 24, June 14, and August 1, 1825, Green Family Collection, WHM.

[70] J. B. Quinby to William E. Green, April 28, 1825, Green Family Collection, WHM.

of the information, observing, "You may, I think, put your Mines into a co. on good terms." Within a few days, he pressed Green to sell the coal if he could realize $12,000 or $15,000: "Whilst the canal fever is at its height, is, in my opinion, the crisis at which you should sell."[71] Yet despite the "canal fever" then gripping the Blackstone Valley, investors remained noncommittal. Green's mine lay northwest of downtown Worcester, and the Blackstone Canal Company hoped to find coal along a more direct route from Providence to the town center.

Providence merchant Henry Holden urged Green to produce samples of his best coal as soon as possible to try to induce the canal company to build to Long Pond, nearer the coal mines.[72] When Green apparently failed to provide the requested samples, Holden reported that Elliot had sent him a load of coal, which he intended to burn in his store. Holden told Green that the canal company also wanted to buy Elliot's coal; however, he suggested there was an opening for Green. The canal commissioners, Edward Carrington and Stephen H. Smith, were apparently unimpressed with Elliot personally and they seemed to appreciate the potential of Green's product.[73] Thus, when Holden received a visit from the Rhode Island Coal Company's civil engineer asking about Green's coal, he concluded that Carrington had sent him. The engineer

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[71] J. B. Quinby to William E. Green, April 28 and May 3, 1825, Green Family Collection, WHM.
[72] Henry Holden to William E. Green, July 2, August 12, and September 23, 1825, Green Family Collection, WHM.

Holden also advised Green to consider incorporation and to obtain a charter with banking powers, one that would be transferable in Boston, Providence, and New York. He reported on the Lehigh Coal Company's increasing dividends and even ventured to suggest that Green might price his shares at $50 or $100 each to make them affordable to more investors.

Joyce Appleby observed that capitalism required "freshets of cash" to sustain itself. On capitalism and banking, see Appleby, *The Relentless Revolution: A History of Capitalism* (New York: W. W. Norton, 2010), and Sharon Ann Murphy, *Other People's Money: How Banking Worked in the Early American Republic* (Baltimore: The Johns Hopkins University Press, 2017), esp. chap. 2.

[73] Henry Holden to William E. Green, and August 12 and 21, 1825, Green Family Collection, WHM.

told Holden that if the coal performed as promised and was available in sufficient quantities, he thought the company would buy it. Holden informed Green breathlessly, "I think you may not dispare of realizing…a very large sum for the coal if you will lett me manage it with your assistance.…write me your wishes."

Yet like Quinby, Holden was not primarily concerned with Green's welfare; in the late 1820s, Green could be certain that any one of his correspondents had their own reasons for sourcing Worcester coal. If Quinby aspired to ingratiate himself with Bostonians and New Yorkers and ensure the success of his iron furnace, the merchant Holden sought to profit as a broker. Unsure whether or not he could trust Holden, Green asked his friend Abel Wesson Jr. to make inquiries. Wesson reported that Carrington considered Holden "a verey Lazey fellow…and—if you can Raze money on [the coal], he thinks you had Better keep it and Never sell it."[74]

Green remained in debt, credit was tight, and still he had no offers to finance the excavation and sale of his coal.[75] His response as a farmer was to turn to the land itself, to know it better, and to increase potential cultivation. Green became intent on investigating where the best coal in Worcester lay. In October 1825, he struck a deal with Carter Elliot by which he or his assigns would continue to excavate Elliot's mine to a depth of twenty-five feet. Green would

[74] Henry Holden to William E. Green, August 21, 1825, and Abel Wesson, Jr., to William E. Green, September 27, 1825, Green Family Collection, WHM.

[75] By early 1826, Quinby would inform Green, "at no time in the past three years has the moneyed market been so depressed, or speculation of every kind at so low an ebb." J. B. Quinby to William E. Green, March 26, 1826, Green Family Collection, WHM. A week later, desperate to satisfy a creditor, Thomas Wetmore, Green sent Wetmore to collect the rent he was owed from his mortgagee, Col. Job Tuttle. Wetmore, who held a second mortgage on the property, threatened to take possession and force its sale if Green would not do so and settle his account. J. N. Tuttle to William E. Green, April 3 and 30, 1826, Green Family Collection, WHM.

receive $100 for the job but was prohibited from digging elsewhere on the property.[76] Green was even willing to acquire more land. A fifty-acre lot west of Elliot's mine prompted questions regarding its costs and terms in 1827, and by 1828, Green would strike an agreement to purchase the Sargent Farm near his own coal bed.[77]

As indebtedness continued to plague Green, it was all he could do to retain his interests. In March 1827, he invited Henry Ellsworth to invest $300 in exploring his coal bed. If Ellsworth thought the mine was promising enough to operate, Green would give him a quarter of the property in exchange for one tenth of the net income; otherwise, he would repay the $300. Green explained that he was making the offer "on account of an attempt…to force the same out of my hands, & not being able to meet the expenses of the works myself I wish to put the same into the hands of a Gentleman who will…opperate on the bed with engrossing the whole & do it in a fair & honourable manner."[78] Ellsworth declined. By that summer, Green was forced to transfer the deed to the mine lot to William Eaton to settle a debt of $641.18, but he maintained the right to reacquire it.[79]

Now ready to make a deal wherever he could, Green approached Col. Amos Binney, the U.S. Navy agent in Boston, who had purchased property in Worcester. Binney rebuffed Green's overtures, telling him that he had his own plans to begin coal mining in the spring. He had an agent and was preparing to hire workmen, obtain tools, and raise buildings; when the

[76] Agreement between Carter Elliot and William E. Green, October 25, 1825, Green Family Collection, WHM.
[77] Abel Wesson Jr. to William E. Green, December 2, 1825; "Undated Col. A. Binnys Mendon 1827"; "Promise to sell Green the Sargent farm near his coal mine," October 1, 1828; and "March 13, 1829 agreement at Worcester signed by Samuel Harrington Jr., John Gleason Jr. and William Eaton Jr.," all in Green Family Collection, WHM.
[78] William E. Green to Henry L. Ellsworth, March 20, 1827 (copy), Green Family Collection, WHM.
[79] William Eaton to William E. Green, Bond, July 20, 1827, Green Family Collection, WHM.

arrangements were complete, he expected Elliot to join him.[80] Binney advertised job openings for a blacksmith and fifteen to twenty men. By November they had dug a 12' x 8' tunnel sixty feet deep at a twenty-five-degree incline and installed a short railway, which moved three-quarters of a ton of coal at one time.[81]

Simply put, Binney didn't need Green, and he drove home the point by telling Green that he expected to find enough good coal to work the seam for two or more generations; however, if the effort failed, he was secure enough to lose his investment. Binney then struck a conciliatory tone. "Quite willing and even anxious to promote your interest also," he invited Green to join him in turning their land into a joint stock corporation. Each man would be entitled to subscribe for up to ten percent of the stock, with up to forty percent reserved for Worcester citizens and sixty percent for Boston capitalists."[82] Green rejected the offer. Binney's proposal to comingle their coal was simply unacceptable, he declared, since it was "really nothing, in value to mine." Green continued, "His proposal to a stranger looks fair, & well, but to me, who knows Binny & Elliot both, [it] has no inducements; because they are men who cannot meet my views for a fair sale."[83]

That fall, with the opening of the Blackstone Canal imminent, Binney purchased Carter Elliot's mortgage of the Black Lead Mine lot, and Green made a counter proposal to Binney. The colonel could have Eaton's bond for his coal bed for $150,000. When that was rejected, Green offered the mine lot and an adjacent pasture, fifty acres in total, for $75,000 plus one third of the

[80] Col. Amos Binney to William E. Green, December 14, 1827, Green Family Collection, WHM. Ivan Sandroff, *Your Worcester Street* (Worcester, n.p., 1948), 36. In the letter Binney refers to property he has purchased. Several sources including Sandroff state that Binney bought the mine in 1827, but they contain other factual errors and the deed has not yet been located.
[81] Charles G. Washburn, *Industrial Worcester* (Worcester, 1917), 58-59..
[82] Col. Amos Binney to William E. Green, December 14, 1827, Green Family Collection, WHM.
[83] William E. Green to William Eaton, March 6, 1828, Green Family Collection, WHM.

coal income. Binney would receive the coal only, and Green would reserve the right to improve the land.[84] That proposal, too, was unsuccessful.

Now there was a rival mine in operation. Green had dealt with a host of characters—Quinby, Holden, and Binney—and still failed either to attract partners in developing his mine lot, or to find a buyer for his coal. In response, he decided to try raising capital by obtaining a corporate charter and selling shares directly. Green established the Worcester Coal Company with six local men: Samuel B. Thomas, keeper of Thomas's Temperance Exchange Coffee House; George A. Trumbull, publisher of *The Massachusetts Spy* and a possible owner of the Trumbull & Ward brewery; several incorporators of the new Central Bank including attorney Isaac Davis, Asahel Bellows, and Benjamin Butman; and Nathaniel Paine. Organized under the general act that chartered manufacturing corporations, the company was authorized to raise and sell Worcester anthracite and to acquire up to $400,000 in real estate and $200,000 in personal estate.[85]

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[84] "Copy of Sale by Binney to Carter Elliot, Boston, September 22, 1828. Suffolk deeds Bk. 264 p. 100, entered October 23, 1828" and William E. Green to Col. Amos Binney, October 10, 1828, Green Family Collection, WHM.

[85] 1828 Chap. 93, "An Act to Incorporate the Worcester Coal Company" (signed into law February 27, 1829), *Acts and Resolves of the Commonwealth.* William Lincoln and Charles Hersey, *History of Worcester, Massachusetts,* 2 vols. (Worcester, 1862), 209, 277, 367-38, 425.

When Green was told that he could not use the same petition to obtain charters for both the coal company and the railroad, he chose to delay the railroad act until the next legislative session. He did this despite warnings that the legislature would only grant one request for a railroad in Worcester, and if Binney obtained the charter first he would be able to locate the line to his advantage. Green won this gamble. Only he, Thomas, and Davis served as incorporators.

The act was lengthy because the Worcester Rail Road Company was only the second to be chartered in the state and the only precedent was Perkins's Granite Railway. The company was authorized to build a line "from the lands called the Coal Mines in Worcester, to the waters of Quinsigamond Pond in said town; and also from said lands to the banks of the Blackstone Canal in said town." Viewed as a limited undertaking, the corporation's real and personal estate was not to exceed $50,000. John W. Lincoln to William E. Green and Samuel B. Thomas, February 22, 1829, Green Family Collection, WHM. 1829 Chap. 26, "An Act to Incorporate the

In return for allowing others to profit by holding a majority of the coal company's shares, Green proposed terms for the business that would relieve him of his debt and restore his ownership of certain parcels. He would take only $25,000 worth of the shares but would receive more than $50,000 in cash. Green would also "have the Taylor lot purchased & Mine Lot redeemed &…receive the wood & organizational improvements" except as needed for mining. David T. Brigham would give his bond to sell shares and see that the claims and mortgages against Green were cleared.[86]

By taking matters into his own hands, Green had apparently increased his chance of success. The following spring, with a charter for the Worcester Rail Road all but assured, he purchased the Sargent farm adjacent to the coal mine for $5,000. Green was also in communication with Stephen H. Smith of Providence, who informed him that the right to load coal on Long Pond was essential to the Rhode Island Coal Company; delivering Providence goods to the head of the pond would also allow them to serve traders north of Worcester. He told Green that until he could speak with him in person, "I wish you would make no disposition of your coal mine."[87]

Of course, just because Green held a charter didn't mean that Binney couldn't proceed with his plans. He had begun to mine in the spring of 1828 as he had promised, and in the fall of 1830, he gave a financial account to Carter Elliot's wife, Nancy, in which he reported that he had invested more than $13,000 in the business, including more than $6,000 for buying land and

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Worcester Rail Road Company" (signed into law June 12, 1829), *Acts and Resolves of the Commonwealth*.

[86] "Green to have 25,000 Dols. in shares worked free of Expense" and related documents, Green Family Collection, WHM.

[87] "March 13, 1829 agreement at Worcester signed by Samuel Harrington Jr., John Gleason Jr. and William Eaton Jr.," Green Family Collection, WHM. Stephen H. Smith to William E. Green, April 17, 1829, Green Family Collection, WHM.

buildings, more than $4,000 for the agent, Charles Brigham, and smaller amounts for a water engine, pump, and iron track. However, mining ceased by 1833 due to Elliot's death, the poor quality of the coal, and Binney's failure to buy an adjacent parcel, perhaps where better fuel could be found.[88]

Throughout this period, although shares in the Worcester Coal Company remained available for $100 each from David T. Brigham and Benjamin Butman, Green persisted in his efforts to sell the mine and produce a guaranteed income for himself and his heirs. In 1830, he offered the mine for $100,000 plus half the net income, observing, "There can now be no doubt of there being sufficient in the hill to pay as many millions as I have asked thousands." He also continued to praise the quality of his coal, which "makes a greater degree of heat than any other…[and] burns more madely [madly] than the Lehigh or Schuylkill, as I am informed by the Providence dealers."[89]

By 1833, Green's price for fifty acres of coal land had increased to $250,000. Perhaps citing Hitchcock, Green reported that the coal seam was 200-300 feet thick and spanned almost the entire fifty acres. The terms of the agreement that he offered to New Yorkers were that they would pay $100,000 up front and remit $150,000 in $25,000 annual installments. Green further specified that he wished to retain one quarter of the shares and reserve the property for

[88] Col. Amos Binney of Boston to Mrs. Nancy Elliot of Worcester, September 12, 1829, Green Family Collection, WHM. Chase, *Graphitic Coal Mines in Rhode Island and Massachusetts,* 53. By 1830 Binney turned his attention to mining and smelting copper in South Strafford, Vermont. Collamer M. Abbott, "Early Copper Smelting in Vermont," *Vermont History* vol. 33, no. 1 (January 1965), 233-42.

[89] Copy of blank subscriptions paper for Worcester Coal Company; William E. Green to Charles Cleveland, January 12, 1830; and William E. Green to William Eaton, February 4, 1830, Green Family Collection, WHM.

agricultural use except where land was needed for the mine's pit, buildings, railways, and drainage.[90]

The mine also remained available to Brigham and Butman if they could sell $200,000 worth of shares and raise $100,000 through mining operations. If these funds were paid to Green along with another $100,000 in stock, Green would convey the mine lot to them while retaining the agricultural use of the property.[91] Yet after a decade of effort, there was no evidence to suggest that William E. Green would ever be successful in developing his coal bed or selling the property. William Eaton still held the mortgage.[92] It was time, Tallmadge counselled, to "let the future go."

As the new year 1834 began, Green was still stalling creditors if not maintaining genuine hope. To one lender, he wrote, "I have had proposals from different people relative to the coal mine, but have not had anything certain, as yet.…although I am dayly expecting to have something done in the business."[93] Yet by Christmas, he was writing to an acquaintance out West who had settled his son in Texas. Posing detailed questions about how to obtain title to land and the best means of earning a living there, he mused, "I have some idea of going to that country myself, & try to see if fortune will not be a little more propitious to me there than it has been in this."[94]

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[90] William E. Green to David Tallman, April 10, 1833, and William E. Green to J. N. Cunningham, April 20, 1833, Green Family Collection, WHM.
[91] "Memorandum of Agreement between William E. Green and Benjamin Butman and David T. Brigham all of Worcester, April 11, 1833," Green Family Collection, WHM.
[92] William Eaton to William E. Green, July 6, 1833, Green Family Collection, WHM.
[93] William E. Green to Walter Allen, January 28, 1834, Green Family Collection, WHM.
[94] William E. Green to Joseph S. Martin, December 25, 1834 (copy), Green Family Collection, WHM.

Conclusion

The Hitchcock report provides scholars with our best overview of the extractive industries of Massachusetts in the early 1830s, demonstrating their ubiquity and their significance. However, it only represents a moment in time and fails to capture the period's dynamic business environment for the extractive industries, which included long-established mines and quarries as well as new digs, established partnerships and young corporations, fluctuating markets, and uneven access to capital. Central to the process were rural farmers such as William Elijah Green who lived close to the source of New England minerals, ores, and stones, in contrast with urban capitalists who ranged widely in search of investment opportunities.

The coal business that Green attempted to enter was hardly a level playing field, yet the impetus to proceed was strong, for both historic and contemporary reasons. The urgent demand for an alternate fuel source had its origins in the colonial period. Concurrently, steam technology offered exciting possibilities in industry and transportation, and no one could guess how much the demand for coal would increase in the future. Despite Green's failure to profit from his own holdings, the potential to make a handsome profit from coal created a boom in mining activity; the hope of meeting the region's needs through a local supply was not yet quashed.

After the Hitchcock report appeared, if not because of it, the Massachusetts legislature was compelled to grant more than a dozen new charters for the purpose of mining and selling coal and minerals in Essex, Suffolk, Norfolk, Bristol, Hampshire, and Hampden Counties. Urban capitalists were implicated in some of these corporations. However, the long tradition of rural investment in mines and quarries, as well as in transportation improvements and manufacturing, indicates that most of the entrepreneurs, investors, and workers who assumed the risk of

developing the extractive industries were local men, notably farmers like Green under whose soil these valuable resources lay.[95] Born of the farm, mining and quarrying thus gave life to the factory.

And what became of Green? Decades later, he proved to be a survivor. He never moved to Texas. In 1861, four years before his death, he and his fourth wife, Elizabeth, welcomed his ten surviving children—teachers, engineers, and physicians, including a missionary—back to the mansion on Green Hill for a memorable family reunion. Born during the American Revolution, Green would live through the Civil War, witness to America's extraordinary industrial transformation and the growth of the extractive industries that enabled it—indeed, knowing that he and other rural farmers like him had played an active role in the process.[96]

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[95] See 1832 Chap. 38, "An Act to incorporate the Franklin Coal Company"; 1832 Chap. 154, "An Act to incorporate the Braintree and Weymouth Coal Company"; 1833 Chap. 86, "An Act to incorporate the Boston Copper Mining Company"; 1833 Chap. 121, "An Act to incorporate the Boston and Norwegian Coal Company"; 1833 Chap. 131, "An Act to incorporate the Ixion Black Lead Factory"; 1836 Chap. 12, "An Act to incorporate the Cuba Mining Company"; 1836 Chap. 135, "An Act to incorporate the Massachusetts Mining Company"; 1836 Chap. 143, "An Act to incorporate the Mansfield Coal Company"; 1836 Chap. 161, "An Act to incorporate the Hampshire and Hampden Mining Company"; 1837 Chap. 59, "An Act to incorporate the Berkshire Mining Company"; 1837 Chap. 161, "An Act to incorporate the Boston and New York Coal Mining Company"; 1837 Chap. 174, "An Act to incorporate the Merrimack Coal Mining Company"; 1837 Chap. 206, "An Act to incorporate the Tremont Mining Company"; 1838 Chap. 81, "An Act to incorporate the Abington Mining Company"; 1838 Chap. 10; "An Act to incorporate the Wrentham Mining Company"; 1838 Chap. 116, "An Act to incorporate the Bristol and Norfolk Mining Company," *Acts and Resolves of the Commonwealth.*

For more on the 1830s coal boom, see Chase, *Graphitic Coal Mines in Rhode Island and Massachusetts,* and Harry B. Chase, *Coal Mines and Prospects in New England* (Mansfield, Mass.: privately printed, 1987; rev. ed 1992).

[96] Hersey, *History of Worcester,* 2:379; *Green Hill,* [12].