

Anthracite Enters the American Home

THE story of the development of the Pennsylvania anthracite coal trade with its widespread domestic market is inseparable from an account of its uses. Although *The North American Review* in 1836 referred to Pennsylvania as "the Key-Stone State . . . not solely by reason of its geographical position and its magnitude but on account of its natural resources also,"¹ it was William Bigler, governor of Pennsylvania from 1852 to 1855, who used the phrase "the Key-stone of the Federal Arch" when describing the state's abundant supplies of mineral wealth. The governor called specific attention to Pennsylvania's rich deposits of iron ore and limestone and her extensive bituminous coal seams. He then proudly noted, "Her anthracite coal beds, furnishing a choice and cheap fuel for domestic purposes, for generating steam for the stationary and locomotive engine, as well as for the propulsion of our steamships, give to her a trade almost exclusively her own."²

The major uses for anthracite listed by Governor Bigler were the results of many years of experimentation. Often the work was hampered or delayed by the forces of supply and demand, which depended upon public suspicion or rejection, by lack of capital, inadequate transportation routes, or by technological difficulties. And yet, within the span of four decades, between 1820 and 1860, Pennsylvania anthracite came to be regarded more and more as a household commodity, and as a basic source of power for industry and transportation.

By water, and later by rail, coal found its way to the consumer. In spite of the early arguments advanced in favor of the many uses of Pennsylvania anthracite in industry, the major market for this eastern fuel during the first decade of the trade was the American home. Domestic conversion to anthracite grew steadily until coal was looked upon as a household necessity. Although in 1834 the

¹ *The North American Review*, XLII (1836), 256.

² *Pennsylvania Archives, Fourth Series*, VII, 515, 516.

Pennsylvania Senate reported that "Coal is even yet used by comparatively a small portion of our population," and observed that the use of wood fuel in New York and Philadelphia had kept pace with population growth, it added that between 1830 and 1833 there had been a large increase in the use of coals of all kinds.³ The dependence upon Pennsylvania anthracite fuel by a part of the population of New York was evident as early as 1831-1832 when a hard coal shortage, caused by an unusually severe winter and new demands on the supplies contracted for by dealers, resulted in considerable suffering in that city.⁴

The utilization of anthracite in the home and in public buildings was brought about by a deluge of informative propaganda by advocates of anthracite coal, as well as by new and practical inventions in grates, furnaces, and stoves, and through scientific fuel analyses. Experiments in anthracite heating and later in cooking were encouraged by men of enterprise. Motivated by a desire for profit and by pride in accomplishment, capitalists, speculators, retailers, and politicians enlisted the aid of the scientist, geologist, political economist and journalist in a successful campaign to educate the public in the virtues of anthracite, "the most despised of the combustibles."

Virginia bituminous coal from the James River mines had been available to the West Indies and the eastern seaboard since 1758. Ten years later Great Britain began exporting small amounts of soft coal to the continental colonies and the islands.⁵ Bituminous coal burned easily and never presented the combustion problems of anthracite, but as long as wood remained plentiful and cheap, soft coals were not consumed in any quantity by the eastern towns, with the exception of Richmond. Wood continued to be the chief household fuel of the eastern population centers until the rise of the anthracite trade in the decade of the 1820's. Dr. James Mease, describing Philadelphia in 1811, wrote:

The principal article of house fuel in Philadelphia, is hickory, oak or maple wood. Pine wood is used chiefly by brick burners and bakers. Coal is only

³ *Report of the Committee of the Senate of Pennsylvania upon the Subject of the Coal Trade* (Harrisburg, 1834), 43.

⁴ *Miners' Journal*, Dec. 17, 1831, Mar. 31, 1832.

⁵ H. N. Eavenson, *The First Century and a Quarter of American Coal Industry* (Pittsburgh, 1942), 32-36; C. E. Peterman, "Early House Warming by Coal Fires," *Society of Architectural Historians*, IX (December, 1950).

partially used in dwelling houses, but would be in general demand for counting rooms, offices and chambers, owing to the danger from fire being thereby lessened, if it could be afforded at a rate as cheap as wood. The time is anxiously looked forward to, when the inexhaustible bodies of excellent coal with which our western counties, and Wayne county abound, will be brought down to Philadelphia, by means of that great chain of inland navigation, which has been so long in contemplation, and by the removal of the obstructions in the Lehigh.⁶

During the War of 1812, Dr. Mease, then secretary of the Philadelphia Society for Promoting Agriculture, received specimens of anthracite from Luzerne County sent by Jacob Cist of Wilkes-Barre, an early entrepreneur of the anthracite trade. Cist urged the building of a canal between the Delaware and the Susquehanna so that Philadelphia could be supplied with gypsum and anthracite. Anthracite, shipped by way of the Susquehanna to tidewater and thence coastwise to New York City, had found there a limited but promising market. Cist, undoubtedly interested in promoting a Philadelphia household market for his anthracite, touched upon a theme that was to prevail in the arguments of coal masters for many years. He argued that excellent, cheap fuel was as important to man as water, and by providing it the coal merchant was able to aid the needy, and make a profit at the same time. "How many miserable wretches, who shiver over your wood fires, which costs them 6 and 8 dollars per cord, could be made comfortable at half the price? Much of the coal from here is shipped at Havre de Grace or at tide, for New York, and readily commands 50 per cent per bushel more than the best Liverpool coal."⁷

How well the pen of Franklin could have served the anthracite interests, for if Franklin was not the first practical scientist and propagandist in home heating, he certainly was the most famous. Desirous of little more than a warm home to keep him and his family safe from the chill of winter, Benjamin Franklin had conceived of the "Pennsylvania Fireplace," or Franklin stove. He did not patent the invention, but gave the model to Robert Grace, who manufactured

⁶ James Mease, *The Picture of Philadelphia* (Philadelphia, 1811), 125.

⁷ *Memoirs of the Philadelphia Society for Promoting Agriculture, Containing Communications on Various Subjects in Husbandry and Rural Affairs* (Philadelphia, 1814), III, 141.

these cast-iron fireplaces at his Chester County furnace.⁸ To help Grace sell the product, Franklin turned pamphleteer and, through the subtlety of a learned treatise, advertised his contrivance for comfort. Cold drafts or great, bright fires were both dangerous to health, Franklin wrote. The ladies, in particular, were constant victims of "rheums," defluxions resulting in loss of teeth and shriveled skin caused by improper heating apparatus. After this artful appeal to woman's vanity, Franklin listed fourteen advantages of his invention and gave detailed instructions on how to install it. He then closed with the most conclusive argument of all: rooms were warmer with one quarter the amount of fuel.⁹ The "Pennsylvania Fireplace," invented in 1740, was designed to burn wood, the common fuel of the colonies. Later, while in England, Franklin perfected a stove which burned soft coal and consumed much of the annoying smoke.¹⁰ During the early years of the anthracite trade, however, when Pennsylvania hard coals were tried in Franklin's inventions and in the old ten-plate stoves, incomplete combustion resulted in waste and expense.¹¹

In the valleys of eastern Pennsylvania anthracite was used in many smiths' forges prior to 1800. In 1788 Jesse Fell of Wilkes-Barre experimented with anthracite in his nailery and found it to be a cheap, profitable fuel. The inhabitants of Wilkes-Barre firmly believed, however, that anthracite could not be used as a domestic fuel, because if not subjected to a forced draft, it would stop burning. This local opinion had been sustained by a trained scientist of the University of Pennsylvania, James Woodhouse. In 1805 Dr. Woodhouse tested Lehigh anthracite. His experiments, the first of their kind in the United States, proved anthracite's superiority over Virginia bituminous when long, continued periods of heat were needed.

⁸ Carl Van Doren, *Benjamin Franklin* (New York, 1938), 117. For an excellent, well-illustrated popular history of early heating apparatus, see Josephine H. Peirce, *Fire on the Hearth. The Evolution and Romance of the Heating Stove* (Springfield, Mass., 1951). The oldest known model of the Franklin stove is now in the possession of the Bucks County Historical Society.

⁹ Van Doren, 141-142.

¹⁰ *Ibid.*, 728.

¹¹ J. T. Scharf and Thompson Westcott, *History of Philadelphia* (Philadelphia, 1884), III, 2271.

Anthracite could be used to advantage in distilling, evaporating large quantities of water, melting metals, subliming salts, generating steam, and also for washing, cooking, and home heating, “. . . provided the fireplaces are constructed in such a manner, as to keep up a strong draught [*sic*] of air.”¹²

Jesse Fell was not one to conform to local opinion. What is more, he was probably ignorant of Woodhouse's experiments. In 1808 Fell constructed a crude ten-inch iron rod grate, stumbled upon the principle of the minimum draft, and began a revolution in home heating. Many years later he described his experience with anthracite: “I had for some time entertained the Idea that if a sufficient body of it was ignited it would burn; accordingly in the month of February 1808 I procured a Grate made of Small Iron rods, 10 inches in depth and 10 inches in height, and I set it up in my common room fireplace and on first lighting it found it to burn excellently well. This was the first successful attempt to burn our Stone Coal in a Grate, so far as my knowledge extends.”¹³

There is evidence that Fell was not the first to contrive the use of the grate, for as early as 1800 the ingenious Oliver Evans had succeeded in burning anthracite in an open grate without an artificial draft.¹⁴ Dr. Thomas C. James of Philadelphia heated his living room with an anthracite fire during the winter of 1804, and continued to use hard coal for more than twenty years. He predicted that someday anthracite would become the domestic fuel of the city.¹⁵

It was Fell's grate, however, which gained popularity in the Wyoming Valley and led to the first successful venture of the anthracite coal trade in Pennsylvania. Abijah Smith and Company of Plymouth, Pennsylvania, realized that in order to sell its coal the means for burning it must be sold first. The two brothers, Abijah and John, who formed the company, came to Columbia, Pennsylvania, in the spring of 1808, bringing with them several tons of coal and some skilled masons who constructed Fell's grates in a number of public

¹² James Woodhouse, M.D., “Experiments and Observations on the Lehigh Coal,” *The Philadelphia Medical Museum*, I (1805), 444.

¹³ Jesse Fell to Jonathan Fell, Dec. 1, 1826, The Historical Society of Pennsylvania (HSP).

¹⁴ *Manufactures of the United States in 1860, Compiled from the Original Returns of the Eighth Census* (Washington, 1865), clxx.

¹⁵ T. C. James, M.D., “A Reminiscence” (manuscript), HSP.

places. The Smiths then gave demonstrations of burning Wyoming anthracite. Convincing the skeptics with these public exhibitions, the pioneer company found a domestic market for its fuel in the towns along the Susquehanna. Some of their coal was taken down to Baltimore and shipped to New York. Although others entered the field, by 1820 the coal trade of the Wyoming region totaled only ten thousand tons.¹⁶

Public demonstrations and sworn testimonials were commonly resorted to by early coal traders. When the year 1814 found Lehigh coal being hawked in the streets of Philadelphia for fourteen dollars a ton, its virtues were advertised by handbills in German and English and by affidavits signed by Philadelphia blacksmiths who had been prevailed upon, with difficulty, to use it. Jacob Cist, who had shown such concern for the "miserable wretches, who shiver over . . . wood fires" in Philadelphia, hauled a model stove from door to door, begged home owners to permit him to test anthracite in stoves constructed to burn Liverpool coal and, for good measure, bribed journeymen in blacksmith shops to use his Lehigh fuel.¹⁷

Following the War of 1812, the early, almost unnoticeable anthracite trade of Philadelphia and its environs was submerged in a return to Virginia and English bituminous coal. Unless cheap transportation could be found for anthracite, it could not hope to compete with wood or the free-burning, water-borne bituminous. Inadequate and expensive transportation to potential markets, coupled with prevailing ignorance and suspicion of hard coal, created overwhelming obstacles of price and prejudice.

When improvements in navigation on the Lehigh and Schuylkill rivers brought anthracite to tidewater, the eastern market expanded and prices gradually fell. Anthracite producers, individual and corporate, made a fetish out of the quest for new uses for their product, particularly in manufacturing. But during the 1820's and early 1830's they remained conscious of the fact that the demand for anthracite was dependent chiefly upon household consumption. Producers

¹⁶ William Griffith, "The Proof that Pennsylvania Anthracite Coal was first shipped from the Wyoming Valley," *Proceedings and Collections of the Wyoming Historical and Geological Society*, XIII (1913-1914), 65-70.

¹⁷ Charles Miner to Samuel Packer, Nov. 17, 1833, from the *Report of the Committee of the Senate of Pennsylvania upon the Subject of the Coal Trade*, 95; J. L. Bishop, *A History of American Manufactures from 1608 to 1860* (Philadelphia, 1864), II, 185.

eagerly encouraged technical improvements in grates and stoves and welcomed the chemist and inventor to their cause.

While the coal trade was still in its infancy, Marcus Bull, a champion of anthracite coal, conducted "Experiments to determine the comparative quantities of Heat evolved in the combustion of the principal varieties of Wood and Coal used in the United States, for Fuel. . . ." His paper was read before the American Philosophical Society on April 7, 1826, and was summarized in the first volume of the *Journal of the Franklin Institute*, then known as *The Franklin Journal and American Mechanics Magazine*.¹⁸ The article began on a note of pessimism for all coal users and dealers: "The principal article of fuel used in the United States, is forest wood, which, from necessity, or choice, will continue to be so, in many sections of the country, notwithstanding the abundant supply of anthracite and bituminous coal, already discovered in some of the states." Anthracite was difficult to burn in open grates. Until this problem was overcome, said Bull, there could be no general introduction of anthracite for home heating. This early heating engineer then made some encouraging suggestions for the improvement of grates currently in use. Contrary to popular belief, anthracite did not need a strong draft to burn effectively. In fact, a rush of air would destroy the fire since it tended to reduce the temperature and hamper combustion. Deeper grates and enclosed ash pits to heat a light draft would solve the basic problem. He concluded his lengthy treatise with the plea that furnace manufacturers read his statements with care.

Marcus Bull was convinced that anthracite possessed great utility in the arts as well as in the home. When confronted with experiments favoring bituminous and wood fuels, he defended himself in another pamphlet,¹⁹ repeating his earlier findings and supporting his contentions with public testimony from a pamphlet issued by the Lehigh

¹⁸ Marcus Bull, "Experiments to determine the comparative quantities of Heat evolved in the combustion of the principal varieties of Wood and Coal used in the United States, for Fuel; and, also, to determine the comparative quantities of Heat lost by the ordinary apparatus made use of for their combustion," *American Philosophical Society Transactions*, New Series, III (1830), 1-63; *Journal of the Franklin Institute*, I (1826), 285-289.

¹⁹ Marcus Bull, *An Answer to "A short reply to 'A defence of the experiments to determine the comparative values of the Principal varieties of fuel, etc' by one of the Committee of the American Academy"* (Philadelphia, 1828).

Coal and Navigation Company.²⁰ Anthracite, argued the scientist, had been proved not only in the laboratory, but in the shops, forges, and homes of delighted consumers. His remarks were an unusual combination of scientific investigation and blatant pamphleteering, but they contributed to the strengthening of the early anthracite market.

Ideas for anthracite stoves, ovens, and furnaces, singly or in combinations, developed side by side with improved grates for open fires. The greatest boom in such innovations came between 1828 and 1835, but applications for patents continued year after year.²¹ A prolific inventor in this field was the remarkable Reverend Dr. Eliphalet Nott. A century ago the name of Eliphalet Nott was a familiar one, for he was one of those significant figures, outside the realm of politics, who was frequently in the public eye.²² President of Union College for sixty-two years, he attained a national reputation as an educator, pulpit orator, prohibitionist, and practical inventor. Nott's first patent for a rotary grate for burning anthracite and for shaking the ashes was granted in March, 1826, revised and improved in 1828 and in 1832.²³ He next turned his attention to anthracite stoves, and in June, 1833, applied for and was issued eleven patents on an improved coal stove.²⁴ Over the years Nott patented thirty different types of stoves and was the chief power behind H. Nott and Company, leading stove manufacturer of the day.²⁵

Grate and stove manufacturers mushroomed in the eastern cities. The more rigorous the climate, the more numerous and prosperous they seemed to become. One offered a grate of Boston origin, guar-

²⁰ *Facts Illustrative of The Character of The Anthracite or Lehigh Coal, found in the Great Mines at Mauch Chunk, in possession of the Lehigh Coal and Navigation Company, With Certificates from Various Manufacturers, proving its decided superiority over Every Other Kind of Fuel* (Philadelphia, 1824).

²¹ See the *Journal of the Franklin Institute*: IX (1830), 136, 145-148; X (1830), 78; XV (1833), 99-100, 172-174; XVI (1833), 87, 106-108, 404-407; XVII (1834), 395; XVIII (1834), 200-202; XIX (1835), 205; and succeeding volumes XX (1835) to LXX (1860); *7th Annual Report of the American Institute of the City of New York* (1849), 119.

²² D. R. Fox, *Dr. Eliphalet Nott (1773-1866) and the American Spirit. A Newcomen Address* (Princeton, N. J., 1944).

²³ *Journal of the Franklin Institute*, XV (1833), 172-174.

²⁴ *Ibid.*, XVI (1833), 404-407.

²⁵ Fox, 11.

anteed to eliminate dust and falling ash²⁶; others announced the newest virtues of their particular coal stoves. Advertisements of this kind dotted the pages of the newspapers in the major coastal cities of the northeast.²⁷ Hazard's *Register of Pennsylvania* encouraged the use of anthracite stoves in 1828,²⁸ the same year the first anthracite stove manufacturer, Williamson and Paynter, opened its doors in Philadelphia.²⁹ "By adopting stove furnaces and pipes, they can dispense with chimnies [*sic*] and fire places, and the removal of soot, and obstructions by sweeping will not be required."³⁰ To Samuel Hazard and to many New Yorkers, Philadelphians, and Bostonians who could afford the new fuel and the new apparatus, the millennium in home comfort had arrived.

Although heating stoves never completely took the place of the open grate in the period before the Civil War, they became common equipment for home heating in the urban areas. Central heating was slower to develop, but the concept was an old one. Daniel Pettibone had invented a "rarefying air stove," or hot air furnace, in 1810. The furnace was adopted by some home owners and installed in a few public buildings. The Philadelphia Bank, the Almshouse, St. Augustine Roman Catholic Church in Philadelphia and the House of Representatives in Washington used Pettibone's apparatus. This was a wood burner; it remained for Professor Walter R. Johnson of the Franklin Institute to apply anthracite to the air furnace in 1825. Johnson, later to become one of the nation's authorities on fuel analysis, placed his furnace in the cellar and piped out the smoke and gases through drums which penetrated the first, second, and third stories.³¹ Johnson's furnace was adopted in public buildings when the smaller coal stoves proved troublesome and expensive. The Eastern State Penitentiary in Philadelphia installed this type furnace and warmed twenty cells simultaneously.³² One may assume that by the decade of the fifties, most public buildings utilizing mineral coal

²⁶ Samuel Hazard, ed., *The Register of Pennsylvania*, XIV (1835), 141.

²⁷ See various issues, 1830 to 1860, of *The Pennsylvanian*, *Philadelphia North American*, *Public Ledger*, *Boston Daily Advertiser*, *New York Commercial Advertiser*.

²⁸ Hazard's *Register of Pennsylvania*, I (1828), 312.

²⁹ Scharf and Westcott, III, 2272.

³⁰ Hazard's *Register of Pennsylvania*, I (1828), 312.

³¹ Scharf and Westcott, III, 2271.

³² *Pennsylvania House Journal*, II (1829-1830), 549.

for fuel used an adaptation of the air furnace in central heating. Many did, including the House of Refuge in Philadelphia and the Treasury buildings in the capital.³³ But the humble grate remained popular. As late as 1859 the proprietors of New York's Fifth Avenue Hotel, the "Palace of the People," announced with pride that each room had been equipped with a modern open fireplace grate perfected by a Pittsburgh manufacturer, and called attention to the aesthetic beauty of an open coal fire filling the room with warmth, "mirth and sociability."³⁴

It was not long after the acceptance of Pennsylvania anthracite as a clean, efficient fuel for "store and parlour" that kitchen fuel experiments began. Two Philadelphians, James Vaux and Thomas Mitchell, among the first to proclaim the advantages of anthracite coal grates in home heating, recommended open kitchen grates for cooking and offered original designs to the public. Mitchell used a slip grate to regulate the amount of coal. A top of ordinary sheet iron radiated the heat of the fire. "No stoop, no smoke, no odors—little care and less fuel" might have been the slogan of these early practical improvers, for their articles noted the above advantages, in a more dignified manner, of course.³⁵ The editor of the *Journal of the Franklin Institute*, commenting upon Mitchell's grate, believed "that the time will soon arrive, when our servants will, if required to use wood for cooking fires, object to it on account of the difficulty in managing it."³⁶

Elaborate grates, often necessitating the revamping of chimneys, were set permanently in kitchen fireplaces of some wealthy homes and exclusive hotels in Philadelphia, New York, and Boston. Anthracite was the fuel of the fashionable, who turned not a coal themselves, but hired servants to prepare fire and food.³⁷

Mine owners were confident of a great increase in anthracite consumption by the introduction of their fuel for culinary purposes. The

³³ *Pennsylvania Legislative Documents* (1857), 718; *Senate Executive Document*, No. 31, 32nd Cong., 2nd Sess., contains an item regarding the fuel used in the Treasury buildings in Washington during 1852: 149 tons of anthracite; 158 tons of bituminous.

³⁴ *Scientific American*, New Series, I (July 2, 1859), 6.

³⁵ *Journal of the Franklin Institute*, II (1826), 293-295; III (1827), 121-122.

³⁶ *Ibid.*, III (1827), 123-124.

³⁷ *New York Evening Post* and *Boston Courier*, reprinted in the *Miners' Journal*, Apr. 28, 1827, and Oct. 18, 1831.

Miners' Journal voiced the opinion that in 1829 not one person in ten knew anything about anthracite for cooking, but that by 1830 nine out of ten had become authorities on the subject.³⁸ Although consumption did increase, Schuylkill County producers were not satisfied with the kitchen grate. "The expensive and complicated contrivances hitherto presented to the public for cooking with anthracite coal, have been a great barrier to the introduction of this economical fuel in the culinary department," said their trade organ. The large cities were urged to take note of Pottsville inhabitants eating their steaming dinners, hot off coal fires burning under two hundred anthracite grates. These grates were simple and economical, the *Journal* stated, selling for about ten dollars each.³⁹ Mine operators in Pottsville subscribed one hundred dollars to be donated to the Franklin Institute for encouraging the invention of an anthracite cook stove, the price not to exceed ten dollars. Although the Franklin Institute offered the cash inducement and promised a silver medal to the winner,⁴⁰ the suggested price was still difficult to meet. Hazard's *Register* continued to lament the high cost of all anthracite appliances, and to urge that anthracite coal stoves, kitchen grates, and simple baking ovens be put on the market within the reach of all.⁴¹ The Board of Managers of the Fuel Savings Society of Philadelphia announced that anthracite should be the fuel of the poor. This would be possible, however, only if a cheap apparatus were constructed for burning coal in common room and kitchen. The board set the price of an anthracite stove at six dollars, and promised a dividend to anyone inventing such an economical unit.⁴² New York formed a fuel committee which posted a prize of fifty dollars for a cheap cooking grate utilizing anthracite coal. Schofield and Hall of Poughkeepsie won the award and that season promised to market from six hundred to one thousand anthracite kitchen grates retailing for about four dollars each.⁴³

³⁸ *Miners' Journal*, Mar. 13, 1830.

³⁹ *Ibid.*, Aug. 6, 1831.

⁴⁰ *Ibid.*, Mar. 19, 1831; *Journal of the Franklin Institute*, XII (1831), 1-2.

⁴¹ Hazard's *Register of Pennsylvania*, VII (1831), 238; for a similar article, see also *Poulson's American Daily Advertiser*, Oct. 15, 1831.

⁴² Hazard's *Register of Pennsylvania*, VIII (1831), 127-128.

⁴³ *New York Evening Journal*, reprinted in the *Miners' Journal*, Sept. 17, 1831.

Stimulation of new and cheaper technical improvements increased demand. At the same time, better transportation and competition with other fuels, especially wood, brought down the price of coal when the mineral fuel was in good supply. The cost of coal, like the cost of wood, was influenced by a multitude of variables, including supply, demand, kind, and climate.⁴⁴ New York consumed more than fifty thousand short tons of anthracite in 1832-1833, worth \$513,797, and almost two hundred and sixty-six thousand cords of wood valued at \$615,914.⁴⁵ In January, 1836, anthracite averaged between eight and ten dollars a ton in New York City, while hickory wood, delivered, brought \$3.25 per cart load, and oak, \$2.50.⁴⁶

Prices in Philadelphia varied as much as in New York.⁴⁷ *Poulson's Advertiser* in 1831 estimated fuel consumption for an inexpensive anthracite stove for one season to be about \$4.50, and the cost for firewood to heat the open hearth at twenty-one dollars per season. Small wonder that the coal masters pressed for cheap grates and stoves. During the cold fall of 1829, anthracite along the Schuylkill was scarce because of better prices at tidewater. Most of it was shipped to Philadelphia where it brought nine dollars a ton. The *Reading Chronicle* growled over being ignored by the passing coal boats, but took comfort in hickory wood which was selling for four dollars a cord. "Huzzah for Old Hickory," cheered the disgruntled *Chronicle*.⁴⁸

One of the early retail coal yards in Philadelphia, the J. Donaghy firm, still doing business today as Donaghy and Sons, sold anthracite egg for three dollars a ton in 1837, four dollars a ton in 1845, and \$4.50 a ton in 1853.⁴⁹ The Boltons at Callowhill Street wharf retailed Schuylkill coal from 1827 to 1830 for six dollars per ton, excluding cartage.⁵⁰ In the fifties, J. F. and S. Jones of Germantown held their

⁴⁴ For average retail prices of anthracite coal on the New York market, per ton of 2,000 pounds, see *House Executive Document*, 38th Cong., 1st Sess., VI (1863-1864), 362-401. Prices varied with the season and were not consistent. Sometimes the highest price was in June or July, and not at the peak of the winter season.

⁴⁵ Hazard's *Register of Pennsylvania*, XI (1833), 289.

⁴⁶ *New York Commercial Advertiser*, Jan. 13, 1836.

⁴⁷ Anne Bezanson, R. D. Gray, and Miriam Hussey, *Wholesale Prices in Philadelphia, 1784-1861* (Philadelphia, 1936), Pts. I and II, *passim*.

⁴⁸ Reprinted in the *Miners' Journal*, Oct. 31, 1829.

⁴⁹ Coal Yard Receipts, Donaghy and Sons, Philadelphia.

⁵⁰ Eyre-Ashurst Papers, Historical Society of Schuylkill County.

prices between four and five dollars on egg, nut, and stove coal, but with inflation during the last years of the Civil War, Philadelphia retail coal prices soared to as high as fourteen dollars a ton.⁵¹

Despite price inconsistencies, the coal trade of the state expanded rapidly. Anthracite production rose from less than eighty thousand tons in 1827 to approximately two hundred and fifty-eight thousand tons in 1831.⁵² This amount, however, fell far short of the demand during the winter of 1831-1832 in the two great anthracite marts of Philadelphia and New York. Schuylkill coal, a drug on the Philadelphia market at five dollars during the mild fall days of 1831, couldn't be had at double its usual price by late November. The consumption of the little towns of Connecticut alone was equal to that of Philadelphia four years before.⁵³ The demand on the mines was unforeseen. Reserve supplies were soon exhausted. When winter closed the water routes, the northeast experienced its first anthracite coal shortage. Coal operators had completely misjudged the market. In order to meet the new demands, production was doubled, reaching the half-million mark the following year.⁵⁴

Ignoring contributory causes for the shortage in 1831-1832, Philadelphia fixed the blame on the rapid adaptation of anthracite for cooking.⁵⁵ Purchases had been light that fall, and independent operators gauged production according to contracts with coal agents. The large corporations, furthermore, were hesitant to overproduce. With the chill of early winter and continued bitter weather, anthracite was needed not only to feed the new kitchen grates, but to supply the parlor stove. Moreover, manufacturers had begun to use anthracite in larger and larger amounts for steam. The combination of severe weather plus the concentrated efforts of the anthracite interests to increase the popularity and the uses of their fuel in home and factory descended upon the coal market with an unexpected suddenness.

Many New Yorkers resented the shortage and accused the mine operators of speculation. Congress was petitioned to repeal the duty

⁵¹ Ledgers, J. F. and S. Jones, Germantown.

⁵² Eavenson, 498.

⁵³ *Philadelphia Saturday Bulletin*, Nov. 26, 1831, reprinted in the *Miners' Journal*, Dec. 3, 1831.

⁵⁴ Eavenson, 498.

⁵⁵ *Philadelphia Saturday Bulletin*, Nov. 26, 1831.

on foreign coal. Some "traitorous" Philadelphians supported the New York petition.⁵⁶ There was legitimate foundation for complaint. Although Lehigh prices remained fairly steady, Schuylkill operators and the Delaware and Hudson Company of the Lackawanna district sold low when the market was slow and boosted prices when the shortage ensued. Prices soared to ridiculous heights. Anthracite brought as much as sixteen dollars a short ton on the New York market, the highest price to be recorded in thirty-five years of the New York anthracite coal trade.⁵⁷ Part of the blame for the price rise should be placed on the boatmen, who, like the mine owners, took advantage of the rising market and increased their freight charges.⁵⁸ By spring the coal shortage had eased in Philadelphia and anthracite sold on the average of seven dollars per ton, but the Pennsylvania fuel was still scarce in New York and what was available there brought twelve dollars a ton.⁵⁹

In scarcity or in plenty, the new fuel was accepted on an ever-increasing scale. Domestic consumers became aware of the various kinds of anthracite on the market and made purchases with care. Dealers seldom advertised "anthracite coal," but used the names of the district or mines from which the coal came. Lehigh, Schuylkill, or Lackawanna coal could be found side by side with Liverpool and Virginia coal in the urban markets. More specifically, red ash and white ash coals were noted, and prices varied with the brands.⁶⁰ An inferior quality of surface coal brought to the New York market in 1829 by the Delaware and Hudson Canal Company was quickly detected by the public, whose confidence in this new anthracite was immediately shaken. It took the company an entire season to campaign against this unsavory beginning.⁶¹ The *New York Constellation* warned coal buyers against unscrupulous dealers who would cheat them by short measure or adulteration with slate. In very poor poetry, the *Constellation* offered words of advice to its readers. Some of the lines of this bit of practical humor are worth quoting:

⁵⁶ *Miners' Journal*, Jan. 7, 14, 28, 1832.

⁵⁷ *House Executive Document*, 38th Cong., 1st Sess., VI (1863-1864), 362-401.

⁵⁸ *Miners' Journal*, Mar. 17, 1832.

⁵⁹ *Bicknell's Reporter*, Apr. 9, 1832, reprinted in the *Miners' Journal*, Apr. 28, 1832.

⁶⁰ For examples, see *Poulson's American Daily Advertiser*, January through February, 1831.

⁶¹ *Annual Report of the Board of Managers of the Delaware and Hudson Canal Company to the Stockholders* (1831), 5.

Rules for Buying and Burning Anthracite Coal
Done into Verse

But if your coals a quick ignition take!
And being lighted, show a lambent flame,
Of yellow, orange, or rose colored taint,
Still playing calm and gentle o'er the surface,
Like smiles upon the gentle face serene;
And if the ashes prove, instead of white,

A reddish brown, soft, fine, impalpable;
And if the fire once lit, continue long,
Glowing and lively, sending forth the heat;
The Coal is good and fit to warm the hearths,
Of honest men. Make haste to purchase more,
If more there be, and you are not supplied.

The poem rambled on, explaining in detail the use of grate and poker and commenting on the proper measurement of coal.⁶²

New Yorkers preferred the red ash anthracite from the Peach Mountain and Peach Orchard mines of Schuylkill County and later from the rich Swatara regions of Pine Grove. Its price was slightly more than the common white ash because of increased mining costs—the coal was found in thin seams and was difficult to work. Home owners using open grates found that the ashes did not rise rapidly when the fire was shaken. Easy to ignite, red ash burned best in open grates. Some contended it did not chap the hands or take the varnish from fine furniture as did the white ash. Red ash for the open grate remained the favorite coal of Father Knickerbocker for more than thirty years.⁶³ White and grey ash anthracite were popular fuels for the closed stoves and furnaces. Lackawanna coal first catered to the domestic market, but found its largest sale in manufacturing plants and later as steamboat fuel.⁶⁴

The medical advertisements in the city newspapers or town journals of a century ago offer ample proof that Americans then, like Americans today, were vitally concerned with their physical well-

⁶² Reprinted in the *Miners' Journal*, Feb. 25, 1832.

⁶³ *New York Journal of Commerce*, September, 1835, to January, 1836; *American Railroad Journal*, VII (Aug. 15, 1841); *Miners' Journal*, Sept. 26, 1846; Coal Notes, Aug. 21, 1856, William Jackson Palmer Papers, Colorado State Historical Society.

⁶⁴ W. R. Johnson, *The Coal Trade of British America with Researches on the Characters and Practical Values of American and Foreign Coals* (Philadelphia, 1850), 178.

being. Many citizens were deeply troubled over the effects of anthracite fires upon health. From time to time accounts were printed of the near-fatal effects of escaped coal gas caused by improperly installed stoves. In 1831 the Common Council of the City of New York narrowly missed annihilation when fires were started with the valves closed in the three anthracite stoves used to heat the council chambers.⁶⁵ Henry C. Carey, formerly an outstanding free trader who became the high priest of protectionism and the patron saint of the tariff, was gently chided by a friend for paying so little heed to his health: "Perhaps your not being quite as well as usual may not be *wholly* owing to writing. I dare say it arises in part from this occupation being carried on in a room with a temperature, from anthracite coal (dry and unwholesome) somewhere near 75 or 78. You ought to hear our Cousin Charlotte talk against the hard coal fires, and tell of the injury thereby done to Eye-sight, hair, complexion and nerves."⁶⁶ Whether or not Carey heeded these warnings after returning from an ocean voyage is difficult to say. Since Carey gained considerable revenue from coal lands, one doubts if he quenched his coal fires, but rather continued to warm his bones and pen his tracts before the cheerful glow of an anthracite stove.

The opinions of Carey's friends, if not common, were shared by more than a few. One irate New Yorker unleashed a tirade against the anthracite furnace, crying out that this curse of mankind should be abolished: ". . . furnaces in private dwellings will hourly destroy the health of our women and children." He was convinced that hot air contributed largely to the cemeteries and increased the number of "bald heads, decayed teeth and black-craped hats."⁶⁷

Investigation of such health hazards were conducted in the thirties,⁶⁸ and inquiry was still being made after the Civil War. Dr. George Derby, surgeon in the Boston City Hospital and Harvard Professor of Hygiene, wrote a small book in 1868 on home heating and the effects of anthracite coal fires on health. He concluded that it was not the lack of moisture in anthracite heated homes which had

⁶⁵ *Poulson's American Daily Advertiser*, Feb. 3, 1831.

⁶⁶ Caroline Tyler to Henry C. Carey, May 4, 1857, Henry C. Carey Papers, Edward Carey Gardiner Collection, HSP.

⁶⁷ J. C. Battersly to editors, *Scientific American*, I (July 9, 1859), 20.

⁶⁸ H. D. Rogers and A. D. Bache, "Analysis of some of the Coals of Pennsylvania," *Journal of the Academy of Natural Sciences*, VII (1834), 3-12.

a depressing effect, but the escape of noxious gases, namely, colorless and odorless carbonic oxide gas (carbon monoxide). Headaches, listlessness, and dullness were the result; death could be induced by prolonged exposure to the fumes. Derby prescribed a remedy: install a wrought-iron furnace, for gases seeped from the pores of cast-iron stoves when overheated.⁶⁹

For every critic extolling the salubrious advantages and restful beauty of a crackling wood fire and condemning the hazards of anthracite, there were a thousand champions of the mineral fuel. By the mid-forties wood had lost the battle; there was little doubt that anthracite was looked upon as a necessity for the homes of rich and poor alike in the cities and towns of the northeast.⁷⁰ An article in Freeman Hunt's famous *Merchant Magazine* eulogized the anthracite of Pennsylvania and urban dependence upon it: "Commerce is President of the Nation and Coal her Secretary of State." Emphasizing that bituminous coal was little used and almost unknown among domestic buyers of the northern seaboard cities, the article continued in that wonderful, melodramatic style employed by the journals of the day:

We could do without the gold of California, for it does not add a single comfort to the life of a man; but we could not do without our coals. The Kookinoor diamond is valued at 2½ million—a sum which could purchase 500,000 tons of coal. If this diamond were dropped into the depths of the sea and lost forever, no one in the world would suffer for a single useful article the less; but if 500,000 tons of coal were prevented from coming to New York this summer, 200,000 people would be reduced to a state of intense suffering during next winter. Coals, then, are the real diamonds of our country.⁷¹

In the towns and cities of the northeast, from Baltimore to Boston and west by way of the Hudson and Mohawk valleys to Buffalo, the importance of anthracite as a domestic fuel increased in each succeeding decade. A network of canals and railroads carried the new fuel from the Pennsylvania mines to the great coal marts of Philadelphia and New York for immediate consumption or for transshipment

⁶⁹ George Derby, M. D., *Anthracite and Health* (Boston, 1868), 1–76.

⁷⁰ Freeman Hunt, ed., *The Merchant Magazine and Commercial Review*, XXXII (1855), 256; *Annual Report of the Chamber of Commerce of the State of New York For the Year 1859* (New York, 1860), 64.

⁷¹ Hunt's *Merchant Magazine*, XXX (1854), 248–249.

to other ports here and abroad. More than eight million tons of anthracite were produced by Pennsylvania in 1860. Anthracite mining was a Pennsylvania monopoly by virtue of nature and political boundaries; her closest competitor was Rhode Island with an annual output of a mere one thousand tons. Pennsylvania's eight million tons represented well over half of all the various coals mined in the United States in that year, statistical evidence that the coal of the "coal age" referred to by the writers of the period usually meant Pennsylvania anthracite.⁷²

As Governor Bigler had said, anthracite was used as steam coal for manufacturing and to fire the boilers of steamboat and locomotive. Anthracite iron introduced a new era in heavy industry. Each new discovery and perfection in the utilization of hard coal is a story in itself. But it was the use of anthracite in the home which first caught the popular fancy and the imagination of the early entrepreneurs. And it was the domestic consumption of the fuel which remained the basis for the continued expansion of the anthracite industry to the first decade of our present century.

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⁷² *Eighth Census, Manufactures*, clxiii-clxiv.