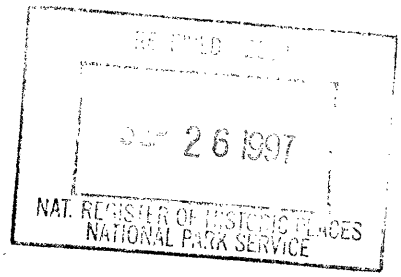
NPS Form 10-900-b
(Revised March 1992)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form



cover

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Complete each item by entering the requested information. For additional space, use continuation sheets (Form 10-900-a). Use a typewriter, word processor, or computer to complete all items.

X New Submission ___ Amended Submission

A. Name of Multiple Property Listing

Anthracite-Related Resources of Northeastern Pennsylvania, 1769 - 1945

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

Anthracite Industry in Northeastern Pennsylvania, 1769 - 1945

C. Form Prepared by

name/title Patrick W. O'Bannon, Ph.D., Martin Abbot, Susan Nabors, James Parkinson

organization Kise Franks & Straw, Inc. date August 1997

street & number 219 N. Broad St., 9th Floor telephone (215) 561-1050

city or town Philadelphia state PA zip code 19107

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. (☐ See continuation sheet for additional comments.)

Brent D. Glass Dr. Brent Glass, Exec. Dir. 9/11/97

Signature and title of certifying official Date

PA Historical and Museum Commission

State or Federal agency and bureau

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Edson H. Beall 10/24/97

Signature of the Keeper Date of Action

NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET
Anthracite-Related Resources of Northeastern Pennsylvania; 1769 - 1945

Table of Contents

SECTION E: STATEMENT OF HISTORIC CONTEXTS

Table of Contents

E. STATEMENT OF HISTORIC CONTEXTS

I. INTRODUCTION

Statement of Significance

The anthracite coal industry of northeastern Pennsylvania, along with the closely related anthracite iron industry and the anthracite canals and railroads that delivered the output of the mines and factories to markets outside the region, is nationally significant. Areas of significance include architecture, commerce, community planning and development, economics, education, engineering, ethnic heritage, industry, politics/government, social history, and transportation.

The anthracite industry played a critical role in the expansion of the American economy during the second quarter of the nineteenth century. The decade between 1839 and 1849 marked the most rapid expansion of the economy's manufacturing sector in the nineteenth century. The opening of the anthracite fields directly influenced this critical development and helped "determine the timing and process of accelerated growth and institutional change in American manufacturing and mining."[1]

Anthracite coal fueled the modernization of the American iron industry east of the Alleghenies. It facilitated sharply increased production at rapidly falling prices. By 1844 anthracite produced the cheapest iron ever made in America. This iron became railroad rails, stoves, household furnaces, agricultural machinery, and a host of other products whose manufacture is considered central to the industrial revolution in the United States.

Anthracite offered manufacturers an inexpensive alternative to waterpower, facilitating the widespread adoption of steam power and the spread of factory production. The lack of coal was probably the most significant technological constraint holding back the spread of the factory in the United States. In Great Britain, the adoption of coal as the principal industrial fuel occured earlier than in the United States, largely because of the deforestation of the British countryside and the vital need to develop a substitute fuel for wood and charcoal. As a result, the British led the United States in the adoption of steam engines, the development of automated machinery, the use of factory production methods, and the development of improved iron-making techniques.[2] The opening of the anthracite fields lifted this constraint upon American industry and helped initiate a period of unprecedented growth within the manufacturing sector of the nation's economy beginning in the 1830s. Steam factories, placed in cities where coal was delivered by water, were closer to raw material supplies and markets. These factories provided work to the increasingly important new labor supply comprised of European immigrants.

---

[1] Alfred D. Chandler, Jr., "Anthracite Coal and the Beginnings of the Industrial Revolution in the United States," *Business History Review* 46 (1972): 179.

[2] Victor S. Clark, *History of Manufactures in the United States*, 3 vols. (New York: Peter Smith, 1949), 1:243; George Rogers Taylor, *The Transportation Revolution: 1815-1860*, vol. 4 of *The Economic History of the United States* (New York: Holt, Rinehart & Winston, 1951; White Plains, NY: M.E. Sharpe, n.d.), 224-226.

Anthracite also occupied by prominent role within the non-industrial sectors of the economy. It became, starting in the 1830s, the major fuel source for residential heating and cooking in the northeastern portion of the nation. The adoption of anthracite solved the fuel crisis confronted by northeastern cities in the 1820s and helped make possible the rapid expansion of these urban areas.

The location of the anthracite fields, behind mountain barriers a considerable distance from urban centers, necessitated heavy investments in transportation systems in order to deliver the coal to market. Owners of coal lands first began building canals into the region in the 1820s. As these canals came into service the output of anthracite soared, from almost nothing before 1825 to 290,600 tons in 1830.[3] The anthracite industry pioneered the development of railroads in the United States. Some of the earliest rail lines in the country hauled anthracite from remote mines to canals. Spurred by developments in the iron industry, themselves a result of the expansion of the coal industry, railroads rapidly began to supplant the canals. The interrelationships between the mining industry, the iron industry, and the transportation industry within the anthracite region are exceedingly complex and represent some of the earliest vertically integrated industrial enterprises in the United States.

The anthracite industry played a nationally significant role in various areas not directly associated with the economy and industrial development. The anthracite industry reigned supreme in northeastern Pennsylvania for nearly a century. The anthracite region was, during this period, a locus for dreams of wealth and freedom for capitalists and workers alike. The society developed in the region, and the history of that society, has national significance. The region's patterns of urban development, its recognition of the environmental and social costs of mining, and the histories of the various immigrant groups who supplied the work force for the mines and factories all have national significance. The industry's role in the development of industrial unionism and the transformation of labor relations in the United States is central to the history of labor. Anthracite was one of the earliest industries to unionize by industry, rather than by trade or skill. The industry pioneered industrial unionism in this country. Events in the anthracite fields provided examples and lessons for labor organizers in other industries throughout the country.

In sum, the anthracite coal industry played a major role in the transformation of the American economy prior to World War I. After that period, while no longer a driving force within the national economy, the region and the industry continued to have national significance. The industry's decline offered one of the nation's earliest examples of deindustrialization. Throughout its history, developments in the anthracite reached far beyond the seven counties in which the anthracite fields lay. From the perspective of economic, industrial, business, social, ethnic, and labor history the anthracite region and the anthracite industry are clearly of national significance.

---

[3] Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977), 76.

The Geography and Geology of Anthracite

The largest concentration of anthracite deposits in the United States is located in northeastern Pennsylvania, which produced 96 percent of the nation's anthracite in 1911. Elsewhere in the United States, nominal deposits are found in Alaska, Arkansas, Colorado, New Mexico, Rhode Island, Virginia, and Washington. Anthracite deposits are also located in numerous foreign countries, including Scotland, Ireland, Wales, Mexico, and Canada.[4]

Pennsylvania's anthracite deposits comprise four geographically distinct fields totaling 484 square miles. The deposits generally run in a northeast-southwest direction along the line of the Appalachian Mountains. The Northern field consists of 176 square miles and is largely located in the Wyoming and Lackawanna Valleys of Luzerne and Lackawanna Counties, with vestiges in Susquehanna and Wayne Counties. The principal cities of this field are Scranton and Wilkes-Barre. The Eastern Middle field comprises 33 square miles, primarily in Luzerne County, with vestiges in Schuylkill, Carbon, and Columbia Counties. Hazleton is the field's principal city. The Western Middle field consists of 94 square miles in Northumberland, Columbia, and Schuylkill Counties. Shamokin, Shenandoah, and Mahanoy City are the principal cities in this field. The Southern field, located primarily in Schuylkill and Carbon Counties, with vestiges in Dauphin and Lebanon Counties, contains 181 square miles. Pottsville, Tamaqua, and Jim Thorpe (formerly Mauch Chunk) constitute the principal cities in this field. The Northern, Western Middle, and Southern fields occupy valleys or basins, while the Eastern Middle field occupies a plateau-like tableland.[5]

For industrial purposes the four geographic fields are divided into three commercial fields – the Wyoming, Lehigh, and Schuylkill. The Wyoming field corresponds to the Northern field. The Lehigh field consists of the Eastern Middle field and the east end of the Southern field between Jim Thorpe and Tamaqua. The Schuylkill field includes the Southern field west of Tamaqua and the Western Middle field.[6]

Anthracite is the final product of the geological process known as coalification. It is quite hard and heavy, a cubic yard weighing a bit more than a long ton, and one cubic foot more than ninety pounds. Anthracite is nearly pure carbon, generally averaging 86 percent. The high carbon content makes anthracite difficult to ignite, but it burns longer and cleaner than bituminous coal. When fully ignited it burns with a short, very hot, almost colorless, smokeless flame and yields a small quantity of ash.[7]

---

[4] Eliot Jones, *The Anthracite Coal Combination in the United States: With Some Account of the Early Development of the Anthracite Industry* (Cambridge, MA: Harvard University Press, 1914), 4-5.

[5] Jones, *The Anthracite Coal Combination*, 6.

[6] Ibid.

[7] Henry Darwin Rogers, *The Geology of Pennsylvania*, 2 vols. (Philadelphia: J. B. Lippincott & Co., 1858), 2:970-1000; Anthony F. C. Wallace, *St. Clair: A Nineteenth-Century Coal Town's Experience with a Disaster-Prone Industry* (New York: Alfred A. Knopf, 1987), 7; Donald L. Miller and Richard E. Sharpless, *The Kingdom of Coal: Work, Enterprise, and Ethnic Communities in the Mine Fields* (Philadelphia: University of Pennsylvania Press), 5.

In northeastern Pennsylvania the coal beds or veins were folded and faulted by the geological formation of the Appalachian Mountains. The intense pressures associated with this process produced the high carbon content that characterizes anthracite. Where the veins intersect the surface they can be mined without expensive equipment or any technical knowledge of mining principles. However, where the steeply pitched veins descended beneath the surface, frequently extending beneath the water table, underground mining, with its inherent uncertainties and dangers was required. It was often difficult to follow the folded and faulted veins below the surface.[8]

All three anthracite fields were produced by the same geological processes, but each is characterized by unique geological conditions.[9] These conditions dictated the amount of capital investment required to extract the coal from the ground and the mining methods employed. These decisions, in turn, strongly influenced the business landscape of each field, determining whether a field was dominated by large corporations or independent operators. The Wyoming field's deposits are the deepest in the region, and the highest in carbon content. The depth of the deposits necessitated heavy capital investments in order to sink the shafts and tunnels required to reach the coal. The high initial investment requirements, combined with the field's distance from Philadelphia and lack of a passable river connection to the eastern seaboard, resulted in it being the last of the fields to be fully commercially developed. Nevertheless, it became spectacularly productive, in its peak years shipping approximately half of Pennsylvania's total anthracite production. The field's commercial centers, Scranton and Wilkes-Barre, were the region's largest and most import cities. The Lehigh field is a group of parallel basins sitting atop a high plateau bordered by Spring and Green Mountains. Most of the coal mined in this field reached market in Philadelphia by means of the Lehigh and Delaware Rivers. The Schuylkill field is characterized by narrow valleys and steep mountains drained by the Schuylkill River and its tributaries. The coal veins are steeply folded beneath the surface and fractured by faults. The terrain results in numerous surface outcrops of coal veins, attracting small operators to the region.

Early Utilization of Anthracite: 1769-1825

The discovery of anthracite in northeastern Pennsylvania is the subject of local folklore and is difficult to substantiate. One source notes that Moravian missionaries may have reported the existence of anthracite in the Lehigh Valley in 1746 and that this anthracite may have been used by blacksmiths at the Moravian settlement of Nazareth in the 1750s.[10]

The first documented use of anthracite in Pennsylvania is generally thought to have occurred in the Wyoming Valley. The coal outcrops in this area were easily accessible from the surface, and local

---

[8] Miller and Sharpless, *Kingdom of Coal*, 5; Robert B. Gordon and Patrick M. Malone, *The Texture of Industry: An Archaeological View of the Industrialization of North America* (New York: Oxford University Press, 1994), 119.

[9] The descriptions of the three fields are based upon Miller and Sharpless, *Kingdom of Coal*, 3-5 and Wallace, *St. Clair*, 7-8.

[10] Hugh Moore Historical Park and Museums, "Historic Resources Study: Delaware and Lehigh Canal National Heritage Corridor and State Heritage Park" (n.p.: n.p., 1992), 207.

blacksmiths adopted the fuel after Obadiah Gore, a fellow blacksmith, successfully used anthracite at his shop in Wilkes-Barre in 1769. The Wyoming Valley enjoyed relatively easy access to small markets outside the region by means of the Susquehanna River. In 1776 anthracite was shipped down the Susquehanna from Wilkes-Barre to Harris Ferry (Harrisburg) and thence overland to Carlisle, where it fueled the forges of gunsmiths manufacturing arms for the Continental Army.[11] In the late eighteenth century occasional shipments of anthracite made their way down the Susquehanna River for use in the forges and smithies of the Lower Susquehanna Valley.

Anthracite began to be used in the Lehigh and Schuylkill fields approximately two decades after the Wyoming field. As in the Wyoming field, local blacksmiths were among the first to utilize the local coal. Discovery of anthracite in the Schuylkill field is accorded to Necho Allen, a hunter who inadvertently set fire to an anthracite outcrop near Pottsville in 1790.[12] Similarly, Philip Ginter, a local miller, is said to have discovered a large exploitable outcrop near Summit Hill in the Lehigh field in 1791.[13] Jacob Weiss, a prominent local businessman, took a sample of Ginter's find to Philadelphia for an assessment of its significance. Encouraged by what he learned, Weiss gained the backing of Philadelphia capitalists, including Robert Morris, and formed the Lehigh Coal Mine Company in 1792.[14] Repeated attempts by the Lehigh Coal Mine Company, and its successors, to mine the Summit Hill anthracite and delivery the product to Philadelphia were stymied by the mine's location, well-removed from the Lehigh River, and the inadequacy of the unimproved Lehigh as a reliable transportation route.

The discovery of anthracite deposits in each of the three commercial fields did not immediately lead to widespread use of the new fuel source. Homeowners in both the anthracite region and urban markets, principally Philadelphia, resisted the introduction of anthracite. The hard coal proved practically impossible to ignite in the open fireplaces then common. Technical improvements in stove and grate design that would assure a continuous draft of heated air across the coal were required. The breakthrough development occurred in Wilkes-Barre in 1808, when Judge Jesse Fell devised a modified fireplace grate that made it possible to burn anthracite in a common household fireplace.[15]

Transportation represented the other significant brake upon the widespread use of anthracite. Hauling coal by road from the mines to distant markets proved utterly impossible. Available roads were impassable much of the year and hauling of bulk freight by wagon was inordinately expensive. Bulk products moved from the interior by water, along rivers and streams. Unfortunately the major rivers flowing from the anthracite region to the coast, the Susquehanna, Schuylkill, and Lehigh, were shallow streams difficult to navigate even during periods of high

---

[11] Jones, *The Anthracite Coal Combination*, 7; Miller and Sharpless, *Kingdom of Coal*, 6-7.

[12] Miller and Sharpless, *Kingdom of Coal* , 9; Jones, *The Anthracite Coal Combination*, 16.

[13] Miller and Sharpless, *Kingdom of Coal* , 8-9; Jones, *The Anthracite Coal Combination*, 10.

[14] Jones, *The Anthracite Coal Combination*, 10-11. For a more recent account, see Michael J. Knies, "The Development of the Lehigh Coal Field and the Lehigh Coal and Navigation Company: 1791-1820" (M.A. thesis, Pennsylvania State University, 1989).

[15] Jones, *The Anthracite Coal Combination*, 11; Miller and Sharpless, *Kingdom of Coal* , 11.

water. Substantial improvements were required to convert these streams into reliable and safe avenues for the shipment of large quantities of coal or other products.

During the early years of the industry's development, flat-bottomed wooden arks of varying sizes were used to carry coal down these streams. River shipments generally occurred during freshets, when high water eased the downstream journey. Upon reaching their destination, the arks were broken up and sold for lumber and the rivermen walked back to their homes.

Fell's improved grate was promoted and disseminated by early coal entrepreneurs in an effort to stimulate demand. In 1807, a year before Fell's discovery, Abijah and John Smith of Plymouth, near Wilkes-Barre, sent a shipment of anthracite down the Susquehanna River, but were unable to find any buyers and had to dump the cargo. The following year the Smiths sent another shipment, accompanied by masons to educate homeowners on how to adapt their fireplace grates. The entire shipment sold. Buoyed by this initial success, the Smiths expanded their trade in the Wyoming Valley and down the Susquehanna River. By 1812, the company was shipping anthracite down the Susquehanna to the Chesapeake Bay and Baltimore, and thence via coastal schooners to New York City.[16]

Despite the early success of the Smith Coal Company, widespread adoption of Fell's grate remained slow. The first shipment of coal from the Schuylkill field occurred circa 1800, when William Morris took a wagon-load to Philadelphia. Morris was unable to sell the anthracite.[17] In 1812, Colonel George Shoemaker of Pottsville loaded nine wagons with coal from the Schuylkill field and hauled it overland to Philadelphia, where he sold two wagonloads and had to give away the rest. Adding insult to injury, Shoemaker was labeled a swindler by those who purchased the anthracite and was forced to flee Philadelphia.[18]

The War of 1812 and the Development of the Anthracite Market

At the beginning of the nineteenth century wood served as the primary industrial and household fuel throughout the United States. Local residents in the anthracite region burned hard coal in shops and homes, but the limited amount of coal consumed in the major eastern cities, particularly Philadelphia, came from Great Britain or the mines along the James River in Virginia. During the War of 1812, the British stopped shipments from Liverpool and cut off shipments of coal from the James River by a naval blockade on the Chesapeake and Delaware Bays, sparking a fuel crisis in Philadelphia. In April 1813, Philadelphia craftsmen created the Mutual Assistance Coal Company of Philadelphia to explore alternative energy sources, including the possibility of importing anthracite from northeast Pennsylvania.[19] About the same date, coal entrepreneurs in the Wyoming

---

[16] Miller and Sharpless, *Kingdom of Coal*, 11-12; H. Benjamin Powell, "Pioneering the Anthracite Industry: The Case of the Smith Coal Company," *Wyoming Historical & Geological Society Proceedings* 24 (1984): 5-22.

[17] Jones, *The Anthracite Coal Combination*, 17.

[18] Chester Lloyd Jones, *The Economic History of the Anthracite-Tidewater Canals* (Philadelphia: University of Pennsylvania Press, 1908), 2-3; Robert D. Billinger, *Pennsylvania's Coal Industry* (Gettysburg, PA: Pennsylvania Historical Association, 1954), 7.

[19] H. Benjamin Powell, "The Pennsylvania Anthracite Industry, 1769-1976," *Pennsylvania History* 47 (January

Valley sought to provide the fuel-starved Philadelphia market with anthracite. These entrepreneurs included John and Abijah Smith of the Smith Coal Company and Jacob Cist, a Philadelphia-born Wilkes-Barre merchant whose father had been a partner in the Lehigh Coal Mine Company in the 1790s.[20]

Cist spearheaded a partnership of Wyoming Valley that obtained a ten-year concession from the Lehigh Coal Mining Company to mine coal, construct roads, and use timber for the construction of arks at the old Summit Hill mines.[21] Cist's first shipment of anthracite to Philadelphia arrived in the city in August 1814, although three of the five arks that left Mauch Chunk sank before reaching Philadelphia. Cist personally followed the first shipment to Philadelphia to initiate a marketing campaign intended to educate the public, primarily craftsmen, in anthracite's potential. Cist visited blacksmiths, nail and wire works, rolling and slitting mills, glass manufacturers, and other industries whose manufacturing process relied upon heat. In 1815, he wrote and published a pamphlet, intended for craftsmen, titled *On the Importance and Necessity of Introducing Coal, Particularly the Species Known as Lehigh Coal, into Immediate and General Use.*[22] The end of the war and the removal of the British blockade, in 1815, signaled the end of the fledgling Philadelphia anthracite market. Renewed shipments of bituminous from England and Virginia proved cheaper than anthracite, which remained hampered by high transportation costs.

1980): 5.

[20] H. Benjamin Powell, *Philadelphia's First Fuel Crisis; Jacob Cist and the Developing Market for Pennsylvania Anthracite* (University Park: Pennsylvania State University Press, 1978).

[21] Miller and Sharpless, *Kingdom of Coal* , 13.

[22] Ibid., 15.

II. THE ANTHRACITE CANALS

Cist's experience during the War of 1812 established that anthracite could penetrate the urban markets of the eastern seaboard, provided it could be delivered to those markets at a competitive cost. Thus the primary obstacle to the establishment of a viable anthracite industry was the coal region's physical isolation and the absence of a reliable and economical means for transporting bulk shipments of anthracite to market.

After the war a handful of entrepreneurs purchased coal lands and began devising means for delivering anthracite to tidewater markets, with Philadelphia as the primary target of their endeavors. Josiah White and Erskine Hazard, Philadelphia merchants, purchased the Summit Hill deposits from Jacob Cist and set out to improve navigation on the Lehigh River. Farther north, William and Maurice Wurts purchased coal land at Carbondale, at the northeast tip of the Wyoming field. Realizing they could not be cost competitive with White and Hazard, since their mines were located significantly further from Philadelphia than those in the Lehigh field, they turned their attention towards the New York City market, planning to develop a canal to connect their mines to the Hudson River.[23] Lastly, the concerted efforts of coal landowners in the Schuylkill field helped assure the construction of a long-planned canal between Reading and Philadelphia. As a result of these pioneering efforts, by 1830 canals delivered anthracite from the three isolated coal fields to tidewater markets. The following discussion of the major anthracite canals is arranged by region.

Lehigh Field

In 1814 Josiah White and Erskine Hazard inadvertently discovered a method for burning anthracite in an iron furnace at their wire-works factory in Philadelphia. The discovery is generally considered the first industrial use of anthracite.[24] Convinced that anthracite represented a viable alternative to charcoal as an industrial fuel, White approached the recently chartered Schuylkill Navigation Company in an effort to obtain the right to improve the Schuylkill River for the movement of coal arks.[25] Rebuffed, the partners shifted their focus to the Lehigh River, and secured a twenty-year lease of the Summit Hill mines from the Lehigh Coal Mine Company.

White and Hazard formed two separate companies in 1818, the Lehigh Navigation Company, charged with improving navigation on the river, and the Lehigh Coal Company, whose responsible for mining the coal. A bill passed by the state legislature that same year granted the navigation company "permission to build a slack water navigation by locks, dams, or any devices" from Mauch Chunk to Easton.[26] It was agreed that the improvements would only allow descending

---

[23] Jones, *The Anthracite Coal Combination*, 8-9.

[24] Robert B. Gordon, "Custom amd Consequence: Early Nineteenth-Century Origins of the Environmental and Social Costs of Mining Anthracite," in *Early American Technology: Making & Doing Things From the Colonial Era to 1850*, ed. Judith A. McGaw (Chapel Hill: University of North Carolina Press, 1994), 246; Miller and Sharpless, *Kingdom of Coal* , 22.

[25] Miller and Sharpless, *Kingdom of Coal* , 22.

[26] William H. Shank, *The Amazing Pennsylvania Canals* (York, PA: American Canal & Transportation Center,

navigation, and that improvements for ascending navigation would be constructed within twenty years. White constructed wing dams to force the shallow and rocky river into a narrow channel. He invented a hydraulic sluice, known as a "bear trap," that when opened produced a sudden release of the water impounded behind a dam, sluicing arks and boats downstream to the next dam.[27]

In 1820, upon completion of the improvements, White and Hazard shipped 365 tons of coal down the Lehigh to the Delaware, and thence to Philadelphia. White and Hazard's demonstrated that the transportation constraints that had hampered the introduction of anthracite into the Philadelphia market at a reasonable cost and in significant quantities could be overcome. In 1822 the Lehigh Navigation Company and the Lehigh Coal Company combined to form the Lehigh Coal & Navigation Company (LC&N). The new company's charter granted it the right to mine and transport coal, as well as to charge tolls for use of the river improvements. Between 1820 and 1825 LC&N was the sole supplier of anthracite to Philadelphia, then the focal point of anthracite trade. Shipments increased from 365 tons in 1820 to 34,893 tons in 1825.[28] From Philadelphia, the coal was transshipped by coastal vessels to New York, Boston, Hartford, and Providence.[29]

The development of an efficient connection between the mines at Summit Hill and the river landing at Mauch Chunk, a distance of nine miles, proved as critical to anthracite's position in the market as the improvement of the Lehigh. In 1826, LC&N began construction of what is generally considered the first railroad in Pennsylvania, and the second in the United States.[30] The nine-mile Summit Hill to Mauch Chunk Gravity Railroad, completed in 1827, far out-distanced its predecessor, a two-mile railroad in Quincy, Massachusetts. Coal cars were loaded with anthracite at Summit Hill and, accompanied by a driver with a hand brake, coasted downhill to Mauch Chunk. Mules, carried along on the descending trip in their own special cars, pulled the empty cars back up to Summit Hill.[31] The gravity railroad became both a tourist attraction and an industrial success. To speed the shipment of empty coal cars back to Summit Hill, a return system consisting of two inclined planes with steam-powered hoisting engines was developed.[32]

In 1825, the Schuylkill Navigation Company inaugurated operations between Philadelphia and Mount Carbon, in Schuylkill County. Confronted for the first time by a competitor, in 1827 LC&N undertook to further improve navigation on the Lehigh by constructing a combination of

---

1981), 62.

[27] Donald Sayenga, "The Untryed Business; An Appreciation of White and Hazard," *Canal History and Technology Proceedings* 2 (1983): 112; Thomas Dinkelacker, "The Construction of the Lehigh Canal and the Early Development of the Lehigh Valley Region," *Wyoming Historical & Geological Society Proceedings* 24 (1984): 50-51; Taylor, *The Transportation* Revolution, 39-41.

[28] Jones, *The Anthracite Coal Combination*, Appendix: Table I.

[29] Frederick M. Binder, *Coal Age Empire: Pennsylvania Coal and its Utilization to 1860* (Harrisburg: Pennsylvania Historical and Museum Commission, 1974), 142, 149.

[30] Jones, *Anthracite-Tidewater Canals*, 15-16; Jones, *The Anthracite Coal Combination*, 14; Taylor, *The Transportation Revolution*, 76.

[31] Hugh Moore Historical Park and Museums, "Historic Resources Study," 155.

[32] Ibid., 157.

slackwater navigation improvements within the river and a parallel canal that would permit both descent and ascent of the river. The improvements, completed in 1829, extended from Mauch Chunk to the mouth of the Lehigh at Easton and could accommodate boats of up to 100 tons. LC&N also applied to the state legislature for authority to improve the Delaware River south of Easton, but the state denied this application in favor of a state-owned canal, the Delaware Division Canal.[33]

At Easton the Lehigh connected with two other canals. The Delaware Division Canal extended sixty miles between Bristol and Easton and was scheduled for completion in 1830. However, the canal leaked water at an alarming rate and was not completed until 1833-1834, after White and Hazard intervened to complete the improvements.[34] As early as 1830 state canal commissioners conceded that the Delaware Division "may be fairly considered as an extension of the Lehigh Coal and Navigation Company's canal."[35] However, in a misplaced attempt at economy, the canal was built on a smaller scale than the Lehigh and could not handle the Lehigh boats, necessitating transshipment of cargo at Easton, a costly and time consuming process. Nevertheless, despite its shortcomings, the Delaware Division prospered as a crucial link in the transportation system that delivered Lehigh field anthracite to the urban markets of Philadelphia.[36]

The Morris Canal connected with the Lehigh at Easton and extended for 102 miles across northern New Jersey before reaching Newark Bay. Soon after Lehigh anthracite began to arrive in New York, by coastal sailing vessel from Philadelphia, New York and New Jersey businessmen became interested in gaining a direct connection to the anthracite region. In 1824 the Morris Canal Company was formed to link the Delaware and Passaic Rivers across New Jersey. Completed in 1833, the canal provided Lehigh anthracite with direct access to the New York City market. The Morris Canal also served as a vital connection between the iron ore deposits of New Jersey and Pennsylvania's emerging anthracite iron industry. Although it cost approximately $3 million, the Morris was only four feet deep and its locks could not accommodate boats larger that twenty-five tons. As with the Delaware Division Canal, this excluded the large Lehigh boats and necessitated transshipment of cargo, hampering the canal's profitability during its early years.[37]

In the mid-1830s LC&N undertook the northward extension of the Lehigh Navigation from Mauch Chunk to the town of White Haven. Construction of this canal, through particularly difficult terrain, fulfilled a provision in the company's charter that required it to establish a connection with the Susquehanna River. It also provided LC&N with access to the Eastern Middle coal field and the Wyoming field, significantly expanding the firm's area of operations. Built between 1835 and 1838, this 39-mile extension became known as the Upper Grand section.[38]

---

[33] Miller and Sharpless, *Kingdom of Coal*, 25-27; Taylor, *The Transportation Revolution*, 40.

[34] Albright Zimmerman, "Problems of a State-Owned Delaware Division Canal," *Canal History and Technology Proceedings* 10 (1991): 115-148.

[35] Jones, *Anthracite-Tidewater Canals*, 60.

[36] Taylor, *The Transportation Revolution*, 40.

[37] Ibid.

[38] Hugh Moore Historical Park and Museums, "Historic Resources Study," 145-46; Miller and Sharpless, *Kingdom of Coal*, 31.

By the mid-1830s the Lehigh field was connected by canal to the major urban markets of Philadelphia and New York. LC&N owned and operated the critical link in this transportation system, the Lehigh Canal, which delivered coal from the mines to Easton. The Upper Grand section of the extended the Mauch Chunk to Easton main trunk and exemplified the expansion of LC&N throughout the Lehigh field. From Easton, the state-owned Delaware Division Canal provided access to Philadelphia, while the Morris Canal furnished a direct connection to New York.

Wyoming Field

Anthracite was discovered at Carbondale, at the northeast end of the Wyoming field, in 1799. In 1812, William Wurts, a Philadelphia merchant, purchased coal lands in the Carbondale area, most likely in response to the regional fuel crisis associated with the War of 1812.[39] Over the next decade, Wurts and his brother, Maurice, shipped anthracite to Philadelphia on a sporadic basis via the Lackawaxen and Delaware Rivers. The cost of transporting coal over this route did not permit sales at prices competitive with Lehigh field anthracite, which had captured the Philadelphia market in the early 1820s. Consequently, the brothers turned to an untapped urban market, New York City, and began planning a canal to the Hudson River.[40]

In 1823 the State of New York chartered the Delaware & Hudson Canal Company, promoted by the Wurtses and capitalized by New York City investors, and authorized the corporation to construct a canal from the Delaware River to the Hudson River. The Commonwealth of Pennsylvania granted the company rights to improve navigation on the Lackawaxen River, a tributary of the Delaware and also granted it the authority to acquire coal lands in Pennsylvania.[41] The Delaware & Hudson's entry into the Wyoming field established a pattern of large-company domination, backed by outside investors, that characterized this field throughout its history.[42]

Construction of the Delaware & Hudson Canal began in July 1825. The canal extended from Honesdale, sixteen miles distance from the mines at Carbondale, down the Lackawaxen River to Montgap on the Delaware River. It then continued east sixty-five miles to Roundout, on the Hudson River near Kingston. Unlike the Lehigh and Schuylkill Canals, the Delaware & Hudson consisted entirely of a constructed canal prism, and included no sections of slackwater navigation within the river channel. The first coal boat passed through the Delaware & Hudson Canal in February 1829. Originally capable of handling boats no larger than twenty-five to thirty tons, the Delaware & Hudson was enlarged by 1843 to accommodate 40 ton boats, and by 1853, after several additional campaigns of improvement, could handle boats as large as 140 tons.[43]

---

[39] William Henry Williams, "Anthracite Development and Railway Progress," *Journal of the American Irish Historical Society* 22 (1923): 89.

[40] Jones, *The Anthracite Coal Combination*, 8-9; Miller and Sharpless, *Kingdom of Coal*, 36-37.

[41] Jones, *The Anthracite Coal Combination*, 9.

[42] Miller and Sharpless, *Kingdom of Coal*, 36-37.

[43] Taylor, *The Transportation Revolution*, 39.

Since the canal only extended to Honesdale, sixteen miles away from the mines at Carbondale, a gravity railroad was constructed to deliver coal from the mines to the canal landing. Completed, in conjunction with the canal, in 1829, the railroad used stationary steam engines to haul cars attached to a metal chain up a series of eight inclined planes. As with the LC&N gravity railroad between Mauch Chunk and Summit Hill, the speed of the descending cars was partially checked by the ascending cars attached to the other end of the chain. The track was comprised of a timber substructure faced with rolled iron plates, imported from England and screwed to the substructure.[44]

The Delaware & Hudson was an early advocate of railroads, convinced of "their near approach to canals in respect to cheapness and facility of transportation."[45] Demonstrating this belief, in 1829 the company imported a locomotive engine from England, the "Stourbridge Lion." The first steam locomotive in America, it was given a three-mile trial run at Honesdale on 8 August 1829.[46] The trial run was a technical success, but the locomotive proved far too heavy for the lightly-constructed wood track system and too underpowered to haul anthracite. Nevertheless, this isolated experiment in a remote corner of Pennsylvania presaged the start of the railroad era in the United States.[47]

In the late-1820s, as part of the statewide canal-building campaign, a canal was constructed into the Wyoming Valley along the Susquehanna River. Built between 1828 and 1830, the North Branch Canal paralleled the upper Susquehanna River from Northumberland to Nanticoke. The Wyoming Extension of the North Branch, completed in 1834, extended the canal through Wilkes-Barre to the mouth of the Lackawanna River. Over the next twenty years the North Branch Canal was extended up the Susquehanna River into New York. The North Branch offered Wyoming field coal operators an alternative to the Delaware & Hudson. It offered Wyoming Valley operators access to the east-west Pennsylvania Main Line Canal and, ultimately, to the Philadelphia market.[48]

Schuylkill Field

In contrast to the Delaware & Hudson and Lehigh Canals, the inspiration for a canal along the Schuylkill River did not originate with anthracite interests. Philadelphians had expressed interest in opening a route between Philadelphia and the city's western hinterlands since the time of William Penn. In 1792, the Commonwealth of Pennsylvania chartered two companies to improve the Schuylkill between Reading and Norristown and to build a canal from Norristown to the Delaware River.[49] Fifteen miles of work were completed before the exhaustion of funds in 1794. By the early 1800s, the two original companies had joined together as the Union Canal Company.

---

[44] Jones, *Anthracite-Tidewater Canals*, 78-79; Edward Steers, "The Delaware and Hudson Canal Company's Gravity Railroad," *Canal History and Technology Proceedings* 2 (1983): 129-203.

[45] Jones, *Anthracite-Tidewater Canals*, 79.

[46] Billinger, *Pennsylvania's Coal Industry*,12.

[47] Taylor, *The Transportation Revolution*, 77.

[48] F. Charles Petrillo, *Anthracite and Slackwater: The North Branch Canal, 1828-1901* (Easton, PA: Center for Canal History and Technology, 1986).

[49] Shank, *Pennsylvania* Canals, 10.

In 1815, at the behest of Schuylkill County farmers anxious to obtain access to Philadelphia markets, the Pennsylvania legislature chartered a new company, the Schuylkill Navigation Company, to improve navigation on Schuylkill River.[50]

Work began on the improvements in 1816, two years prior to White and Hazard's formation of the Lehigh Navigation Company. Philadelphians invested heavily in the new project. Indeed, in 1824, when the twenty-two miles of canal below Reading were opened for traffic, the segment was named the Girard Canal, in honor of its principal financier, Philadelphia merchant Stephen Girard.[51] Officially opened in October 1825, the navigational improvements to the Schuylkill stretched 108 miles between Port Carbon and Philadelphia. They consisted of sixty-two miles of canal and forty-six miles of slackwater navigation pools in the river. A series of dams, passed by locks, formed the pools. One of the most significant engineering features was a 450-foot tunnel driven through a mountain near Auburn, in Schuylkill County.

Although not conceived as an anthracite canal, by the time of its opening in 1825 coal was expected to comprise the majority of the freight hauled on the Schuylkill Navigation. Indeed, 31,000 tons of anthracite passed down the Schuylkill Navigation in 1827, only two years after completion of the improvements.[52] Since the canal was not conceived as an anthracite canal the Pennsylvania legislature did not grant the Schuylkill Navigation Company the corporate right to own and mine coal lands, as it the Delaware & Hudson and the Lehigh Coal & Navigation. This corporate structure, combined with the relatively easy accessibility of the Schuylkill fields anthracite deposits, resulted in a flurry of independent coal mining activity. The Schuylkill Navigation Company encouraged this situation by keeping its tolls low to stimulate trade. By 1833, there were as many as forty-seven coal operators shipping anthracite over the Schuylkill Navigation Company.[53]

Though overlooked and underfunded, the Union Canal Company, whose purview had been reduced to linking the Susquehanna and Schuylkill Rivers upon incorporation of the Schuylkill Navigation Company, received state funds for completion. The legislature viewed the combined Union-Schuylkill Canal system as a primary link to the western portions of the state.[54] Construction on the Union Canal began in 1821. Completed in 1828 it linked Middletown, on the Susquehanna River, with Reading, where it connected to the Schuylkill Navigation. Because of topographical difficulties and water shortages the canal was built upon such small dimensions that it could only handle boats of twenty-five tons. Its locks could not accommodate the larger boats of the Schuylkill or the Pennsylvania state canals, with which it was linked. The line was eventually enlarged, beginning in 1850. Although the main line of the Union Canal did not traverse the anthracite region, by 1831 a feeder line extended north to Pine Grove in the Schuylkill Field. Shortly after the completion of this link, anthracite became the most significant freight hauled on

---

[50] Miller and Sharpless, *Kingdom of Coal*, 34; H. Benjamin Powell, "Coal, Philadelphia and the Schuylkill" (Ph.D. diss., Lehigh University, 1968).

[51] Jones, *Anthracite-Tidewater Canals*, 128.

[52] Powell, *Philadelphia's First Fuel Crisis*, 97.

[53] Jones, *The Anthracite Coal Combination*, 19.

[54] Shank, *Pennsylvania Canals*, 11.

the Union Canal.[55] Partially in response to the design limits of the Union Canal, the Pennsylvania legislature chartered the Philadelphia & Columbia Railroad as the principal Philadelphia–Susquehanna link in the Pennsylvania Main Line system. The Union Canal was relegated to service as a feeder for the Schuylkill Navigation, which evolved into the busiest waterway in the United States.[56]

The Canal Era

By 1830, three primary canal companies, the Delaware & Hudson Canal Company, the Schuylkill Navigation Company, and the Lehigh Coal & Navigation Company, transported anthracite from the coal region of northeast Pennsylvania to the urban markets and seaports of the northeast. Financed by New York and Philadelphia investors, the three canals formed the nation's largest canal network. They played a vital role in opening northeastern Pennsylvania to settlement and economic development. Prior to the completion of the canals the only sizable settlement in the anthracite region was Wilkes-Barre. By 1830 mining towns and settlements existed in all four anthracite fields. The canal companies promoted settlement along their routes. Supply and labor camps and loading and docking facilities grew into small villages and local entrepots. At the heads of navigation, the companies built terminals with wharves, warehouses, stables, boatyards, and housing. These terminals developed into the region's first urban centers: Pottsville (Schuylkill), Mauch Chunk (Lehigh), and Carbondale (Delaware & Hudson).[57]

The anthracite canals were among the most heavily capitalized privately-owned corporations in the United States prior to the mid-nineteenth century.[58] The vertically integrated Delaware & Hudson Canal Company and Lehigh Coal & Navigation Company enjoyed significant legal advantages over their competitors. Both companies were legally permitted to own coal estates, which allowed them to mine, transport, and sell their own coal. As a result, by the 1850s, the Delaware & Hudson and Lehigh Coal & Navigation were the two largest mining companies in the anthracite region.[59] The Schuylkill Navigation Company did not enjoy charter rights as advantageous as those of the Delaware & Hudson and Lehigh Coal & Navigation. Nevertheless, it became the greatest of the anthracite canals, carrying approximately the same tonnage as the other routes combined.[60] As the terminus of the Schuylkill Navigation, Philadelphia became the focal point and primary port of the coal trade, shipping anthracite by coastal vessels to New York and New England.

Other canals in the Middle Atlantic states carried anthracite from inland areas to tidewater, but these canals are not generally considered anthracite canals. These include the Susquehanna & Tidewater Canal, the Chesapeake & Delaware Canal, and the Delaware & Raritan Canal. The Susquehanna

---

[55] Powell, "The Pennsylvania Anthracite Industry," 7; Taylor, *The Transportation Revolution*, 41.

[56] Spiro G. Patton, "Anthracite Canals and Urban Development: The Case of Reading," *Canal History and Technology Proceedings* 4 (1985): 10-11.

[57] Miller and Sharpless, *Kingdom of Coal*, 45.

[58] Powell, "The Pennsylvania Anthracite Industry," 7.

[59] Ibid., 8.

[60] Jones, *Anthracite-Tidewater Canals*, 132.

& Tidewater Canal, completed in 1840, tapped the Susquehanna River trade for Baltimore interests and extended forty-five miles upriver from Havre de Grace, Maryland to Wrightsville, Pennsylvania. The Chesapeake & Delaware Canal, completed in 1830, linked the Chesapeake and Delaware Bays. Prior to development of a more direct route, Wyoming Valley anthracite traveled down the Susquehanna River and along the Susquehanna & Tidewater and Chesapeake & Delaware in order to reach Philadelphia. The Delaware & Raritan Canal linked Bordentown, New Jersey, on the Delaware River, with Perth Amboy, New Jersey in 1834. In contrast to its competitor, the Morris Canal, the Delaware & Raritan Canal provided a large and well-built connection between the Delaware River and New York.[61]

[61] Taylor, *The Transportation* Revolution, 41-42.

III. RAILROADS, IRON, AND COAL

Auxiliary and Feeder Railroads

The first railroads in the anthracite region closely followed the establishment of anthracite canals. The region's earliest railroads consisted of short feeder lines that linked mines to canals. Six railroads of this type operated in the Schuylkill region by 1832.[62] The earliest was the Mill Creek & Mine Hill Railroad, completed in 1829, which consisted of a four-mile extension of mine tracks to the Schuylkill Navigation Company. Motive power was supplied by horses.[63]

Much of the earliest experimentation with railroads in the anthracite region occurred in the Schuylkill field. The corporate charter of Schuylkill Navigation Company did not grant the company the right to own and mine coal lands, unlike the charters of its counterparts in the Lehigh and Wyoming fields. Prevented from mining coal, the Schuylkill Navigation Company kept its freight tolls low in order to encourage investment in mining by independent operators, who would have to ship their coal to market via the Schuylkill Navigation's canal. As a result of these policies the Schuylkill field experienced a wave of speculative investment by small independent operators in the late 1820s. By 1829 coal lands sold for as much as $250 per acre, and investment capital poured into the field from Philadelphia and the southeastern part of the state. As mining activity expanded other entrepreneurs developed railroad lines throughout the field. By 1842 Schuylkill County boasted more than one hundred miles of railroads.[64]

The most prominent of the early auxiliary railroads was the Little Schuylkill Navigation, Railroad & Coal Company (LSNR&CC), founded by Freidrich List, a German economist and political refugee, and financed by Stephen Girard, a prominent Philadelphia merchant. The LSNR&CC, completed in 1831 and one of the first railroad corporations chartered in Pennsylvania, extended twenty-eight miles between the Schuylkill Navigation Company depot at Port Clinton and Tamaqua, in the Lehigh field.[65] In 1833 the LSNR&CC became the first railroad in the region to regularly use steam locomotives.[66] Unlike the other five feeder lines, which only carried coal, the LSNR&CC obtained the privileges to own and mine coal lands. By mid-century, the LSNR&CC ranked as the third largest coal company in the coal regions, behind the Delaware & Hudson Canal Company and the Lehigh Coal & Navigation Company.[67]

Between 1827 and 1841, sixteen additional auxiliary railroads were built in the anthracite region. Prominent among these were the Beaver Meadows Railroad and the Hazleton Railroad in the

---

[62] Powell, "The Pennsylvania Anthracite Industry," 10.
[63] Jules I. Bogen, *The Anthracite Railroads: A Study in American Railroad Enterprise* (New York: Ronald Press Co., 1927), 11; Taylor, *The Transportation Revolution*, 77.
[64] Miller and Sharpless, *Kingdom of Coal*, 55.
[65] Ibid., 55-56.
[66] Bogen, *The Anthracite Railroads*, 12.
[67] Powell, "The Pennsylvania Anthracite Industry," 10.

Lehigh field, and the Lykens Valley Railroad and the Danville & Pottsville Railroad in the Schuylkill field.[68]

In 1837 the Pennsylvania state legislature authorized the Lehigh Coal & Navigation Company to construct an auxiliary railroad between the North Branch Canal at Wilkes-Barre and the Lehigh Navigation at White Haven. The resulting 19.7-mile Lehigh & Susquehanna Railroad, completed in 1846, brought the Wyoming Valley within the sphere of the Lehigh Coal & Navigation Company and provided Wyoming Valley coal operators with direct access to Philadelphia and New York markets for the first time. Prior to completion of the Lehigh & Susquehanna, Wyoming Valley operators were essentially shut out of these large urban markets because of the prohibitive cost of shipping their coal down the Susquehanna River and through the Chesapeake & Delaware Canal to Philadelphia. A notable feature of the Lehigh & Susquehanna were the Ashley Planes, a series of three steam-powered inclined planes that remained in continuous service from 1843 to 1948.[69]

The Pennsylvania Coal Company Gravity Railroad was established in 1850 as an auxiliary railroad to the Delaware & Hudson Canal. The Gravity Railroad connected Port Griffith on the North Branch Canal, near Pittston, to Hawley on the Delaware & Hudson Canal, passing through Dunmore. This connection provided the Delaware & Hudson with access to the lower Lackawanna Valley anthracite deposits. The Gravity Railroad extended approximately forty-seven miles and consisted of twenty-two inclined planes. Most of the planes were steam powered, but four used water wheels as a power source.[70]

The Philadelphia & Reading Railroad

The success of the early auxiliary railroads led entrepreneurs in the Schuylkill field to contemplate establishment of a through rail line linking the mines directly to tidewater and competing directly with the Schuylkill Navigation. Backed by capitalists from Philadelphia and Reading, the Philadelphia & Reading Railroad was chartered in 1833. Completed in 1842 between Philadelphia and Mount Carbon, located just below Pottsville, the Philadelphia & Reading immediately entered into intense competition with the Schuylkill Navigation Company, the area's leading anthracite carrier. Within two years the railroad was hauling more coal than the canal.[71] By 1845, the Reading carried three times the tonnage of the Schuylkill Canal and dominated the Schuylkill field west of Tamaqua.[72] The Reading revealed the limitations of the Schuylkill Canal and the inherent advantage of railroads over canals. Railroads could carry more tonnage, deliver it to market quicker, and operate throughout the winter months, when canals were frozen. Similarly, railroads were not susceptible to the occasional droughts or floods that plagued canals.

---

[68] Ibid., 10.

[69] Hugh Moore Historical Park and Museums, "Historic Resources Study," 169-170.

[70] Edward Steers, "The Pennsylvania Coal Company's Gravity Railroad," *Canal History and Technology Proceedings* 1 (1982): 158-66.

[71] Hugh Moore Historical Park and Museums, "Historic Resources Study," 176.

[72] Louis C. Hunter, *Steam Power: A History of Industrial Power in the United States, 1780-1930* (Charlottesville: University Press of Virginia, 1985), 421.

In 1833, the year the Reading was chartered, the Pennsylvania legislature began investigating the legitimacy of transportation and mining monopolies, such as those enjoyed by the Lehigh Coal & Navigation Company and the Delaware & Hudson Canal Company. These companies were accused by the public and the press of charging excessively high freight rates and buying large tracts of coal land to stifle competition. The legislature responded to the charges by appointing a commission "to ascertain the effect of incorporated companies with mining and trading privileges on the progress of the business."[73] The resultant Packer Report, named after commission chairman, Samuel Packer, concluded that incorporated companies had benefited the public by introducing anthracite and furnishing a steady supply at a reasonable price. However, the report noted that corporate privileges should only be granted when private, individual enterprise was inadequate to the task at hand. The report concluded that corporate privilege could be determined by the legislature, but warned "the grand evil . . . against which the committee would most earnestly protest, is in giving them, in addition to their mining privileges, the control of a canal or railroad, with power to lock up at pleasure the resources of a whole valley or community."[74]

It is scarcely surprising, given this political climate, that corporate powers conferred on the Philadelphia & Reading Railroad forbid it to own land or operate coal mines. Thus both the major canal and the major railroad in the Schuylkill field were legally enjoined from owning and operating anthracite mines. This distinguished the field from the Lehigh and Wyoming fields, where the Lehigh Coal & Navigation Company and the Delaware & Hudson Canal Company had been granted extensive corporate powers to own and operate mines. As a consequence the pattern of development in the Schuylkill field differed significantly from those of the Lehigh and Wyoming fields. The nature of the anthracite monopolies would not be questioned again until the trust-busting era of the early 1900s.

Anthracite Region Railroads in the 1840s and 1850s

The Philadelphia & Reading remained the sole through rail line in the anthracite region until the 1850s. In 1847 railroads operated 503 miles of track in the anthracite region; 409 miles (81 percent) consisted of feeder railroads that delivered coal from the mines to the region's canals. The remaining 94 miles (19 percent) comprised the Philadelphia & Reading. The Schuylkill field contained 71 percent of the region's railroad trackage, with 19 percent in the Lehigh field and 10 percent in the Wyoming field.[75] Despite the success of the Philadelphia & Reading in the Schuylkill field, canals remained the dominant method for transporting anthracite to market. In the Wyoming and Lehigh fields canals provided the only direct connections to tidewater, while in the Schuylkill field, the Schuylkill Navigation remained a viable alternative and powerful competitor to the Philadelphia & Reading. Railroad mileage in the region expanded rapidly beginning in the 1850s, especially in the Lehigh and Wyoming fields, but canals remained prosperous through, and especially during, the Civil War.

---

[73] Jones, *The Anthracite Coal Combination*, 21.
[74] Ibid., 22.
[75] Bogen, *The Anthracite Railroads*, 15.

During the 1840s the nation's railroad network tripled in size, expanding from approximately 3,000 miles to nearly 9,000 miles. During this same period only 400 miles of new canals were constructed, bringing the nation's total canal mileage to just under 4,000 miles. In the 1850s more miles of canal were abandoned than built, while over 21,000 miles of new railroad were constructed.[76]

The Origins of the Anthracite Iron Industry

The expansion of the American railroad network depended upon a major restructuring of the American iron industry. The most important components of the railroads–rails, boilers, locomotives, wheels, couplings–were iron. At the beginning of the 1840s, most railroad rails were wood, with iron strapping for a bearing surface. Suitable for horse-drawn cars and other light rolling stock, these strap rails proved unable to support heavier steam locomotives. An alternative design, all-iron "T" rails, were developed in 1831 for New Jersey's Camden & Amboy Railroad.[77] The T-rail proved superior to strap rail, but its widespread adoption was gradual; as late as 1845, 4,000 miles of railroads were laid with strap rails.[78] The T-rail became the primary manufactured product required for railroad construction, and the dominant new product of the period. By 1856 the manufacture of T-rails consumed over one-third of the nation's total output of wrought iron.[79]

In the 1830s and early 1840s, Great Britain was the sole supplier of T-rails for the expanding American rail network. During this period, the United States had no industrial facilities capable of rolling heavy rails. The British supplied the American market until the mid-1840s, when a railroad boom in their own country increased domestic demand and drove up the price of imported British rails in America. The British rail boom was concurrent with the development of an anthracite-fueled ironmaking capability in eastern Pennsylvania. The manufacture of iron using anthracite, and associated innovations in smelting and refining, provided the United States with the technology to manufacture heavy rails and, beginning in the mid-1840s, the ability to undercut the cost of imported British rail.[80] As the demand for rails increased in the mid-1840s, a number of anthracite-fueled iron furnaces in eastern Pennsylvania erected rail mills.[81] Although the British reentered the rail market in the late 1840s, by this date the American industry, protected by tariff barriers, had become well established.[82]

---

[76] Chandler, *The Visible Hand*, 83.

[77] Brooke Hindle and Steven Lubar, *Engines of Change: The American Industrial Revolution, 1790-1860* (Washington: Smithsonian Institution Press, 1986), 137.

[78] Peter Temin, *Iron and Steel in Nineteenth-Century America: An Economic Inquiry* (Cambridge, MA: M.I.T. Press, 1964), 117.

[79] Temin, *Iron and Steel*, 46.

[80] Ibid., 118.

[81] W. David Lewis, "The Early History of the Lackawanna Iron and Coal Company: A Study in Technological Adaptation," *Pennsylvania Magazine of History and Biography* 96 (October 1972): 456.

[82] W. David Lewis, *Iron and Steel in America* (Greenville, DE: The Hagley Museum, 1976), 31.

Before the 1830s American ironmakers relied almost entirely upon traditional methods and technologies little changed from the colonial period, and wholly inadequate to the production of the equipment required by railroads.[83] The basic unit of production remained the iron plantation, located in remote rural areas near ore deposits, ample supplies of wood for making charcoal fuel, and adequate water sources to power machinery. The dependence upon wood and waterpower placed constraints upon the location and size of furnaces and forges, forcing their dispersal along waterways in woodlands. Ironmakers often incurred high transportation costs hauling furnace and forge products from these remote locations to market over primitive roads. As a result of the industry's small capacity and inadequate distribution network, much of the nation relied upon iron imported from Britain.[84]

With the opening of the anthracite fields in the 1820s Pennsylvania ironmakers began a concerted effort to use anthracite in ironmaking. The earliest success came in adapting anthracite to puddling. Later, techniques were developed that permitted the use of anthracite as a fuel for blast furnaces. Between 1855 and 1875 more iron was produced using anthracite than with any other fuel source.[85]

The adoption of anthracite as a fuel source freed ironmakers from the locational constraints previously imposed by their dependence upon wood and waterpower. They could establish their works in cities and towns alongside the anthracite canals, which would deliver coal and other raw materials directly to the works. Locating in urban areas meant that iron makers could establish their operations closer to labor sources and closer to the various metal-working industries that purchased their output. In an urban setting ironmakers no longer had to provide housing and other services for their workers, as they had at the remote plantation locations. Freed from dependence upon charcoal and waterpower, ironmakers were released from fuel- and power-imposed limits upon the size of their operations.[86]

The opening of the Schuylkill Navigation in 1825 first allowed Pennsylvania ironmakers to attempt to use anthracite as a fuel for puddling and smelting. The development of successful techniques for the use of anthracite, combined with opening of the Lehigh (1830), North Branch (1834) and Eastern Division of the Main Line (1833) canals created an anthracite ironmaking district. For three decades, until the 1870s, the anthracite ironmakers dominated the American iron industry.[87]

Prior to the adoption of anthracite as a fuel source American ironmakers relied upon charcoal-fired blast furnaces to smelt iron ore into pig metal, which could be cast into marketable products. Higher quality wrought iron was produced in finerys and bloomerys, where the impurities in pig iron were removed by reheating and reworking the metal. This was usually accomplished by

---

[83] Temin, *Iron and Steel*, 15; Miller and Sharpless, *Kingdom of Coal*, 59.

[84] Robert B. Gordon, *American Iron, 1607-1900* (Baltimore, MD: Johns Hopkins University Press, 1996), 14, 45; Chandler, "Anthracite Coal," 147; Temin, *Iron and Steel*, 15.

[85] Gordon, *American Iron*, 45; James M. Swank, *History of the Manufacture of Iron in All Ages*, 2nd ed. (Philadelphia: American Iron and Steel Association, 1891), 376.

[86] Gordon, *American Iron*, 45, 76; Chandler, "Anthracite Coal," 161.

[87] Gordon, *American Iron*, 76.

hammering the molten mass, consolidating the metal and expelling the slag. Charcoal was used to fuel the fineries because the sulfur in coal contaminated the liquid iron. Wrought iron proved a tough, malleable material. Smiths could produce complex shapes by heating it in a forge and hammering it on an anvil. Once forged to the rough shape of the final product, mechanics could chisel and file the piece to its final form. Musket locks, building and ship hardware, nails, and metal tools were produced from wrought iron using this general process of forging and finishing from the colonial period into the nineteenth century.[88]

Puddling represented a new technique for converting pig metal into wrought iron. Developed and perfected in England in the 1780s, puddling substituted coal fuel for charcoal and kept the fuel and metal separated through the use of reverberatory furnaces. The earliest American efforts to produce wrought iron by means of puddling occurred in western Pennsylvania circa 1817 and used bituminous coal. This corresponded to the British experience, which was entirely based upon the use of bituminous coal fuel in the reverberatory furnaces.[89]

Anthracite did not burn well in fireboxes designed for use with bituminous or wood because its characteristic short flame made it difficult to distribute the fire's heat over a large area. Additionally, cold air drafts, a common practice of the period, only extinguished the anthracite fire. Consequently, the adoption of anthracite as a fuel for puddling necessitated the development of a new firebox and grate design and the addition of a forced draft to the British-style furnaces. By 1830 these innovations were in place, and Pennsylvania ironmakers were puddling with anthracite in Phoenixville and Conshohocken on the lower Schuylkill River. During the next decade some ironmakers began to introduce rolling mills as a substitute for the hammers traditionally used to squeeze slag from the iron in the puddling process. By 1841 anthracite puddling furnaces were well established in southeastern Pennsylvania, with a notably concentration along the lower Schuylkill.[90]

Pennsylvanians began to experiment with anthracite as a fuel for blast furnaces as early as 1821. These early experiments proved a deadend; however, since burning anthracite in a cold blast furnace would not produce a temperature high enough to melt the iron ore and as a result the furnace clogged. In the 1830s Frederick W. Geissenhainer of New York began experimenting with a heated, high-pressure air blast. In 1836 he successfully produced a small amount of iron using anthracite as fuel at Valley Furnace, on Spring Creek in Schuylkill County.[91]

---

[88] Ibid., 7, 125-133.

[89] Ibid., 133; Charles K. Hyde, *Technological Change and the British Iron Industry: 1700-1870* (Princeton, NJ: Princeton University Press, 1977), 76-94.

[90] Gordon, *American Iron*, 134-136; Binder, *Coal Age Empire*, 77; Walter R. Johnson, *Notes on the Use of Anthracite in the Manufacture of Iron* (Boston: Little & Brown, 1841), 11; Frederick A. Overman, *The Manufacture of Iron in All Its Various Branches* (Philadelphia: Baird, 1850), 271.

[91] Eli Bowen, *The Coal Regions of Pennsylvania* (Pottsville, PA: E. N. Carvallo, 1848), 31; Gordon, *American Iron*, 100, 155; Wallace, *St. Clair*, 85; Swank, *Ironmaking and Coal Mining*, 73; Temin, *Iron and Steel*, 61.

The potential economic benefits to be derived from producing iron with anthracite were widely recognized and the early experimenters were encouraged by several proffered prizes. The Franklin Institute offered a gold medal, the Lehigh Coal & Navigation Company offered a furnace site with free waterpower, and a group of Philadelphians led by Nicholas Biddle offered a $5,000 prize. In 1839, following two years of experimentation, Joseph Baughman, Julius Guiteau, and Henry Hugh succeeded in placing an anthracite furnace in blast at Mauch Chunk for a period of approximately five months. This furnace utilized a hot blast.[92]

Other early efforts included William Lyman and Burd Patterson's Pioneer Furnace at Pottsville, Schuylkill County. This furnace maintained a blast from October 1839 through January 1840, winning Biddle's $5,000 prize. Benjamin Perry, the English founder who blew-in the Pioneer Furnace, oversaw the establishment of two more furnaces, at Roaring Creek and Columbia, near Danville in Montour County in 1840. By 1840 Pennsylvania ironmasters were successfully operating seven anthracite-fueled blast furnaces. The following years an additional six furnaces were blown-in. Clearly, Pennsylvania's ironmasters had mastered the techniques required to smelt iron with anthracite by 1840.[93]

Many of these early furnaces failed to produce on a commercial basis. Baughman, Guiteau and Company went bankrupt and the furnace was sold at a sheriff's sale in 1840. The Pioneer Furnace had many difficulties with its hot blast machinery and did not operate for some time after its initial blast. All of the early furnaces shut down within a year because of low production, poor-quality iron, and problems with their blast machinery.[94]

The individual most frequently credited with the commercial scale introduction of coal-fired blast furnace techniques in America is David Thomas. Thomas successfully smelted iron with anthracite in Wales in 1837, and shortly thereafter was recruited by Erskine Hazard to establish a furnace along the Lehigh Canal. In 1840 Thomas blew-in the Lehigh Crane No. 1 furnace at Catasaqua, in Lehigh County. This furnace, designed in the English style, used a separate coal-fired stove to heat the blast. In 1842 Thomas blew-in Lehigh Crane No. 2, designed in the developing American style, with the stove mounted atop the furnace and using waste heat from the stack to produce the hot blast.[95]

---

[92] Gordon, *American Iron*, 155-156; Bowen, *Coal Regions*, 31-33; Robert B. Gordon, "Industrial Archeology of American Iron and Steel," *IA: The Journal of the Society for Industrial Archeology* 18:1&2 (1992): 7.

[93] Gordon, *American Iron*, 156; Bowen, *Coal Regions*, 33; Johnson, *Notes on the Use of Anthracite*, 41-45.

[94] Darwin H. Stapleton, *The Transfer of Early Industrial Technologies to America* (Philadelphia, PA: American Philosophical Society, 1987), 172-173.

[95] Gordon, *American Iron*, 156-157; Craig L. Bartholomew and Lance E. Metz, *The Anthracite Iron Industry of the Lehigh Valley* (Easton, PA: Center for Canal History and Technology, 1988), 30; Craig Bartholomew, "Anthracite Iron Making and Industrial Growth in the Lehigh Valley," *Proceedings: Lehigh County Historical Society* 32 (1978): 135-135; William Firmstone, "Sketch of Early Anthracite Furnaces," *Transactions of the American Institute of Mining Engineers*, 3 (1874-1875): 152-156; Samuel Thomas, "Reminiscences of the Early Anthracite-Iron Industry," *Transactions of the American Institute of Mining Engineers*, 29 (1899): 901-928; Stapleton, *Transfer of Early Industrial Technologies*, 169-201.

Thomas's well-documented accomplishments took place within an atmosphere of experimentation and innovation. Pennsylvania ironmasters had clearly learned the skills necessary to smelt iron with anthracite in the late 1830s. The fact that seven anthracite furnaces existed in 1840 suggests that the basic techniques were generally available, although commercial success appears to have remained elusive prior to Thomas's work at Catasaqua.

The adoption of anthracite fuel and steam-powered blowing engines liberated Pennsylvania's ironmasters from the geographical constraints imposed upon charcoal-fueled furnaces. Freed from dependence upon waterpower, ironmasters could increase the size of their works, constructing several furnaces in a single location. These locations were likely to be alongside the region's canals and railroads, which delivered coal, iron ore, limestone, and other raw materials directly to the furnace location. Locating in towns alongside canals and railroads, rather than along waterpower sites deep in the woodlands, placed ironmasters closer to their markets and the source of their labor. It also permitted them to surrender the responsibility for providing housing and other services to workers, as frequently occurred at the remote iron plantations, to other residents of these small urban communities.[96]

The rise of the community of Danville, located along the Susquehanna River in Montour County, exemplifies this new pattern of development. The North Branch Canal, which paralleled the Susquehanna from the Wyoming field down to Harrisburg, reached Danville in 1831. Local entrepreneurs had already discovered iron ore deposits near Danville and were smelting this ore using charcoal-fueled blast furnaces. Philadelphia capitalists, attracted to the community because of its convenient location, built four anthracite-fueled blast furnaces alongside the canal between 1840 and 1842. In 1845 they erected a rail mill, the Montour Iron Works, alongside the furnaces. In October 1845 the Montour Works produced some of the first T-rail manufactured in the United States. A second rail mill was added in 1853. By 1856 the Montour Works consumed 100,000 tons of anthracite per year, producing 20,000 tons of railroad rail. Additional improvements to the works increased production to 45,000 tons of rail per year, with a work force of 1,400. The Montour Works were, for a time, the largest rail mill in the United States.[97]

The rapid growth of the anthracite iron industry in Danville clearly indicates that Pennsylvanians had mastered the process and techniques needed to produce cast and wrought iron using anthracite fuel. By the 1850s anthracite produced more iron in the United States than charcoal. Anthracite-fueled blast furnaces remained the largest producers of American pig iron until 1875, when coke-fired furnaces became dominant. Most anthracite ironworks located along the region's major transportation corridors, the Susquehanna, Schuylkill, and Lehigh Rivers, and their associated canals and railroads. Relatively few works were located in the heart of the anthracite region itself. A notable exception was Scranton's Lackawanna Coal & Iron Company.

In 1842 geologist William Henry, in partnership with experienced New Jersey ironmasters, Selden and George Scranton, began producing pig iron at an anthracite-fueled furnace located along Roaring Brook, a tributary of the Lackawanna River, at the future site of the city of Scranton.

[96] Gordon, *American Iron*, 45, 157; Chandler, "Anthracite Coal," 161.
[97] Chandler, "Anthracite Coal," 157-158; Gordon and Malone, *The Texture of Industry*, 156.

With little local demand for the furnace's output, the major problem confronting the enterprise was the delivery of its product to outside markets at a competitive price. The furnace was not sited near any of the region's canals, which greatly increased transportation costs. In 1844 the firm shifted its orientation from the production of pig iron to the manufacture of nails, constructing a sizable rolling mill with twenty nail machines. The low quality of the Lackawanna area iron ore produced nails so brittle that one in three broke when struck, and the cost of transporting their product by wagon to Carbondale, on the Delaware & Hudson Canal, or Pittston, on the Susquehanna River, proved prohibitive.[98]

In desperation the Scrantons decided to once again reorient their business, shifting to the production of railroad rails. In 1846, only a year after the Montour Works first production of American-made T-rails, the Scrantons contracted with the New York & Erie Railroad to provide four thousand tons of rails. This contract and a second for an additional 12,000 tons of rail, provided the infusion of capital required to construct a rail mill and place the firm on solid financial footing. The firm reorganized in late 1846 with a capitalization of $230,000, approximately 40 percent of which came from investors connected with the New York & Erie. Rail production began in earnest in August 1847. The rails were hauled by horse and mule teams over wilderness roads to various points along the New York & Erie. These shipments saved the railroad from bankruptcy, as the tracks reached Binghamton, New York just four days before a deadline specified by the New York legislature that would have required the line to forfeit a state endowment of three million dollars. In 1853 the enterprise that gave Scranton its material underpinning was again reorganized, doubling its capitalization and becoming Lackawanna Iron & Coal Company. The firm, which became one of the nation's largest manufacturers of iron and steel rails, retained this name throughout most of the remainder of the nineteenth century. In 1902 the company moved all its operations to Buffalo, New York, terminating its associations with the community it developed in the heart of the anthracite region.[99]

Anthracite at Mid-Century

The success of Thomas, the Scrantons, and the Pennsylvania's other anthracite ironmasters opened a new era for American industry. The availability of a plentiful supply of inexpensive, high-quality iron sparked the rapid development of the nation's railroads and metal-working industries. Anthracite eliminated the dependence upon wood and water as energy sources for industry, and its use in ironmaking facilitated the adoption of steam engines and other metal machinery. Anthracite enabled manufacturers to concentrate their production in factories, increasing the scope and scale of industrialization. The ability to produce large quantities of high-quality iron and the fabrication plants associated with this new supply assured the industrialization of the American economy.[100]

---

[98] Gordon and Malone, *Texture of Industry*, 157-158; Lewis, "Early History," 424-468; Daniel K. Perry, *"A Fine Substantial Piece of Masonry": Scranton's Historic Furnaces* (Harrisburg: Pennsylvania Historical and Museum Commission, 1994).

[99] Lewis, "Early History," 457-466; Perry, *"A Fine Substantial Piece of Masonry"*, 19-23.

[100] Miller and Sharpless, *Kingdom of Coal*, 63.

Anthracite coal from northeastern Pennsylvania fueled the transformation of the American economy beginning in the 1830s and 1840s. The opening of the anthracite canals enabled mine operators to dramatically increase their output and spurred a rush of development throughout the anthracite region. In 1828 anthracite production amounted to approximately 91,000 tons. Seven years later, in 1835, production stood at 670,000 tons, and by 1840 production passed 1 million tons. Before the end of the 1840s annual production surpassed 3 million tons. Increased production, combined with falling transportation costs, led to lower prices. In the 1830s anthracite sold for $7.00 to $7.50 per ton in Philadelphia. By the mid-1850s prices had dropped to $3.00 to $4.25 per ton. The opening of the anthracite fields provided the northeast with a constantly increasing domestic supply of coal that provided it with high-quality fuel for most industrial and domestic needs at decreasing prices.[101]

By the mid-1850s the use of anthracite coal for smelting cast or pig iron and puddling wrought iron had literally and figuratively altered the landscape of the American iron industry. Anthracite provided the fuel that modernized the industry east of the Alleghenies, and permitted a locational shift away from the isolated hills of central Pennsylvania to the waterways and population centers of the eastern portion of the state. Cities located along the routes of the anthracite canals, such as Allentown, Bethlehem, Reading, Norristown, Phoenixville, Danville, and Harrisburg became major centers of the iron industry. Anthracite iron provided manufacturers throughout the northeastern United States with a reliable source of "high grade domestic iron at prices which were, during most of the critical decade of the 1840's, appreciably lower than both domestic charcoal-produced, and imported coal-produced iron."[102]

Statistical data clearly demonstrates the preeminence of anthracite iron by the mid-1850s, and the dominant role of eastern Pennsylvania. In 1856, only a decade and a half after the establishment of the earliest commercially successful anthracite furnaces, pig iron production in the United States totaled approximately 800,000 tons.[103] One-half this output consisted of anthracite iron – charcoal accounted for 42 percent of the nation's production and bituminous coal or coke for 8 percent.[104] In 1856 over half of United States' pig iron production came from Pennsylvania. Anthracite produced 68 percent of the state's pig iron.[105] Eastern Pennsylvania produced 78 percent of the nation's supply of anthracite iron.[106]

Between 1856 and 1871, anthracite iron accounted for more than half of the nation's total production of pig iron. In 1863, 60 percent of American iron was smelted using anthracite. During this period, the importance of charcoal iron and bituminous/coke iron reversed. In 1856 charcoal iron comprised 42 percent of the nation's production. This figure declined to 20 percent

---

[101] Ibid.; Chandler, "Anthracite Coal," 151, 156-158.

[102] Chandler, "Anthracite Coal," 159, 164.

[103] There appear to be discrepancies among sources concerning the total production figure. Binder in *Coal Age Empire* cites 803,917 tons. Temin in *Iron and Steel* cites three sources: two give 788,515 tons, the other gives 812,817. The average of all four sources is 798,441 tons; approximately 800,000 tons.

[104] Temin, *Iron and Steel*, 268.

[105] Binder, *Coal Age Empire*, 164.

[106] Ibid., 70.

by 1871. Bituminous and coked iron, however, increased its share from 8 percent of the nation's output in 1856 to 30 percent in 1871. In the years following 1871, as the ability to produce steel in large quantities at reasonable costs grew, iron declined in importance as an industrial product, as did the place of anthracite coal in the industrial economy.[107]

Anthracite facilitated the widespread adoption of steam engines within both the iron industry and the general industrial sector of the economy. The hot air blasts associated with anthracite furnaces were generally produced by steam engines fired with anthracite, as were the rolling mills, rail mills, and other machinery associated with the ironworks. The adoption of steam technology depended partially upon the availability of a reliable and inexpensive fuel supply, such as that offered by anthracite, and reliable and inexpensive boilers and other metal machinery, much of which was manufactured using anthracite. Steam technology permitted greatly expanded levels of production, since manufacturers were no longer limited by wood and water power sources. The removal of size limitations associated with the adoption of steampower brought the factory, a large, subdivided, routinized, continuously operating operation manned by a large work force, to the metalworking industry. In the 1840s, with the great domestic expansion of iron production and the associated drop in coal and iron prices, factory production became the norm in the metal-working industries. The rapid rise of large metal-working enterprises led to the beginnings of the specialized machine tool industry, and ultimately, to the adoption of standardization.[108]

Anthracite also provided inexpensive fuel for other manufacturing processes that required heat. Within the glass, paper, sugar refining, baking, and brewing industries factory production followed rapidly upon the adoption of anthracite as a fuel source and steam power. By the close of the 1830s the availability of anthracite coal was facilitating the rapid adoption of steam power, at the same time as it revolutionized the iron industry.[109]

Steam technology even affected the anthracite mining industry. Steam powered fans ventilated the mines and steam powered pumps removed water from the works. These technological improvements made it easier to push mines deeper below ground. The greater capital investment required to pursue coal in this fashion resulted in an increasingly concentrated industry, with massive firms, capitalized by Philadelphia and New York investors, owning the coal lands, extracting the coal, and delivering it to market.[110]

The Reign of the Anthracite Railroads

The combination of anthracite, iron, and railroads pushed the anthracite region, and the associated anthracite iron region along the Susquehanna, Schuylkill, and Lehigh Rivers, into the industrial age. In 1850 five firms operated thirteen anthracite blast furnaces in the Lehigh Valley. In 1860 there were six firms and thirty-three furnaces. The construction of branch line railroads that connected to the region's main trunk lines and canals allowed ironmasters to locate their works

[107] Miller and Sharpless, *Kingdom of Coal*, 64; Swank, *History of the Manufacture of Iron*, 362.
[108] Chandler, "Anthracite Coal," 161, 165-168.
[109] Ibid., 165-166.
[110] Miller and Sharpless, *Kingdom of Coal*, 66.

away from the rivers and nearer the iron ore deposits. By the end of the 1860s there were ironworks operating or under construction in at least six communities located away from the river. By 1873 the Lehigh Valley was the largest producer of anthracite iron in Pennsylvania, with 47 furnaces producing 390,000 tons.

The railroads were the major beneficiaries of the anthracite iron industry. For many years the railroad industry consumed up to half the nation's iron production in the form of rails, wheels, boilers, locomotives, and bridges. Following the Civil War, railroads paced the development and expansion of the anthracite industry by overtaking canals and securing the right to purchase coal lands. This new-found dominance and power was reflected in their policy of expansion. The railroad companies increasingly sought to control the source of their tonnage as well as to reach tidewater markets via their own lines. Thus, besides the purchase of coal lands and the extension of short lines within the anthracite region, the railroad companies looked beyond Pennsylvania. Much of the latter expansion took place in the Wyoming and Lehigh fields, where railroads focused on establishing through lines to New York, as opposed to negotiating the right to ship over existing New Jersey or New York lines. New York City represented anthracite's largest market and was not "monopolized" by a single carrier, as Philadelphia was by the Reading. The railroads also sought expansion to the Great Lakes. From Buffalo and other lake ports anthracite was shipped by lake freighters to Cleveland, Chicago, and other midwestern cities.

As the coal trade grew with the expansion of rail lines, the separate fields experienced changes in their development. Towards the close of a period ending in mid-1830s, the Schuylkill field was mining about 60 percent of the total production, the Lehigh field was normally contributing about 25 percent, and the Wyoming field about 15 percent. The production of the Schuylkill field declined, and by the close of a period ending in early 1870s, shipments from the Schuylkill field constituted only about one-third of the total anthracite output. The declining importance of the Schuylkill field resulted from two factors. First, the opening of new rail lines between the upper fields and New York City, which was replacing Philadelphia as the center of the anthracite trade, lessened the importance of the Schuylkill field. Second, veins lying above the water table in both the Schuylkill and Lehigh fields began to fail, which made it cost effective to mine the deep flat workings of the Wyoming field. By the early seventies, the Lehigh field's share of output had declined slightly from 25 percent to 20 percent. The greatest growth in the coal trade was in the Wyoming field, which contributed 45 percent of the industry's output in the early seventies. This figure became even greater in succeeding years.[111]

The primary anthracite-carrying railroads were those that acquired mining privileges in the post-Civil War era. Besides the Philadelphia & Reading, these included the Central Railroad of New Jersey, the Delaware & Hudson, the Delaware, Lackawanna & Western, and the Lehigh Valley. Other railroads operating in the anthracite region included the Delaware, Susquehanna, & Schuylkill; the Erie; the Lehigh & New England; the New York, Ontario, and Western; the New York, Susquehanna, and Western; and the Pennsylvania.[112]

---

[111] Jones, *The Anthracite Coal Combination*, 39.
[112] Powell, "The Pennsylvania Anthracite Industry," 13.

In the Wyoming field, the Scranton family set about establishing a rail connection between their ironworks and outside markets in 1848, shortly after completing their rail contract with the Erie Railroad. The Scrantons ambitiously proposed two railroads: the Liggett's Gap (later renamed the Delaware & Western), would link Scranton with the Erie Railroad and upstate New York; the Delaware & Cobb's Gap would run between Scranton and Stroudsburg and connect with a New Jersey railroad in order to gain rail access to New York Harbor. Construction took place between 1850 and 1853 and, upon completion, the two lines were consolidated into the Delaware, Lackawanna, & Western Railroad.[113] The DL&W primarily hauled iron ore and limestone to the furnaces and bar iron and T-rail to market. It also spurred the opening and development of the Lackawanna Valley anthracite fields. Upon its establishment, the DL&W owned over 2,500 acres of coal lands in the Lackawanna Valley.

In 1856, the DL&W's tracks reached the Delaware Water Gap where, by means of a series of connections with New Jersey railroads, the company acquired a through connection to New York Harbor. In 1868 the DL&W secured an independent outlet to Hoboken by leasing the Morris & Essex Railroad, making the DL&W the first anthracite region railroad that could run trains directly from the coal fields to New York Harbor, a significant advantage over its competitors. In 1870, the DL&W further expanded its system by building or acquiring trackage to Syracuse and Oswego on Lake Ontario.[114]

In the Lehigh field, the Lehigh Valley Railroad was chartered in 1846 with financial backing from Philadelphia investors. The Lehigh Valley sought to emulate the Reading Railroad and become the primary anthracite carrier of the Lehigh Valley. Pressure from the rival Lehigh Canal initially scared away investors and the undertaking languished until 1851, when Mauch Chunk businessman Asa Packer purchased the majority of the outstanding stock. With Packer's backing, the railroad was completed between Easton and Mauch Chunk in 1855.[115] In return for financial aid need to complete the construction of its line, the Lehigh Valley designated the Central Railroad of New Jersey as the primary carrier of the Lehigh Valley's anthracite shipments between the Delaware River and New York harbor.[116] By 1868, the Lehigh Valley carried more than twice the amount of coal and freight as its chief competitor, the Lehigh Canal.[117]

The Central Railroad of New Jersey was created out of the reorganization of the Elizabethtown & Somerville Railroad in 1847. In 1852, the line was completed between Jersey City and Phillipsburg, across the Delaware River from Easton. Throughout the 1850s and 1860s, the Central was the major New Jersey carrier of anthracite, transporting coal that originated on the Lehigh Valley, DL&W, and Lehigh & Susquehanna lines to New York Harbor.[118]

---

[113] Burton W. Folsom, Jr., *Urban Capitalists: Entrepreneurs and City Growth in Pennsylvania's Lackawanna and Lehigh Regions, 1800-1920* (Baltimore, MD: Johns Hopkins University Press, 1981), 33.
[114] Hugh Moore Historical Park and Museums, "Historic Resources Study," 178-179.
[115] Miller and Sharpless, *Kingdom of Coal*, 70-71.
[116] Bogen, *The Anthracite Railroads*, 112.
[117] Miller and Sharpless, *Kingdom of Coal*, 72.
[118] Bogen, *The Anthracite Railroads*, 150-157.

The anthracite business of both the Lehigh Valley Railroad and the Central Railroad was jeopardized in 1868 with the DL&W's lease of the Morris & Essex Railroad. The lease allowed the DL&W to ship anthracite to New York at a lower cost than its competitors. As a result, the Lehigh Valley Railroad and the Central Railroad abandoned their arrangement and sought to rival the DL&W by establishing individual through lines. In the case of the Lehigh Valley, this meant extending its line to New York Harbor and, in the case of the Central Railroad, it meant pushing its line westward into the coal regions.[119]

In 1871 the Lehigh Valley responded to the DL&W threat by leasing the Morris Canal. This action secured prime Jersey City harbor frontage for the railroad, but also earned the hostility of adjacent railroads that barred the Lehigh Valley from establishing a direct line to the parcel. Instead, the Lehigh Valley secured a charter from the New Jersey legislature for a separate line to Perth Amboy, which was completed in 1875. Not until 1893 did the Lehigh Valley established a direct through line to its Jersey City harbor frontage.[120]

The Central Railroad of New Jersey also responded to the DL&W in 1871 by leasing the transportation facilities of the Lehigh Coal & Navigation Company, including the Lehigh & Susquehanna Railroad, the Lehigh Canal, and the Delaware Division Canal, which had become property of the Lehigh Coal & Navigation Company in 1866. Two years later, the Central purchased 5,500 acres of Wyoming Valley coal lands from the Lehigh Coal & Navigation Company. Thereafter the Central became a major producer of anthracite.[121]

Simultaneous with its expansion to the east, the Lehigh Valley pushed its tracks north in the 1860s from Mauch Chunk to the Wyoming Valley. This route had formerly been the sole domain of the Lehigh Coal & Navigation Company's feeder line, the Lehigh & Susquehanna Railroad. Upon gaining access to the Wyoming field, the Lehigh Valley purchased the section of the North Branch Canal that extended north of Wilkes-Barre. This section of the canal was ruined in a devastating flood in 1865. The Lehigh Valley laid a rail line on the former tow path between Wilkes-Barre and Waverly, New York. At Waverly, the railroad connected with the Erie Railroad, providing the Lehigh Valley with an outlet to the Great Lakes. In 1892 the Lehigh Valley completed its own line to Buffalo.[122]

Away from the Lehigh and Wyoming fields, the Philadelphia & Reading Railroad reigned unchallenged in the Schuylkill field. In the 1890s, the Reading undertook a period of expansion, the goals of which were the creation of an anthracite mining and transportation monopoly and an elevation in the line's status to that of a major trunk line, like the Pennsylvania Railroad. Between 1890 and 1892, the Reading leased the Lehigh Valley and the Central Railroad of New Jersey and purchased majority control of the DL&W. However, this arrangement was short-lived, and the Reading declared bankruptcy in 1893. The Lehigh Valley, Central, and DL&W regained their

---

[119] Hugh Moore Historical Park and Museums, "Historic Resources Study," 167.
[120] Ibid.
[121] Bogen, *The Anthracite Railroads*, 150-167.
[122] Hugh Moore Historical Park and Museums, "Historic Resources Study," 166.

independence. In the wake of the crash, the Reading system came under the control of New York financier J. P. Morgan.[123]

Dissolution of the Anthracite Canals

With the ascendancy of rail transportation in the decade following the Civil War, the anthracite canals faded in importance and prominence. The canals were either transferred to the railroads, built their own rail lines in an effort to remain competitive, or shifted their focus from the transportation to the mining of coal. As early as 1859 the Delaware Division was sold to the Sunbury & Erie Railroad, which in turn transferred it to the Delaware Division Canal Company, a subsidiary of the Lehigh Coal & Navigation Company. The Lehigh Coal & Navigation Company operated the canal until 1931.[124] In 1870 the Schuylkill Navigation Company leased all its property to the Reading Railroad. The Morris Canal leased its property to the Lehigh Valley Railroad and the Pennsylvania Railroad secured control of the Delaware & Raritan Canal in 1871. Also in 1871, the Reading Railroad leased the Susquehanna & Tidewater Canal.[125]

Both the Lehigh Coal & Navigation Company and the Delaware & Hudson Canal Company took proactive steps to counter the challenge of the railroads by shifting their business away from their canals and towards system building among railroads and the acquisition of coal lands. The Lehigh Coal & Navigation Company extended its feeder line, the Lehigh & Susquehanna Railroad, south to Easton. This created an all-rail connection between Easton and Wilkes-Barre and confronted the aggressive expansion of the Lehigh Valley Railroad along the same corridor. At Easton, a connection was made with the Central Railroad of New Jersey, providing an outlet to the New York market. To protect this outlet, in 1871 Lehigh Coal & Navigation leased all its transportation facilities, including the Lehigh Canal and the Delaware Division Canals, to the Central Railroad of New Jersey. However, Lehigh Coal & Navigation maintained control over its coal holdings.[126]

The Delaware & Hudson Canal Company entered into an agreement with the Pennsylvania Coal Company to receive and market the firm's coal at tidewater in 1849. After a series of legal actions, the Pennsylvania Coal Company withdrew from the contract in 1864 and a year later transferred the entire contract to the Erie Railroad. Soon thereafter, the Delaware & Hudson shifted its emphasis from canal transportation to the ownership of coal lands and began acquiring railroads. By the time the transformation was complete, the Delaware & Hudson was primarily a railroad company that owned mines.[127] The first step toward expansion occurred in 1866, when the Delaware & Hudson purchased the Union Coal Company, which owned coal lands, railways, and canal boats. In 1868 the Delaware & Hudson contracted with the Erie Railroad for construction of a branch line from their main line to Carbondale, thereby opening the Great Lakes and New York City markets to the Delaware & Hudson. By 1872, the canal business portion of the Delaware &

---

[123] Ibid., 177; Bogen, *The Anthracite Railroads*, 73, 181.
[124] Zimmerman, "Delaware Division Canal," 144.
[125] Jones, *The Anthracite Coal Combination*, 35.
[126] Ibid., 35-36.
[127] Jones, *Anthracite-Tidewater Canals*, 88.

Hudson had diminished to the point that it no longer merited mention in the company's annual reports.[128]

Urbanization

The anthracite iron industry provided the impetus for the establishment of a host of related industrial activities within the anthracite region and along the principal waterways and railroads that linked the region to the urban centers of the American northeast. Located near the ironworks were plants producing boilers, pumps, tools, fencing, rails, pipe, structural iron, and a host of other metal products. The presence of local supplies of raw materials spawned the development of other businesses, such as brickworks, clay and tile works, and the cement industry of the Lehigh Valley, that relied upon the canals and railroads to deliver raw materials and transport finished goods to market. The urbanization of communities within the region also spurred demand for lumber and other building materials and skilled workmen.[129]

The anthracite region evolved slowly prior to the opening of the coal fields. The establishment of anthracite coal as a viable fuel in the 1830s attracted investors and led to transportation and industrial development linking the region to three major markets. The Delaware & Hudson Canal Company connected the Lackawanna Valley to the New York market; the Schuylkill field, directly connected to Philadelphia via the Schuylkill River, attracted investors from that city. Wilkes-Barre entrepreneurs in the Wyoming Valley used the Susquehanna River to reach the Baltimore market.[130]

Small hamlets and villages developed along the anthracite canals. These communities usually contained housing for canal workers, inns, and small industrial enterprises, such as saw mills. Upstream from these villages, at the heads of navigation, canal company terminals included wharves, warehouses, stables, boatyards, and dwellings. These ports evolved into the region's first urban centers, generally corresponding to one of the anthracite fields: Pottsville, located near the Schuylkill Canal, dominated the Schuylkill field; Mauch Chunk on the Lehigh Canal, developed as an entrepot for the Lehigh field; Wilkes-Barre on the Northern Branch of the Pennsylvania Canal, served as an urban center for the Wyoming field; while Carbondale, on the gravity railroad leading to the Delaware and Hudson Canal, initially served as the regional center of the Lackawanna Valley. Scranton, while not an early transportation center, eventually overtook Carbondale as the regional center of the Lackawanna Valley. Other towns and villages developed soon after the construction of the anthracite canals as satellites of the new regional centers. Port Carbon, St. Clair, Tamaqua, Mount Carmel, Shamokin, Hazleton, Plymouth, Nanticoke, and other settlements experienced rapid growth as the coal industry prospered. Regional variations in urbanization resulted from locational issues, outside or local investment control, and entrepreneurial differences.[131]

---

[128] Ibid., 95.
[129] Miller and Sharpless, *Kingdom of Coal*, 67.
[130] Lawrence M. Newman, "Nine Towns" (M.A. thesis, Harvard University, 1993), 9.
[131] Miller and Sharpless, *Kingdom of Coal*, 45.

Wilkes-Barre, one of the oldest towns in the anthracite region, developed as an important trading center on the Susquehanna River in the late-eighteenth century. When the export of anthracite coal began to shift the local economy from an agricultural to an industrial orientation in the second quarter of the nineteenth century, town leaders shifted easily from mercantile activities to coal land speculation, mining, transportation, and banking. They formed a capitalist elite, bound together by common business interests and marriage. This group took steps to make Wilkes-Barre a regional center in the mid-nineteenth century by gaining control of the area's primary industry to the exclusion of outsiders. Local businessmen organized more than twenty-five major coal companies in the Wyoming Valley, which they headquartered in Wilkes-Barre. This resulted in Wilkes-Barre's dominance of the Wyoming field. The city served as the field's most prominent urban center and exerted a powerful influence over the development of the coal industry. In addition to coal interests, Wilkes-Barre was an important manufacturing center, housing iron works, a wire rope company, and silk and lace mills.[132]

Scranton illustrates successful urbanization in the face of significant locational constraints. Despite a scarcity of lime and iron ore, Scranton's locally-owned iron industry thrived and the town emerged as the Lackawanna Valley's, and the anthracite region's, principal industrial center. The town's phenomenal growth was influenced by the Scranton family's ability to control investment and a fervent entrepreneurial spirit that extended beyond their iron enterprise. The Scrantons exploited their position as land owners by laying out streets, selling building lots, and erecting housing for workers. They sought to encourage bankers, merchants, developers, lawyers, and others with capital or entrepreneurial talent to relocate to the burgeoning community. Their success may be measured in the city's spectacular population increase, from 1,000 in 1850 to 45,000 in 1880, and by the reputation that the city earned as a major manufacturing and transportation center.

The city's new residents established coal and coal-related industries, such as engine manufacturing, lumber yards, and gunpowder works. English immigrant Thomas Dickson, financially backed by the Scrantons, moved from Carbondale to Scranton in 1856 and established a foundry and machine shop. By 1863 the Dickson Manufacturing Company was a major producer of locomotives, railroad cars, engines, and other iron products. Scranton became known as the "Anthracite Capital of the World." The city's factories produced a diversified array of goods. Four major railroads built terminals and yards in the community, transforming the formerly isolated ironworks village into a leading transportation center.

The attitude of the Scrantons and their associates proved decisive to Scranton's rise. These investors sought to establish a modern diversified city economy, not merely a community focused upon serving the needs of a single industry. They invested in the urban infrastructure of hospitals, parks, schools, streetcars, and libraries, as well as in collieries and ironworks. Scranton's industrial elite eventually learned to share power with the immigrant groups that swelled the city's population. In 1866, following an expansion of the city limits that encompassed large tracts of working class neighborhoods, the Irish won control of the city government. Most of the city's elite accepted this situation as preferable to smaller city limits and a continuation of elite control. In

---

[132] Folsom, *Urban Capitalists*, 70; Miller and Sharpless, *Kingdom of Coal*, 77.

1880 Terence V. Powderly, a mechanic and national president-elect of the Knights of Labor became the city's first Irish mayor, exemplifying the accomodation reached between Scranton's elite and the city's burgeoning working class, with its ethnic, religious, and political differences.[133]

Pottsville, located at the head of the Schuylkill Navigation and the Reading Railroad, evolved as the major urban center within the Schuylkill field. Unlike Wilkes-Barre and Scranton; however, Pottsville's local elite never owned more than a third of the Schuylkill field's coal lands. The majority of the coal lands were owned by outside investors, with Philadelphians comprising by far the largest group. Most outside investors did not actually mine coal, since their state-granted charters forbid their firms from acting as both mine operators and coal carriers. Many of these investors formed land companies, which leased coal lands to operators. The investors surrendered control over the mining operations, but retained ownership of the land.[134]

While Pottsville's elite did participate in the coal trade they also went into manufacturing and banking. Nevertheless, the predominance of outside investors within the field meant that, from a relatively early date, Pottsville and the entire Schuylkill field functioned largely as an economic appendage of Philadelphia. Profits earned in the fields flowed down the Schuylkill, like the area's coal, to Philadelphia. Local capitalists did not control the field, or their own community. The inability of Pottsville's capitalists to exert control over the field's coal and transportation industries meant that they lost control over their community's economic future. Pottsville, and the entire field, became subservient to the corporate goals of the Reading Railroad, which virtually monopolized transportation within the field and controlled most of the coal lands after the 1870s. The city of Reading, located outside the anthracite region, ultimately became the dominant city within the Schuylkill basin, with a diversified economy centered on iron, railroads, and textiles.[135]

Jim Thorpe (Mauch Chunk) was a small outpost on the Lehigh River until the Lehigh Coal & Navigation Company established its headquarters there and transformed it into a thriving transportation and mining center and the principal urban center within the Lehigh field. Lehigh Coal & Navigation opened the company town to outside investors in 1831, and the community rapidly developed into a center of mining, transportation, merchandising, banking, and small manufacturing. In 1846 investors from outside the anthracite region obtained a state charter to construct a railroad up the Lehigh Valley to Mauch Chunk, offering direct competition to the transportation monopoly of Lehigh Coal & Navigation. Local entrepreneurs, most notably Asa Packer, supported this effort and invested in the Lehigh Valley Railroad because they saw a clear advantage to breaking Lehigh Coal & Navigation's hold over the field.[136]

Lehigh Coal & Navigation waged a campaign against the railroad venture, attempting to dissuade Philadelphia investors from risking their capital in what the firm portrayed as a risky, costly, and fool-hardy attempt to build a railroad in a mountainous region. Packer ultimately marshaled the resources of his family, friends, and business associates, and purchased the majority of the

---

[133] Miller and Sharpless, *Kingdom of Coal*, 67-68; Folsom, *Urban Capitalists*, 34-35, 148.
[134] Miller and Sharpless, *Kingdom of Coal*, 48-49; Wallace, *St. Clair*, 54.
[135] Miller and Sharpless, *Kingdom of Coal*, 49-50; Wallace, *St. Clair*, 417-418.
[136] Folsom, *Urban Capitalists*, 116-119.

railroad company's stock shortly before expiration of the corporate charter in 1851. Completed between Easton and Mauch Chunk in 1856, the Lehigh Valley Railroad represented one of the earliest examples of local interests, rather than New York and Philadelphia capitalists, raising the millions of dollars required to construct a major transportation system. The Lehigh Valley Railroad enjoyed connections to New York and Philadelphia by means of the Central Railroad of New Jersey and the Morris and Delaware Division Canals. The line also passed through the heart of the emerging Lehigh Valley anthracite iron region. Packer pushed the development of feeder lines deep into the coal fields and strove to maintain competitive rates. By 1868 the Lehigh Valley hauled twice the amount of coal and freight as the Lehigh Canal, its principal competitor.[137]

Mauch Chunk's elite profited from the expansion of the town's coal, transportation, and service industries. They represented the greatest concentration of wealth in the Lehigh field; a fact exemplified by the town's fine homes and massive office headquarters. Additionally, the community emerged as a resort town, attracting affluent tourists from Philadelphia and New York to the "Switzerland of America." Ultimately, despite Mauch Chunk's impressive growth and prosperity, the town's physical constraints–a location in a ravine between two mountains–hindered its industrial development. An emigration of the town's elite, led by Asa Packer in the 1860s, south to the Lehigh Valley and Bethlehem, stunted Mauch Chunk's growth and prevented it from becoming a key industrial center in the region.[138]

Towns like Carbondale, Plymouth, Nanticoke also suffered from an emigration of investors and talent to growing centers like Scranton, Wilkes-Barre, and Pottsville. Carbondale, which developed as a company town for the Delaware & Hudson railroad, was controlled by outside investors from its origins in the 1830s. The few entrepreneurs that settled in Carbondale were eventually lured by impressive investment opportunities to the regional center of Scranton, taking their capital with them.[139]

The town of Hazleton is an example of the importance of regionalism and the reign of independent coal operators when many other towns in the anthracite region, like Pottsville, were controlled by larger, outside interests. A handful of powerful independent operators, primarily the Pardee and Markle families, dominated the northern portion of the Lehigh field.[140] These independent operators owned mining companies, railroads, land trusts, banks, lumber operations, local mills, ironworks, and retail establishments, as well as wielding power over local politicians, police, businessmen, and clergy. According to one account, they were "lords of a small fiefdom they had made through their own enterprise."[141] Because of their extensive power and wealth, these local lords saw themselves as trustees of their fellow men and employees. As a result, independent coal operators set the pattern for labor relations, refusing to deal with unions.

---

[137] Bogen, *The Anthracite Railroads*, chap. 5; Folsom, *Urban Capitalists*, 119.
[138] Miller and Sharpless, *Kingdom of Coal*, 70-72; Folsom, *Urban Capitalists*, 149-150.
[139] Folsom, *Urban Capitalists*, 150.
[140] Harold W. Aurand, "The Anthracite Strike of 1887-1888," *Pennsylvania History* 35, no. 2 (1968):170.
[141] Miller and Sharpless, *Kingdom of Coal*, 225.

Community development in the anthracite region paralleled the development of the mining industry. New towns and villages were created with the increased demand for housing, transportation services, professional services, and businesses servicing the coal industry. The development of the anthracite industry created new jobs in the region, attracting local farmers and recently-arrived English and Irish immigrants to newly-developed mining towns. By 1850 numerous mining towns had been established throughout the region that housed and provided services to mine workers. Towns in the Schuylkill field included New Philadelphia, Port Carbon, St. Clair, Pottsville, and Minersville. The primary towns in the Lehigh field included Mauch Chunk, Hazleton, Tamaqua, and Lansford. Wyoming-Lackawanna field towns included Carbondale, Scranton, Pittson, Wilkes-Barre, Plymouth, and Nanticoke. With the exception of urban centers such as Scranton, Pottsville, Wilkes-Barre, Mauch Chunk, and, arguably, Carbondale, most of these communities developed as small towns that serviced outlying collieries and mining hamlets or patches. In some instances, small towns were established as a result of the influence of the auxiliary railroads. For example, Weatherly, in the Lehigh field, developed around the Beaver Meadows Railroad.[142]

Coal companies developed fewer patch towns in the Wyoming-Lackawanna field due to the geological characteristics of the basin. This field formed a continuous basin populated by a series of towns connected by railroads. In the Lehigh and Schuylkill fields the coal basins were small and scattered, resulting in isolated collieries physically removed from major towns. As a result, coal companies operating in these fields were more likely to develop patch towns to attract and house miners and laborers. Patch towns originally consisted of company housing and a store adjacent to a colliery, and existed solely to produce coal for export.[143]

Coal companies owned isolated patch communities outright, and consequently dominated the lives of the patch inhabitants. The company dictated laws, hired company police, and owned all land, streets, houses, stores, schools, churches, and community buildings. Early patch towns were usually characterized by a row of shacks and houses along a single, narrow road. Over time, additional streets were laid out as necessary. Mine bosses and supervisors lived in larger homes, often located on the high ground of the community. Miners' houses, usually constructed as duplexes, were located downhill from supervisor housing. Laborers and other unskilled workers often lived in shacks at the base of the main street or on side streets and alleys. A company store and a community center, which often served as school, were situated in the center of the hamlet. The company store served an integral role in the patch town. It was usually the only place where food, tools, and dry goods could be purchased. The local coal company extended credit to miners and then deducted the amount due, plus rent, from their paychecks. Prices at the company store were often artificially high and miners were often expected to trade there. If the patch was large enough, a Presbyterian church might be located near the bosses and supervisors' housing, while a

---

[142] Powell, "Pennsylvania Anthracite Industry," 10-11; Wallace, *St. Clair*, 138.

[143] Peter Roberts, *The Anthracite Coal Industry: A Study of Economic Conditions and Relations of the Co-operative Forces in the Development of the Anthracite Coal Industry of Pennsylvania* (New York: Macmillan, 1901), 122-123.

Catholic church sat at the workers' end of village. The colliery's coal breaker, railroad tracks, mule yard, and machine shops stood adjacent to the residential hamlet.[144]

In many cases, patch residents walked to nearby towns to attend church, shop elsewhere than at the company store, visit taverns (often run by the widows of miners), post offices, or railroad depots. Ethnic mutual aid and beneficiary societies were usually headquartered in these larger communities. As with churches, benefit and fraternal institutions helped newcomers find employment, housing, and prepare for citizenship. Once newcomers were established in a mining community, the societies also served to take care of widows and orphans, the ill and infirm, and provided social and economic insurance within different ethnic groups.[145]

Mining towns, also known as "free" towns, served as regional entrepots for the mining community. While communities such as Pottsville, Wilkes-Barre, Hazleton, and Scranton were not wholly owned by the coal companies, the companies often wielded considerable control within the community, providing investment in local infrastructure, such as water and railroads. Coal companies invested in the town's social infrastructure as well, providing land and capital to construct churches, libraries, hospitals, and volunteer fire companies.[146] The coal companies' auxiliary coal police, later institutionalized as the Coal & Iron Police, assisted local police in emergencies. The company police patrolled villages and patches and could enter and search homes at any time. The auxiliary police, who owed allegiance to the coal operators, often dealt with labor troubles.[147]

While successful commercial development of the anthracite coal fields was the primary catalyst for urbanization in the anthracite region, development of major industries in the region further contributed to urban expansion. Transportation and coal companies provided a catalyst for industrialization by promoting and supporting local communities. Both outside and local financial interests created core areas of heavy industry and transportation located close to urban centers. Locally-owned smaller manufacturers, which depended on the region's large labor pool and extant transportation infrastructure, were often located both in and on the outskirts of urban centers, such as Scranton and Wilkes-Barre.[148] Mining industries and farming activities were usually located outside these areas, supplying the urban-industrial centers with agricultural goods. While urban centers were heavily influenced by the coal companies and their financial power, ancillary industries in these towns provided some economic diversification, and with it, a more heterogeneous class structure. This economic diversification helped make industry-community relations more complex and less absolute than in the company town.[149]

---

[144] Miller and Sharpless, *Kingdom of Coal*, 142-143.
[145] Ibid., 148-150.
[146] Harold W. Aurand, *From the Molly Maguires to the United Mine Workers: The Social Ecology of an Industrial Union, 1869-1897* (Philadelphia: Temple University Press, 1971), 20-22.
[147] Miller and Sharpless, *Kingdom of Coal*, 142.
[148] John E. Bodnar, "Socialization and Adaptation: Immigrant Families in Scranton, 1880-1890," *Pennsylvania History* 43, no. 2 (1976): 149.
[149] Aurand, *From the Molly Maguires*, 21.

Because of its close ties with both coal and transportation companies, the iron industry was one of the largest manufacturing industries in the anthracite region. Iron-related manufacturers included forges, furnaces, and rail mills. Manufacturers of mining-related equipment, such as fans, locomotives, steam engines, powder works, and stoves were abundant in the region. Beginning in the late nineteenth century, manufacturers of consumer goods, including silk, lace, tin, and cigars, tapped into a large, mostly young female labor pool concentrated in the region's urban centers. These consumer goods industries, especially the textile industry, were similar to mining in that both offered low-wage and low-skill industrial work. Both industries also suffered from rapid boom and bust cycles.[150]

Consolidation and Control

By the close of the Civil War the five great anthracite railroads, The Philadelphia & Reading, Lehigh Valley, Delaware & Hudson, Delaware, Lackawanna, & Western, and the Central of New Jersey, carried the fuel that heated the homes of the northeast and fired the furnaces of the region's industries. The ascendant railroads had broken the transportation monopoly of the anthracite canals, assuring the demise of these enterprises, and had created a new transportation monopoly.

The railroads sought to bring order and stability to the industry, assuring reliable and consistent levels of production so as to stabilize prices. The preferred means for obtaining order was to acquire control of production. Accordingly, and coincident with the expansion of their lines into all parts of the region, most of the major anthracite railroads set about acquiring large tracts of coal lands in the post-Civil War era. Through a policy of consolidation that included the purchase of coal companies, the Delaware, Lackawanna & Western's coal holdings increased more than eight fold between 1855 and 1870, growing from 2,000 acres to 17,000 acres.[151] Similarly, the Lehigh Valley, whose charter did not authorize it to conduct mining operations, purchased coal companies whose charters granted them the right to mine, transport, and sell coal; thereby giving itself that same right. In 1868 Pennsylvania passed legislation that essentially condoned this behavior, allowing for the consolidation and merger of coal companies and permitting railroads to expand their landholdings.[152] The control of mining companies through the purchase of stock was facilitated by an 1869 act that stated:

> "that it shall and may be lawful for railroad and canal companies to aid corporations authorized by law to develop the coal, iron, and lumber and other material interests of this commonwealth, by the purchase of their capital stocks and bonds . . . *Provided* that this act shall not apply to the stocks and bonds of any corporation possessing mining or manufacturing privileges in the county of Schuylkill."[153]

Given this ability to reduce competition and control the source of their product, the railroads greatly expanded their domain. In 1871 the Reading Railroad worked around its corporate limitations by

---

[150] Bodnar, "Socialization and Adaptation," 158.
[151] Jones, *The Anthracite Coal Combination*, 24-25.
[152] Miller and Sharpless, *Kingdom of Coal*, 81.
[153] Jones, *The Anthracite Coal Combination*, 27.

forming a subsidiary, the Laurel Run Improvement Company, that was incorporated with the rights of a mining company. The Reading then purchased the total stock of the Laurel Run Improvement Company and changed the firm's name to the Philadelphia & Reading Coal & Iron Company (PRCIC).[154] Eventually, the Reading acquired 65,000 acres of coal lands, the Lehigh Valley owned 32,000 acres, the Lackawanna owned 25,000 acres, the Central Railroad of New Jersey owned 21,000 acres, and the Delaware & Hudson owned 5,500 acres.[155]

With the consolidation of coal lands and the expansion of rail lines, the railroad companies and their subsidiaries wielded the greatest power in the anthracite region. As the business of anthracite grew larger and more competitive, independent operators were either driven from the industry or, as in the case of the powerful independents in Hazleton and the Wyoming Valley, forced to enter into long-term cartage contracts that effectively granted the railroads control over the amount of their coal supplied to market. The capital required for both land consolidation and rail expansion came mainly from New York and Philadelphia investors, further solidifying extra-local corporate control of the anthracite industry.[156]

The railroads quickly learned that rate and price wars only hurt their profit margins, and began to combine in pooling agreements to limit production and establish exclusive markets. In 1873, the first combination to control the anthracite coal trade was created. As a result of the Civil War, which inflated anthracite prices and profits, a host of new operators established collieries within the region. This led to over-production, and a decline in coal prices. The attempt by operators to reduce wages, thereby maintaining profit levels, was opposed by the Workingmen's Benevolent Association (WBA), which argued that the solution was to restrict over-production. The WBA rectified the situation itself by announcing work suspensions until the surplus was consumed. Within this environment, the large operators agreed to take unified action and create a combination.[157]

The combination took the form of an agreement between the primary rail lines to regulate the amount of coal shipped to competitive points, such as tidewater cities. An estimate was made of the probable demand at the tidewater points, and this demand was divided among the rail companies. A schedule of prices was set and a Board of Control was established and given authorization to make changes in the price and the amount to be shipped, as necessary. For the first combination, the division of tonnage, granted the Reading 25.85 percent, the Delaware & Hudson 18.37 percent, the Central Railroad of New Jersey 16.15 percent, the Lehigh Valley 15.98 percent, and the DL&W 13.80 percent. The remaining 9.85 percent was delivered by non-members of the combination.[158]

---

[154] Ibid., 30; Wallace, *St. Clair*, 418.

[155] Powell, "The Pennsylvania Anthracite Industry," 13-14. This places the total amount of coal land owned by the railroad companies at approximately 150,000 acres, which Powell qualifies as "only about fifty percent."

[156] Miller and Sharpless, *Kingdom of Coal*, 81-82.

[157] Jones, *The Anthracite Coal Combination*, 40-41.

[158] Ibid., 41-42.

There were a number of combinations between 1873 and the late 1890s. For a variety of reasons, all these efforts collapsed and were replaced by periods of intense competition. In general, the adoption of agreements had a steadying effect upon the anthracite trade, but they were short-lived and only partly successful.[159] In the late 1890s circumstances prevailed that permitted the anthracite railroads to create an effective combination. Following the depression of 1893-1897, J. P. Morgan, Wall Street's premier financier, initiated a campaign to control the anthracite industry by rescuing the bankrupt Philadelphia & Reading Railroad. The Reading then purchased the Central Railroad of New Jersey and a flurry of railroad consolidation followed. A new combination arose, bolstered by the inter-ownership of railroad stock and interlocking directorates that created a community of common interest among the railroads. At the same time, independent operators were virtually eliminated as factors in the control of the anthracite trade. By 1902, more than 96 percent of all anthracite coal lands were controlled by the railroad combination, with 91 percent of deposits owned outright.[160]

The railroads brought the anthracite industry to a state of maturity during the decades following the Civil War. Philadelphia and New York capital, represented in the form of the massive integrated railroad and mining corporations, came to dominate the region. Big business pushed aside or absorbed local entrepreneurs who could not compete in an era of increasingly large capital requirements, intense competition, and the establishment of a truly national market. The local, independent operators who survived became dependent upon markets that they did not control. At the turn of the century, the dominance of the industry by J. P. Morgan exemplified the power of outside capital within the anthracite region.

---

[159] Ibid., 56-58.
[160] Ibid., 59; Miller and Sharpless, *Kingdom of Coal*, 243.

IV. THE WORK OF MINING

While the anthracite business changed dramatically during the nineteenth century the physical act of extracting the coal from the veins remained remarkably the same throughout this period. The most important nexus in coal mining is the relationship between the miner and the coal face, the point at which the miner and the coal meet. This fundamental relationship "changed remarkably little over time."[161] Mining remained a labor intensive process, undertaken by men using simple tools. Significant technological improvements occurred above-ground, but at the face the labor involved in removing the coal from the seams remained in the hands of skilled miners working almost alone. Improved technology augmented capacity while remaining within well-understood limits of production. Innovations "tended to improve the efficiency of the miner without altering the basic pattern of his work."[162]

The implication of this essentially static extraction technology for the anthracite region is important. "A miner of the 1830s would have found little different underground in the 1870s; an English miner from the 1720s would have been in familiar surroundings."[163] It was, therefore, the skill of the individual, enhanced but not replaced by an evolving support system of technology, that drove the mining industry and formed the basis of the anthracite region.

Mining Methods

The physical characteristics of the anthracite seams dictated mining methods. These methods were based upon British experience, modified to respond to local conditions, including the hardness of the coal, the steeply pitched seams, and, initially, the high cost of capital investment. Until well into the twentieth century modern coal-cutting machinery could not be employed effectively in the anthracite mines and the process of extraction remained dependent upon hand labor and skilled workers. Working in small teams in confined passages and galleries, anthracite miners were not closely supervised by management. Consequently, anthracite mining remained, throughout the nineteenth century, fundamentally different from other forms of industrial work.[164]

In the industry's earliest days access to the coal was obtained by open-pit mining of exposed surface outcrops.[165] This system did not require skilled miners, since the seam was mined directly from the surface "in the full glare of the sun."[166] It was often necessary to remove some topsoil

---

[161] Miller and Sharpless, *Kingdom of Coal*, 85.

[162] Harold Aurand, "The Anthracite Miner: An Occupational Analysis," *The Pennsylvania Magazine of History and Biography* 104:4 (October 1980), 463.

[163] Robert B. Gordon, "Environmental and Social Costs of Mining," 262.

[164] Miller and Sharpless, *Kingdom of Coal*, 85-86; Wallace, *St. Clair*, 8.

[165] The following discussion of mining methods is informed by Donald Fred Schaeffer, *A Quantitative Description and Analysis of the Growth of the Pennsylvania Anthracite Coal Industry, 1820-1865* (New York: Arno Press, 1977), 11-24. Rosamond D. Rhone, "Anthracite Coal Mines and Mining," *The American Monthly Review of Reviews* 26 (1902): 55-56; Roberts, *The Anthracite Coal Industry*, 20-28; and Wallace, *St. Clair*, 7-53.

[166] Roberts, *Anthracite Coal Industry*, 20.

and overburden, but the coal was never far from the surface. Open-pit mining – low-risk, requiring little capital, and individualistic – was well-suited for a gold-rush type of entrepreneur. Examination of early development in the Schuylkill field indicates that a large number of young, single men came to this area seeking the frontier and a quick fortune, either as miners or operators. By the 1850s most of these simple quarries had been exhausted and more sophisticated and complex mining methods prevailed.[167]

Where the coal seams outcropped on hillsides miners drove tunnels, known as drifts, directly into the vein, at a slightly upward angle to facilitate drainage. Drift mining remained a relatively simple operation, without any need for elaborate and expensive pumping of groundwater. A variation on the drift mine was the tunnel mine, which also accessed the coal vein by means of a nearly horizontal entryway that ran into a hillside. The tunnel differed from the drift in that it was driven into rock at right angles to the vein, which it intercepted deep within the earth. Headings were then driven, at right angles to the gangway, into the seam. This method required that the miner burrow through rock not containing coal to reach the seam, introducing an additional phase of labor, called "dead work," that produced no marketable product. Tunneling, like drifting, was generally done above the water table.[168]

Drifting and tunneling were fundamentally different activities from open-pit mining. Penetrating the ground to mine coal demanded a substantially different level of knowledge and skill from the miner. "[T]he planning, layout, and development of the mine was a branch of engineering for which the handful of earlier examples of deep mining in the country offered little guidance."[169] Operators turned to contemporary literature for this guidance, and found that the few texts concerning mining came from England, where coal had been mined for three-quarters of a century.

Drifting and tunneling also demanded a substantially greater capital investment than surface mining or open pit mining. The additional difficulty of the work, some of which had no potential for economic return; the requirement of wood bracing to ensure that the emptied seam did not collapse; and the heightened expertise and danger required to mine coal below the surface came at a premium. Small-time operators engaged in drifting and tunneling could not, for the most part, bankroll their own operations and had to form agreements more complex than those required for open-pit mines.

As the market for anthracite boomed in the 1820s and 1830s skilled miners from England, Scotland, Wales, and Germany flocked to the region seeking employment. These men were familiar with the latest European mining methods and techniques, and adopted these methods to American conditions. Bankrolled by the influx of investment capital from Philadelphia and New York, these men developed methods for driving underground mines below the watertable and for hauling tons of coal to the surface. Some of these skilled miners eventually became managers and operators. Between 1827 and 1834, "[i]nexperienced adventurers aided by British miners

---

[167] Miller and Sharpless, *Kingdom of Coal*, 86; Wallace, *St. Clair*, 8.
[168] Roberts, *Anthracite Coal Industry*, 22; Wallace, *St. Clair*, 8.
[169] Hunter, *Steam Power*, 413.

established the basic elements of the underground mining system subsequently used in the anthracite districts. . . ."[170]

As the more obvious and advantageous seams above the watertable became exhausted in the mid-1830s, slope mining became increasingly prevalent. Slope mining was similar to drift mining, except that the tunnel followed the seam down, below the watertable, thus necessitating expensive pumping systems to remove groundwater from the works. Gangways were periodically driven at right angles to the slope, providing access to the entire seam. The depth of early slope mines, once below the watertable, was limited by the lifting capacity of the pumps. As more water had to be pumped from greater depths, more powerful pumping engines were required. Slope mining was significantly more expensive than open-pit mining and drift mining, and required, again, a higher level of skill and planning.[171]

As the revolution in the iron industry made powerful steam lifting and pumping engines available to mine operators, vertical shaft mines were developed to reach veins deep beneath the surface. Once the shaft reached the vein, horizontal gangways were driven off the shaft into the vein, which was often worked using slope or drift mining methods. In some heavily-capitalized mines, a gangway was driven to the far point of the mine, and the coal was removed working backwards, towards the main shaft. Steam-powered lifts hauled miners and equipment up the shaft, and brought the extracted coal to the surface. Shaft mines were not widely employed until the late-1850s, after the required lifting and pumping technologies had become available, after the development of sites requiring less capital intensive mining methods, and after large-scale capital investment by individual investors or corporations became available.[172]

Mining methods differed from field to field. In the Schuylkill and Lehigh fields, where there were outcrops on mountain tops, open-pit mining was conducted during the earliest phase of development. Slopes and drifts were then cut into the hillsides, following the pitch of the veins. In the Wyoming field slopes and drifts were used to exploit readily accessible veins. The thick, deep, seams of the field were developed using shaft mines, sometimes extending over a thousand feet beneath the surface. By the end of the nineteenth century, as easily accessible seams became exhausted, deep slope and shaft mines dominated the region. The capital requirements associated with this type of mining favored large well-financed operators.[173]

The basic plan of an anthracite mine varied little, regardless of the method used to reach the vein. The underground workings were designed to work as a unit, delivering coal smoothly and continuously from the working face, along the gangways, to the entry passage (drift, tunnel, slope, or shaft), and through the passage to the surface, where the coal was cleaned, sorted, and delivered to the transportation system that conveyed it to market.

---

[170] Gordon, "Environmental and Social Costs of Mining," 263.
[171] Schaefer, *Quantitative Description*, 18.
[172] Ibid., 20.
[173] Miller and Sharpless, *Kingdom of Coal*, 87.

Gangways extended from the entry passage to the working face. They were graded to allow water to accumulate along one side and drain to a pit or sump at the lowest part of the workings. Groundwater was pumped from the sump to the surface, or hauled to the surface in tanks. Tracks, wood in the earliest period and subsequently iron or steel, were laid along the floor of the gangway. Mine cars, hauled by horses or mules, and later by electrically-powered locomotives, shuttled back and forth between the mine breasts and the entry passage. Mine cars varied in size from mine to mine, and were often built at the colliery to the particular specifications of a mine. In general they had a capacity of between one and three tons. The gangway was timbered to support the roof and prevent loose rock and coal from sloughing off the sides of the gangway and blocking the tracks. Gangway timbering was usually well constructed, since the gangway was intended to be a permanent part of the mine, in service for many years.[174]

While the driving of the gangway might produce some coal, the principal work of the mine took place in separate chambers known as breasts. The breasts were opened off the gangway and extended uphill into the coal vein. This allowed the coal removed from the face by the miner and his helper to move downhill, aided by gravity, to the gangway and the mine cars. Individual breasts were separated by pillars of coal that supported the roof of the breast. Pillars varied in width from fifteen to forty feet, depending upon the character of the roof and the hardness of the coal. Individual breasts were worked upwards perhaps eighty to one hundred yards and could produce three thousand tons of coal. A quarter-mile long gangway might support as many as twenty breasts, each manned by a miner and his helper. The breasts were connected at intervals by openings known as crossheadings, which also served as air passages.[175]

The process of extracting the coal from the working face was relatively primitive. A journalist described the work in 1902:

> The process of mining is simple, and the tools are of the rudest. They are the pick and shovel, bar, hand and machine drills, – the latter an auger, turned by a crank, – and powder and squibs. The coal is loosened or "cut" from the face by blasting; the pick is only used to knock down loosened pieces from the roof and sides, to break up the largest pieces, and to separate the slate from the coal.[176]

A wood barrier with a gate at the bottom of the breast controlled the flow of coal to the mine cars in the gangway. The loosened coal was allowed to pile up behind this barrier. At the face, which the miners reached by climbing up manways alongside the loose coal, the miners stood atop the pile of coal loosened during previous shifts and attacked the seam.[177]

A more recent method of extracting coal from the seam is known as the "long-wall" system. Developed in the twentieth century, long-wall mining removes a block of coal as much as three hundred feet in length in a single operation. In a single shift, miners use a machine to undercut the

---

[174] Wallace, *St. Clair*, 8-11.
[175] Ibid., 11-12; Miller and Sharpless, *Kingdom of Coal*, 92-93.
[176] Rhone, "Anthracite Coal Mines," 56.
[177] Miller and Sharpless, *Kingdom of Coal*, 96.

entire length of the face. Drillers prepare the holes for blasting and the entire face is brought down. Shaking chutes deliver the coal to the mine cars in the gangway. The roof of the area near the working face is supported on rows of collapsible steel jacks, which are reset to keep pace with the steadily advancing face.[178]

Strip mining represents another twentieth century innovation in anthracite mining methods. In its basic form strip mining is similar to open pit mining, in that the coal is removed while the miner remains on the surface. However, the way the mine is prepared, the scale of the mine, and the tools required to mine the coal, are all significantly different. Once a seam of coal is located underground, the non-coal materials above the seam, called overburden, is removed by blasting and the use of steam shovels or draglines. The quantity of overburden that can be removed while maintaining a mine's economic viability depends upon the size and efficiency of the machinery and the value of the coal to be mined.[179]

Strip mining became an important method during the early twentieth-century when heavy machinery made the removal of large amounts of overburden technically and financially feasible. During World War I, canceled civil construction projects "made more earth-moving equipment available, and many contractors . . . entered the coal stripping fields."[180] Early strip mines used steam shovels to remove overburden and place coal in rail cars for transport to breakers. By the mid-1930s gas-powered steam shovels and draglines fed coal to trucks that drove the coal to breakers.

Strip mining production figures were not maintained prior to 1912, although stripping began at least a decade before this date. In 1915, stripping accounted for 1.3-percent of the total anthracite coal mined in Pennsylvania. The proportion of strip-mined coal rose steadily until, in 1961, the percentage of anthracite stripped exceeded that mined underground.[181]

The Colliery

Above ground the dominant feature of the colliery was the breaker. Developed during the period from 1840 to 1860, the breaker provided a mechanical means for cleaning and separating anthracite. Prior to this period, "[r]aw coal was spread out on iron platforms and pounded with sledgehammers; rock and bony coal were swept aside; and the coal fragments were then pushed over iron screens perforated, section by section, with square holes of different sizes to sort the coal that fell into bins below."[182] Cleaning and sorting remained relatively rudimentary until the 1840s. During this period consumers began to demand higher quality coal, mixed with less dirt and slate,

---

[178] Ibid., 97.

[179] William S. Doyle, *Strip Mining of Coal: Environmental Solutions* (Park Ridge, N.J.: Noyes Data Corporation, 1976), 4.

[180] A. C. Fieldner, P.L. Fisher, and R.E. Brewer, "Annual Report of Research and Technologic Work on Coal, Fiscal Year 1944," *United States Bureau of Mines Information Circular 7322* (Washington: GPO, 1945), 14.

[181] U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*, 2 vols. (Washington: GPO, 1975), 1:592.

[182] Wallace, *St. Clair*, 33.

and varying sizes of coal to meet their individual needs. Breakers represented the efforts of operators to respond to these consumer demands.[183]

The first breakers appeared in the Schuylkill field in the mid-1840s. Joseph Battin, a Philadelphia inventor, patented the basic breaker design in 1843. Battin owned the first breakers erected, charging colliery operators a fee for every ton of coal processed. After the expiration of Battin's patents in 1858 the use of breakers became widespread throughout the anthracite region. Freshly mined coal was hauled to the top of the breaker and dumped into a hopper. The hopper released coal onto sets of screen bars that separated the coal by size. The larger pieces, which would not fall through the bars, were moved aside and cleaned and processed by hand. The coal that passed through the bars was conveyed by gravity chutes to a rotating cylindrical mud screen, where fine particles of coal and dirt were separated out. The coal was delivered to the breaker rolls by gravity chutes. The rolls, cast-iron cylinders studded with steel teeth, drew the coal between the rolls, splitting it into smaller pieces. These pieces fell onto screens, from which they passed to other rolls or down chutes to storage bins. In the last stage of the process the coal passed down chutes past slate pickers. Slate pickers, generally small boys or disabled and infirm former miners, removed any remaining slate or other impurities by hand, casting the refuse into a waste chute. Technological innovations were developed after 1860 to better wash the coal and separate it from impurities. These included washing sprays and flotation in agitating baths known as jigs. The increasing size and complexity of the breaker resulted in increased costs. In the 1850s and 1860s breakers cost $40,000 to $50,000, approximately one-third of the capital investment required to open a mine.[184]

Breakers became the second most important capital investment at a colliery – only the mine absorbed more capital. The definition of a colliery eventually hinged upon the presence of a breaker; in 1909 a mine without a breaker was not classified as a colliery. Nevertheless, they were often the weakest link in the chain of production. They rarely operated at capacity because the mines seldom produced coal at expected rates and because the breakers themselves experienced considerable down time for repairs.[185]

A substantial colliery had a host of additional surface structures, in addition to the breaker. Engine houses contained the steam winding engines that hauled the men and mine cars up from below. The pump house and fan house contained equipment used to remove groundwater from the works and assure a proper flow of air below ground. The boilers that supplied the steam to the engines were sometimes sheltered in their own separate buildings, with insulated pipes conveying steam to the various engines. Additional buildings included a blacksmith shop, machine shop, carpenter's shop, paint shop, and often a sawmill. A powder magazine was located in a safe location. Miners changed clothes before and after their shifts in a wash house, while the managers and clerks

---

[183] Hugh Moore Historical Park and Museums, "Historic Resources Study," 216; Robert A. Janosov, "Glen Alden's Huber Breaker: A Marvel of Mechanism," *Canal History and Technology Proceedings* 11 (March 1992): 103-144.

[184] Hugh Moore Historical Park and Museums, "Historic Resources Study," 216; Wallace, *St. Clair*, 16-17, 33-36.

[185] Wallace, *St. Clair*, 15-16.

worked in the office building. Towering over the entire scene was the culm bank. Culm, bits of coal , coal dust, and mud, was hauled to the bank in cars and dumped onto the ever-growing pile. Mixed with water, some culm banks were later reused to backfill deserted mines. By 1909, concerted efforts were underway to sift through culm banks, "washing" them for small sizes of coal, previously valueless, that were then in demand on the market.[186]

The above ground work force included a variety of jobs. At the bottom of the scale were the slate pickers, who might be as young as four. Disabled and infirm miners also worked as slate pickers. A variety of unskilled tasks required common laborers. Skilled workers included the engineers who operated and maintained the steam engines, hoisting machinery, and ventilation fans, and a host of machinists, carpenters, masons, blacksmiths, hostlers, sawyers, and teamsters. Management positions included the breaker boss, who oversaw the work within the breaker, and the outside boss, who oversaw all surface operations and frequently served as general manager or superintendent for the entire colliery.[187]

The Underground Workers

An elaborate division of labor and a hierarchy of workers, roughly based upon age, characterized the underground work force. The youngest, and lowest status, workers were boys, as young as eight, who opened and closed the doors that controlled the flow of ventilation through the workings. The boys opened the doors to permit men, mine cars, and equipment to pass. Teenage boys served as mule drivers and, after the introduction of electric tramway locomotives, as brakemen and drivers.[188]

Miners' helpers comprised the next senior group of underground workers. The helpers, hired and paid by the miners, handled and loaded the mine cars at the breast, split blocks of coal, sorted out waste material, and aided the miner in setting props and other tasks. The skilled miner occupied the top position in the underground hierarchy and was master of his environment. He generally worked as an independent contractor, supplying his own tools, powder, and helper, and being paid a fixed price per carload of coal. The miner directed the opening and advancing of the breast, determining how to cut the coal and when and how to prop the roof. He supervised the work of his helper, assuring that each carload of coal contained as much clean coal as possible.[189]

A host of underground workers supported the miners. These included masons, carpenters, blacksmiths, hostlers, and others. The fire boss and the inside boss represented management within the mine. The fire boss inspected the workings for evidence of methane gas, known as firedamp. In theory the fire boss determined where it was safe to work, but he could be overruled by the inside boss.[190]

---

[186] Ibid., 18; U.S. Bureau of the Census, *13th Census of the United States, Volume XI, Mines and Quarries, 1909, General Report and Analysis*, 198.

[187] Wallace, *St. Clair*, 22-23; Miller and Sharpless, *Kingdom of Coal*, 121-125.

[188] Miller and Sharpless, *Kingdom of Coal*, 99-104; Wallace, *St. Clair*, 20.

[189] Miller and Sharpless, *Kingdom of Coal*, 97-98, 125-127.

[190] Wallace, *St. Clair*, 20-22.

Ventilation and Pumping

As mines became more complex, and as more workers labored underground, the question of mine safety became increasingly important. Ventilation and pumping issues dominated the discussion of mine safety during the second half of the nineteenth century.

The weight of water pumped from deep mines was generally much greater than the weight of coal removed, ranging from twice to twenty times the weight of coal. Water collected in a sump at the bottom of the mine and steam engines pumped the water to the surface, generally in several lifts. By the turn of the century these pumps could remove as much as 1,200 gallons of water per minute. Pumping continued around the clock, placing a premium on the reliability of pumps and engines. The highly acidic water quickly corroded both pumps and pipes, necessitating regular replacement of the pumping equipment. If pumping ceased, the ground water would flood the workings to the level of the water table. A flooded mine, in addition to killing any trapped miners, could take months to reestablish.[191]

Deep mines required vast amounts of air. Without a constant flow of air, gas and dust accumulated in the mine, creating a constant threat of explosion and fire. Until late in the nineteenth century most anthracite mines were poorly ventilated. The English mining industry developed an advanced system of ventilation early in the century, and experienced miners brought knowledge of this system to the United States, but American operators rejected these improvements based upon their capital costs.[192]

During the early days of the anthracite industry ventilation was not necessary. As long as the drift or tunnel entry to the gangways was above the watertable natural ventilation could be used to supply air to the workings. As mines were driven deeper, beginning in the 1830s and 1840s, artificial means were required to draw air through the works. Initially this took the form of a furnace, placed either on the surface or at the bottom of the shaft. Furnaces were dangerous, since they could ignite methane and create a fire-damp explosion. A safer method, developed in England, piped live steam from the surface down into the mine, supplying the impetus of the light steam to the movement of the air.[193]

By the late-nineteenth century most mines had at least two shafts, one for hoisting and one for ventilation. At the top of the air shaft were huge steam-powered fans that exhausted fetid air from the workings. The design of these fans may be traced to the work of J. Louden Beadle, who installed an enclosed suction fan underground in the Locustdale Colliery near Ashland, in the Lehigh field, in 1858. Beadle patented his design in 1865 and charged royalties for its use. The Beadle design had serious disadvantages, notably the length of belting required to drive the underground unit and its small size, which meant it was only able to operate as a supplement to

---

[191] Ibid., 13, 36-37; Miller and Sharpless, *Kingdom of Coal*, 110; Rhone, "Anthracite Coal Mines," 55.
[192] Wallace, *St. Clair*, 42; Miller and Sharpless, *Kingdom of Coal*, 104-105.
[193] Wallace, *St. Clair*, 42-43.

natural ventilation. By 1870 large surface-mounted Guibal fans began to replace the Beadle units, and by the 1880s Guibal fans were dominant throughout the entire anthracite region.[194]

The fans created a vacuum at the top of the shaft, driving fresh air down the shaft and drawing stale air up from below. Brattices prevented the fresh air from immediately returning up the air shaft and directed it through the workings. Inside the mine a complex series of headings, brattices, and doors. Headings were passages driven between and connecting the breasts. Brattices were board or cloth partitions that conducted the air along the sides of the breasts and across the working face. Doors were required along the gangways to force the air into the headings and along the brattices.[195]

Even the best ventilated mines were not free of danger from dust and gas. Several dangerous gases threatened workers. The most common, methane, was known as "firedamp." Various compounds of carbonic acid gas, known as "after damp," "black damp," and "choke damp;" and "white damp," which is carbonic oxide, are all non-flammable and non-explosive, but deadly to inhale. Early efforts to identify the presence of gas included using dogs and canaries to determine whether a suspected gaseous area was safe. The use of safety lamps allowed workers to test for the presence of gas without risking explosion and fire.[196]

Mine Safety and Legislation

Mining was recognized as a particularly dangerous activity well before the publication of the first official casualty statistics in 1869. The work was inherently dangerous. During the nineteenth century, when safety considerations were often ignored and enforcement of safety regulations was particularly lax, it has been estimated that three miners were killed in the anthracite fields every two days. Tens of thousands of men were injured and maimed. Several spectacular disasters caught the public's attention during this period, but most accidents involved only one or two men. "The monotonous day-to-day toll of lives went largely unnoticed by the public, but the total was grim evidence of the human cost of mining coal."[197]

The variety of accidents is testimony to the danger of the mine as a workplace. Miners were killed by roof falls and blasting accidents. They were crushed by mine cars and, after the introduction of electricity below ground, they were electrocuted. Explosions and mine fires produced the most highly publicized accidents. The casualty rates may have outrun the ability of extended families and benevolent associations to provide relief for the disabled, widowed, and orphaned.[198]

---

[194] Ibid., 45-48.

[195] Miller and Sharpless, *Kingdom of Coal*, 105; Wallace, *St. Clair*, 43; H. M. Chance, *Mining Methods and Appliances Used in the Anthracite Coal Fields* (Harrisburg, PA: Second Geological Survey of Pennsylvania, 1883).

[196] Miller and Sharpless, *Kingdom of Coal*, 106-107; Wallace, *St. Clair*, 43-49; Rhone, "Anthracite Coal Mines," 57.

[197] Miller and Sharpless, *Kingdom of Coal*, 108.

[198] Wallace, *St. Clair*, 258.

Early attempts to provide relief to disabled miners and their families included an "Act for the Protection of Miners, Mechanics, and Laborers in Schuylkill County" in 1858, and an "Act for the Protection of Miners and Laborers in the Collieries of Schuylkill County" in 1866. In April 1869 Pennsylvania passed a mine safety law, under pressure from the newly formed miners' union, the Workingmen's Benevolent Association.[199]

Modeled upon English mine safety laws, the 1869 mine safety law specified minimal safety standards for steam engine systems used at the collieries; it placed responsibility for safety in the hands of management; and it created the office of inspector of mines. The act's major effect was to reorganize the social organization of the colliery by making the mines safer and more disciplined work places. Management had to assume responsibility for mine safety, and could theoretically be held liable for accidents; but this meant that management demanded greater discipline from the underground work force, limiting the fiercely held independence of the miners.[200]

The most disastrous mine fire in the history of the anthracite industry occurred at Avondale, near Plymouth, in Luzerne County, on 8 September 1869. This fire, which resulted in 110 deaths, attracted national attention to the hazards of anthracite mining and played a major role in the passage of mine safety legislation. The mine used both an underground furnace and fans to ventilate the workings. The colliery had been closed by a strike and when it reopened the furnace at the bottom of the shaft was relit. It flashed out of control, igniting the timber lining of the shaft and the breaker and hoist at the top of the shaft. The wood breaker caught fire and collapsed into the shaft, trapping the entire underground work force. The only air shaft was the main shaft, which was blocked with burning debris. After two days rescue workers reached the trapped men and found all of them dead, most having suffocated or died of smoke inhalation. The furnace was still burning, sending noxious gases back into the breasts and gangways.[201]

The Avondale disaster riveted public attention upon conditions within the anthracite industry. The mine safety law of 1869 did not require mines to have a second shaft or tunnel–standard British practice for years–that might have permitted the underground workers to escape. Confronted by public indignation, press cries for legislative action, and the specter of 110 dead miners, the Pennsylvania legislature passed a second mine safety law in early 1870. Essentially an expansion of the 1869 law, the 1870 mine safety law, also known as the Ventilation Act of 1870, responded to the specific circumstances of the Avondale disaster. It required dual shafts or outlets and prohibited the location of breakers or engine houses directly above the shaft in furnace ventilated mines.[202] The law also created the Pennsylvania Office of Inspector of Mines, which was charged with inspecting all collieries, recording and investigating all accidents, and submitting a written annual report to the governor.[203]

---

[199] Alexander Trachtenburg, *The History of Legislation for the Protection of Coal Miners in Pennsylvania, 1824-1915* (New York: International Publishers Co., 1942), 19, 25; Wallace, *St. Clair*, 293-296.

[200] Wallace, *St. Clair*, 293-296.

[201] Miller and Sharpless, *Kingdom of Coal*, 108; Wallace, *St. Clair*, 296-299.

[202] Wallace, *St. Clair*, 302-305.

[203] Trachtenburg, *History of Legislation*, 42; Wallace, *St. Clair*, 295.

Both the 1869 and 1870 safety acts probably had little direct effect upon mine safety. Mine inspectors were frequently drawn from the ranks of colliery superintendents, creating an inherent conflict of interest. Even inspectors with the best of intentions were hampered by the acts' woefully inadequate ventilation standards. The 1870 act required 3,300 cubic feet per minute of fresh air for every fifty miners. This standard actually permitted mines to legally operate with explosive levels of methane, assuring a continued pattern of disastrous and deadly explosions and fires.[204]

By the 1880s, the commonwealth's mine inspectors pushed for legislation that took into account deeper mines with higher output and previously unforeseen dangers. In 1885, a new law codified all safety laws passed between 1870 and 1885, and provided for more rigid enforcement.[205] While mining accidents substantially decreased during the first years of state legislation, the number of fatal and severe mine accidents remained significantly high throughout the 1880s and 1890s, reaching a peak of 502 fatal accidents in 1896. Throughout the 1890s, the Prudential Insurance Company considered several positions in the anthracite mining industry – including foreman, runner, driver, door boy, and helper – among the world's twenty-five most dangerous jobs.[206]

In the late nineteenth and early twentieth centuries, the national labor movement followed Pennsylvania's lead, pushing protective legislation, including mine safety laws. Several coal and metal mining states enacted laws providing for regular inspection of scales, escape shafts, hoisting machinery, boilers, cages, ventilation, doors, lamps, and props.[207] In Pennsylvania, miners lobbied the state legislature for laws to regulate wages and company stores, provide relief, and create hospitals and medical rooms.

The number and severity of mine accidents made the care of injured miners a priority throughout the region. In the industry's earliest years injured miners were simply deposited at home. All care was administered by the individual family and operators assumed little, if any, responsibility for men injured in the mines. After the Civil War some companies began to provide company physicians and first aid facilities. The doctors' fees were deducted from the workers' pay. In the 1870s the state moved to establish a series of state-funded miners' hospitals. The first opened at Ashland, in the Schuylkill field, circa 1878. In 1887 the legislature provided $60,000 for the erection of a hospital in the Lehigh field, and in 1901 the legislature passed a law requiring the establishment of medical rooms in each anthracite mine to provide for men injured below ground who needed urgent attention.[208]

---

[204] Wallace, *St. Clair*, 305-313.
[205] Trachtenburg, *History of Legislation*, 106, 110.
[206] Perry K. Blatz, *Democratic Miners: Work and Labor Relations in the Anthracite Coal Industry, 1875-1925* (Albany: State University of New York Press, 1994), 29, 32.
[207] Joseph G. Rayback, *A History of American Labor* (New York: Free Press, 1966), 183.
[208] Miller and Sharpless, *Kingdom of Coal*, 113; Trachtenburg, *History of Legislation*, 96.

V. THE RISE OF UNIONISM

Arrival of the Irish

The anthracite industry's growth in the mid-nineteenth century created new jobs for semi-skilled and unskilled laborers, many of which were filled by Irish immigrants. These former tenant farmers, peasant villagers, and cottiers on English-owned estates, had fled or been driven from Ireland by landlord efforts to clear their estates and consolidate their holdings and by failures of the potato crop, the staple of food of the Irish tenant. The series of crop failures that began on a catastrophic scale in 1845, sparked unprecedented emigration to the United States. Many early Irish immigrants settled in the Lehigh Valley and Easton, initially working as unskilled laborers constructing the anthracite canals. There they encountered widespread prejudice and bigotry. Large numbers of Irish moved into new mining towns, such as Pottsville, St. Clair, and Mahanoy City, where they lived among the English and Welsh. The new immigrants also resided in company-owned patch towns, overwhelmingly Irish in composition, located directly adjacent to mining operations.[209]

Unionism in the Anthracite Region

Irish miners and their families relied heavily upon mutual and beneficial societies as sanctuaries of "friendship, unity, and true Christian charity," in the face of discrimination in both the mines and mining communities. The newcomers were often cheated of wages, assigned to the most dangerous workplaces, given the worst housing, and suffered mockery of their customs and religion from English and German miners.[210] Unfortunately, the Irish soon found that beneficial societies alone could not deal with the root causes of exploitation that they experienced in their new surroundings. As a result, mine workers turned to trade unions as alternatives and supplements to their mutual aid and fraternal societies.

Early labor activities in the anthracite region proved unsuccessful. They reflected a national trend toward increasing strike activity, mostly spurred by concerns about wages or working hours. Across the country, these strikes contributed to the rise of local craft unions, and ultimately to Working Men's Parties. While the region's first recorded strike in 1842 involved more than two thousand men, it was unorganized and did not result in the formation of a permanent union. Throughout the 1840s, local unions and organizations emerged, but proved ineffectual.[211]

In the 1860s the Irish, many of whom were militantly pro-union, experienced new heights of anti-Catholic hatred and ethnic hostility. The Irish responded with anti-Civil War protests and actions, which, combined with ethnic and class tensions, resulted in a rash of labor-related terrorist acts during the 1860s. While vigilantism in the region was widespread, many Irish workers turned

---

[209] Miller and Sharpless, *Kingdom of Coal*, 137-138; Folsom, *Urban Capitalists*, 142.
[210] Ibid., 149-150.
[211] Ibid., 151.

again to unionism to improve both their working and living conditions. Fortunately, they found a new leader to unite them in the anthracite region's first relatively successful union.[212]

Workingman's Benevolent Association

The apparent indifference of operators and courts to mine safety issues evoked a political response from miners. Unable to control workplace safety on an individual basis, miners banded together to seek legislative action to regulate the industry. During the 1840s miners made many short-lived efforts to form unions in both the anthracite and bituminous coal fields. Some of these unions, particularly during the Civil War, had achieved a degree of success by striking to maintain or increase wages. Miners unions were generally organized by industry, rather than by craft, uniting both skilled and unskilled workers within the industry.[213]

During the Civil War several national trade associations emerged, including those representing iron puddlers and locomotive engineers. These loosely formed national trade associations had little power over local organizations. Their greater significance lie with the emergence of the first national labor leaders, including John Siney of the anthracite miners' Workingman's Benevolent Association (WBA).[214]

John Siney, an Irish miner in the Schuylkill field, led the WBA, later known as the Miners' & Laborers' Benevolent Association. In 1867 Siney organized workers at the Eagle Colliery in St. Clair in a successful strike against wage cuts. In 1868, amidst the rising tide of labor dissatisfaction and encouraged by his limited victories in the Schuylkill field, Siney attempted to bring local organizations together in a single union, the WBA, the first effective union of anthracite miners. The WBA attempted to create an effective regional miners' union out of the numerous locals. Ultimately, at the peak of its power, the WBA represented approximately 80 percent of the workers in the anthracite industry. Despite this success, Siney was unable to create a completely unified organization that encompassed all mine workers. The WBA enjoyed a greater degree of success in the Schuylkill field, where the large number of independent operators could be played off against each other, than in the Lehigh and Wyoming fields, where the Lehigh Coal & Navigation Company and Delaware, Lackawanna, & Western Railroad totally dominated the industry and could present a united front to the union.[215]

Nevertheless, Siney and the WBA enjoyed some notable successes. Beginning in the late 1860s local and national trade unions adopted the eight-hour day as an organizing issue and a demand upon employers. In April 1868 the Pennsylvania legislature passed an act approving an eight-hour work day, if no contract existed to the contrary. Coal operators declined to comply with the provisions of this legislation and Schuylkill County miners struck, laying the foundation for the formation of the WBA. The WBA's involvement in the Schuylkill County strike helped bring

---

[212] Grace Palladino, *Another Civil War: Labor, Capital, and the State in the Anthracite Regions of Pennsylvania 1840-68* (Urbana: University of Illinois Press, 1990).

[213] Wallace, *St. Clair*, 275.

[214] Rayback, *A History of American Labor*, 112.

[215] Miller and Sharpless, *Kingdom of Coal*, 152-153; Wallace, *St. Clair*, 288.

national attention to the eight-hour day as a national standard. In 1869 the WBA forced Schuylkill and Lehigh field operators to accept a sliding wage scale tied to the price of coal. The union also gained passage of legislation that allowed workers to form and join organizations for their "benefit and protection." Prior to this, workers who attempted to unionize were subject to prosecution for criminal conspiracy.[216]

The WBA's limited victories raised optimism among workers and generated alarm among operators. In 1870, following a long strike over wage reductions, the WBA and the operators' Anthracite Board of Trade signed the first written contract drawn up in America between miners and operators. The union was weakened; however, in 1870 when Wyoming and Lackawanna Valley miners and laborers refused to join a strike called by Siney. Regionalism and ethnic divisions continued to plague the WBA during an 1871 strike over wages, which was effectively defeated by the efforts of Franklin B. Gowen, president of the Philadelphia & Reading Railroad.[217]

Angered by labor's demands and determined to destroy the WBA and reassert owner control over their workers, Gowen began a counterattack upon the WBA. Through his control of the Reading Railroad, which set freight charges throughout the Schuylkill field, and the powerful Philadelphia & Reading Coal & Iron Company, the Reading's coal mining subsidiary, Gowen forced large and small operators into a united front. He embarked upon a sensational campaign to divert public attention away from the conditions of the workers by accusing the WBA of criminal activities. Gowen charged that the WBA was dominated by anarchists and foreigners who cowed the miners into going along with their sordid schemes for the destruction of capital and property. He reserved particular venom for assaults upon the Irish, who he accused of controlling the WBA through a secret organization known as the Molly Maguires. In 1875 operators proposed 20 percent wage cuts for contract miners and 10 percent cuts for laborers. The WBA struck.[218]

The Long Strike and the Molly Maguire Trials

The Long Strike and the campaign against the Molly Maguires are significant examples of the manner in which owners and operators portrayed organized miners as criminals to be condemned by society. This strategy was utilized by management in disputes with labor throughout the nation during the last quarter of the nineteenth century. In 1886 the Chicago Haymarket riot climaxed a decade of nationwide labor violence that originated with the Molly Maguires in the anthracite region and continued through the Railway Strike of 1877 and the 1894 Pullman Company Strike. These events fueled the nation's impression that American labor was inclined to riot, arson, assault, and murder; and led to an anti-labor sentiment that employers exploited with private security forces,

---

[216] Trachtenburg, *The History of Legislation*, 18-19; Rayback, *A History of American Labor*, 119; Miller and Sharpless, *Kingdom of Coal*, 153.

[217] Philip S. Foner, *History of the Labor Movement in the United States: From Colonial Times to the Founding of the American Federation of Labor* (New York: International Publishers, 1947), 455-456.

[218] Miller and Sharpless, *Kingdom of Coal*, 155; Hugh Moore Historical Park and Museums, *Historic Resources Study*, 328; Wallace, *St. Clair*, 332-334; 418-422.

lockouts, black lists, and yellow-dog contracts. This impression fueled a national anti-labor attitude that lasted into the twentieth century.[219]

Working conditions and wages for anthracite miners worsened during the years following the end of the Civil War. National economic depressions in the 1870s and 1880s, an expanding national transportation system, increasing use of machinery that resulted in greater reliance upon semi-skilled and unskilled labor, and an influx of immigrants seeking employment all contributed to worsening labor conditions.[220]

The Panic of 1873, and the ensuing national depression, pushed many small mining companies to the brink of bankruptcy. Franklin B. Gowen forced small operators to unite within Schuylkill Coal Exchange, which served as an operators' association for the Schuylkill field. The Long Strike of 1875 resulted from a November 1874 suspension of work at PRCI collieries. Gowen halted work because of a surplus supply of coal at the Reading wharves in Philadelphia. The railroad informed operators who sought to maintain production that it would accept no coal shipments after 1 December 1874. The operators' association responded by cutting the wage rates for miners and laborers, effectively terminated the 1869 contract won by the WBA. Over Siney's protests the WBA called a strike in response to the proposed wage cuts.[221]

The Reading and the field's other corporate powers responded by refusing to negotiate and seeking to destroy the union through a massive display of force. Pinkerton detectives infiltrated the WBA and the operators' Coal and Iron Police attacked strikers and terrorized communities. The union proved unable to prevent provocations and to maintain a united front in all three fields. Violence intensified over the weeks and months of the strike, as miners fought back and attempted to destroy operator and railroad property. The operators convinced local and state authorities to call out the militia at the first sign of violence by strikers. In June 1875 six hundred miners seeking to occupy the town of Shenandoah were met by Pinkerton agents and withdrew. The miners shut down collieries in Mahanoy City and Hazleton, provoking public outcry over their supposed acts of terrorism and destruction. The operators, led by Gowen, displayed a solid front, never meeting with union representatives throughout the entire strike, which lasted over five months, throughout the winter and spring of 1874 and 1875. Eventually, at the end of June 1875, exhausted workers began to return to the collieries, accepting the operators conditions. The WBA, its funds depleted and its reputation in tatters, ceased to exist as an effective representative of labor.[222]

The WBA, which had sought to solve grievances through arbitration, failed to perceive that the coalition of operators, led by Gowen and supported by local and regional governments, did not want even to recognize unions, let alone negotiate with them. The Long Strike was similar to struggles that occurred in the textile and transportation industries during the depression of the

---

[219] Rayback, *A History of American Labor*, 133, 168-169.
[220] Ibid., 159-160.
[221] Wallace, *St. Clair*, 421-422.
[222] Ibid., 422; Miller and Sharpless, *Kingdom of Coal*, 157-158.

1870s. These strikes were similar in their chaotic and militant nature, in the ability of employers to strike a blow against unionism, and in the lesson of effective organization.[223]

The collapse of the WBA was followed by a crackdown on the supposed terrorist group known as the Molly Maguires. Crimes of violence were not uncommon within the coal region, but during the 1870s these crimes were generally laid at the feet of a shadowy organization among the region's Irish immigrants, the Molly Maguires. In the 1840s, during the period of famine and starvation associated with failure of Ireland's potato crops, a secret society known as the Molly Maguires became established in Ireland's northern counties. This group was probably well known to the Irish residents of the anthracite fields.[224]

It is uncertain whether the Molly Maguires ever indeed existed as an organized secret society within the anthracite region. Upon their arrival in the anthracite region, the Irish clearly maintained a tradition of exacting a form of retributive justice in the face of what they considered a hostile constabulary and biased judges and juries. This traditional form of folk-justice, became caught up in the political struggle between labor and Gowen's PRIC. The term Molly Maguires may simply have been a convenient tag, attached to a culturally sanctioned way of exacting retributive justice for personal and family grievances.[225]

Violent resistance to conscription by the Irish during Civil War, which continued in the Schuylkill field throughout the war, was attributed to the Molly Maguires. Frustration and popular belief led to the conclusion that Irish immigrants instigated the violence, with the assumption that they acted under the auspices of the Molly Maguires or the mainstream Irish Catholic benevolent association, the Ancient Order of Hibernians. As threats in the form of coffin notices became more frequent among coal management personnel and police, rumors spread associating the Molly Maguires with organized labor. While this theory was never proven, Franklin Gowen determined to prove that the Molly Maguires were behind the region's rash of violence. He vowed to end the uprisings, something he had been unable to accomplish during a stint as Schuylkill County district attorney during the Civil War.[226]

Violence in the region worsened as the WBA weakened, and in 1873 Gowen employed the Pinkerton Detective Agency in an effort to link the violence to the Molly Maguires, and the Mollies to the WBA. The Pinkerton Agency sent several undercover operatives to the region, one of whom, James McParlan, supposedly infiltrated the Molly Maguires. Information supplied to the Pinkertons by McParlan and others resulted in a series of spectacular, and questionably legal, show trials against alleged members of the Molly Maguires in 1876 and 1877. Most of the trials occurred in Schuylkill County, at the county courthouse in Pottsville, with others held at the

---

[223] Foner, *History of the Labor Movement*, 458-459, 473-474.

[224] Aurand, *From the Molly Maguires*, 97; Wayne G. Broehl, Jr., *The Molly Maguires* (Cambridge, MA: Vintage, 1964).

[225] Wallace, *St. Clair*, 320, 323, 358-361.

[226] Aurand, *From the Molly Maguires*, 97-99.

Carbon County Courthouse in Mauch Chunk. Twenty men were convicted and hanged, four in Carbon County and sixteen in Schuylkill County.[227]

Franklin B. Gowen had sought to achieve a transportation monopoly between the Schuylkill field and Philadelphia, controlling coal production so as to guarantee regular profits to the Reading Railroad. The establishment of the PRCI gave Gowen control over the field's coal lands and collieries. Formed in 1871, by 1880 PRCI had spent $45 million to acquire 161,000 acres of Schuylkill field coal lands, approximately 251 square miles of property. By 1876, after breaking the WBA in the Long Strike and winning convictions in the Molly Maguire trials, "the Reading system. including the railroad and the coal-and-iron company, held an unchallenged, near-perfect monopoly of the Schuylkill coal trade." By 1893, the Reading, through its control of other railroads and mining companies, owned or controlled 70 percent of the anthracite shipments in Pennsylvania.[228]

Continued Labor Activity

The Long Strike and the Molly Maguire trials were acted out against a backdrop of severe economic depression that began with the Panic of 1873. The Long Strike represented the opening salvo in a nearly twenty-year struggle between management and labor. This period witnessed the great railroad strikes of July 1877, the Haymarket Square bombing in 1886, the Homestead Strike of 1892, and the Pullman strike and boycott of 1894. Labor actions, generally in the form of strikes, became a basic component of the American scene. The railroads were the sites of the period's most dramatic confrontations, but rail strikes accounted for less than 2 percent of all job stoppages in the last decades of the nineteenth century. Construction workers initiated the largest percentage of job actions, 26 percent of the total. They were followed by coal miners, who accounted for 10 percent of all strikes. Coal miners, however, comprised the largest population of strikers. Between 1880 and 1900 coal miners accounted for 31 percent of the total number of workers engaged in work stoppages.[229]

Clearly the elimination of the WBA and the execution of the supposed Molly Maguires did not end labor unrest within the anthracite region. Mine workers participated in a series of violent, uncoordinated strikes that swept the region in the 1870s, the most significant occurring in 1877. With fresh memories of the Molly Maguire incidents, coal operators and public officials responded violently to strikers, determined to keep the peace and avoid labor riots. Vigilante groups and special coal company police dealt with labor upheavals in brutal fashion, wounding and killing laborers in several instances. In August 1877 five thousand Pennsylvania National Guard troops were called to the region following an incident between strikers and a vigilante group at the Philadelphia & Reading Railroad's Shamokin station. The troops remained in the area, a clear show of force on the part of the owners and their political allies, for the duration of the strike.[230]

---

[227] Ibid., 108; Wallace, *St. Clair*, 331-361; Miller and Sharpless, *Kingdom of Coal*, 159-170.

[228] Wallace, *St. Clair*, 417-425; quote on 425.

[229] Walter Licht, *Industrializing America: The Nineteenth Century* (Baltimore, Johns Hopkins University Press, 1995), 169-173.

[230] Aurand, *From the Molly Maguires*, 110-113; Miller and Sharpless, *Kingdom of Coal*, 214.

After shutting down the Lehigh field in August 1877, strikers had some success negotiating for a restoration of previous wage rates with independent coal operators in Wilkes-Barre and Hazleton. When workers sent committees to New York to negotiate with the presidents of the larger coal and railroad companies, they were rebuffed. The companies argued that the economic depression did not allow them to raise wages. By October 1877 the increasing hardship among mining families became so great that, despite help from non-striking workers in the Lehigh and Schuylkill field, the strike ended.[231]

The strikes of 1877 taught mine workers that while they could, sometimes, gain concessions from small, independent operators, they would be unable to achieve the same successes with the large coal companies. The labor movement needed a strong union able to organize and unify all workers throughout the region in the name of cooperative action. Organization on this scale proved difficult in the decade following 1877, a time of nationwide anti-union sentiment. Miners in the anthracite region brought two unions to the area in the late 1880s, the Knights of Labor and the Amalgamated Association of Miners of the United States, both of which achieved a measure of success. Coal workers were unable, however, to present a united front against the combined strength of the operators until the organization of the United Mine Workers of America (UMW) in 1890.[232]

Knights of Labor

The Knights of Labor (KOL) became active in the anthracite fields as early as 1871. Organized in Philadelphia as a secret organization in 1869, the KOL went public in 1878. Under the leadership of Terence Powderly, a machinist by trade, the KOL accepted members of the "producing classes" regardless of occupation, nationality, race, religion, or sex. Explicitly barred from membership were bankers, stockbrokers, lawyers, liquor dealers, and gamblers. The KOL gained members throughout the country in the early 1880s. It won a major railway strike in 1885 and in 1886 succeeded in electing several independent political candidates.[233]

As a national organization, the KOL preferred to organize workers by craft rather than by industry, an unpopular idea within the anthracite region. The craft union leanings of Powderly and other KOL leaders conflicted with worker sentiment within the anthracite region, which saw a single union of all anthracite workers as the best weapon against the united and powerful opposition of the operators. The KOL's sole success came in organizing assemblies throughout the region following the 1877 strikes. The KOL's efforts were also hampered by the fact that their membership in the anthracite region was largely Irish. Many English, Welsh, and German miners did not want to belong to the same union as the Irish, an ethnic division that clearly hindered the effectiveness of the KOL. The power of the KOL as a national organization declined rapidly following its successes in the 1886 elections. Employer resistance to strikes, internal divisions,

---

[231] Aurand, *From the Molly Maguires*, 113; Miller and Sharpless, *Kingdom of Coal*, 214-215.

[232] Miller and Sharpless, *Kingdom of Coal*, 214-215; Foster Rhea Dulles and Melvyn Dubofsky, *Labor in America, A History*, 4th ed. (Arlington Heights, IL: Harlan Davidson, Inc., 1984), 179.

[233] Licht, *Industrializing America*, 176-177.

and the defections of craft unionists all weakened the union, which by the mid-1890s had faded from the scene.[234]

Amalgamated Association of Miners of the United States

While the KOL worked to gain a foothold in Pennsylvania's anthracite fields, another union, the Amalgamated Association of Miners of the United States, with members in several bituminous-producing states, sent organizers into the anthracite region in 1883. By 1885 this effort had garnered considerable support among English, Welsh, and German miners in the Lehigh and Schuylkill fields, and a new union, the Miners' and Laborers' Amalgamated Association, had been formed. The Amalgamated formed a joint coordinating committee with the KOL, despite ethnic differences between members of the two organizations.[235]

In August 1887, the Amalgamated called for a 15 percent wage increase in base wages. Lehigh field operators rejected this demand and twenty thousand workers struck. While the union was strong, it could not convince all anthracite workers to walk out. The Reading Railroad, nearly bankrupt, bargained with miners for a temporary 8 percent wage hike, and independent operators in the Schuylkill field agreed to this proposal. Wyoming and Lackawanna Valley workers, who were not as well organized, refused to join the strike. Operators tried to entice new Slavic and Italian immigrants to break the strike, but most recent immigrants supported the union. The operators then threatened to bring in non-union labor from overseas, but a local congressman, Charles N. Brunn, pressured President Grover Cleveland to enforce the Immigration Act of 1885, ending this threat.[236]

While coal operators agreed to a wage increase, they would not recognize the various unions and began to evict families from company housing. Operators denied workers credit at company stores, fired strike leaders, and withheld back wages. Workers held firm. Many found work in other anthracite fields or temporarily moved out of the region to the bituminous fields. Some immigrants returned to their homelands for the duration of strike. Many regional businesses, tired of the operators' domination of the local economy, supported the strikers with relief fund contributions and volunteer work on strike committees. They also encouraged other community members to support the strikers' cause.[237]

The lack of regional solidarity undermined the strike and ultimately led to its defeat. In December 1887, the Reading Railroad rejected an extension of the temporary wage agreement in the Schuylkill field, resulting in a January 1888 walkout by PRCI miners. Knights of Labor members working for the Reading refused to move coal shipments and were fired. Employees of the field's independent operators refused to dig coal that would be shipped on the Reading, and the entire Schuylkill field shut down. Unlike their co-workers in the Lehigh field, Schuylkill field miners

---

[234] Blatz, *Democratic Miners*, 39; Aurand, *From the Molly Maguires*, 115-116; Licht, *Industrializing America*, 177.

[235] Miller and Sharpless, *Kingdom of Coal*, 216.

[236] Blatz, *Democratic Miners*, 41; Miller and Sharpless, *Kingdom of Coal*, 216-217.

[237] Aurand, "Strike of 1887-1888," 176-177; Miller and Sharpless, *Kingdom of Coal*, 218.

failed to secure widespread community support for their actions. A united management front in the Schuylkill field and actions by Wyoming-Lackawanna field operators, who began firing strikers from other fields who had found temporary employment in their mines, led to the unions' capitulation.[238]

In the years immediately following the strike, union activity in the anthracite region proved largely unsuccessful. Large number of workers abandoned the KOL and the Amalgamated, despite the unions' efforts to reorganize. Local activities continued, but proved ineffective in terms of improving wages and working conditions, as management continued to cut wages and fire militants.[239]

A Second Wave of Immigrants

The efforts of operators to break the 1887 strike by employing new, non-union immigrants points to a significant shift in the demographics of the anthracite region. Prior to 1875 mine workers in the anthracite region were primarily English, Scotch, Welsh, Irish, and German. The sons of these miners worked in the mines during their youth, but many either eventually left the industry, moving to larger towns in the area and taking non-mining jobs, or moved upwards within the industry's ranks, to supervisory positions. Slavic immigrants first began to settle in the anthracite region in the 1860s. They represented a new source of unskilled labor, capable of replacing the sons of earlier miners and workers who had abandoned labor in the mines. Between 1880 and 1900 large numbers of eastern and southern European immigrants, a second wave of immigration, settled in the anthracite region. Generally known as "Slavs," they largely came from Eastern Europe and the Balkans, and included Poles, Ukrainians, Czechs, Slovaks, Serbians, and Croatians, mostly people from Czarist Russia and Austria-Hungary. Most of the newcomers were unskilled Catholic and Greek Orthodox peasants, mistrusted by native-born Americans. Non-Slavic immigrants from Lithuania, Hungary, and Italy who came to the region during this period experienced similar patterns of discrimination and distrust from native-born Americans and earlier immigrants, such as the Irish and Germans.[240]

On a national scale, the new immigrants were steered toward certain jobs: Italians to construction work, road building, ditch digging; Slavs to coal and steel areas; Bohemians to Chicago's slaughter and packing houses; Jews into light-industry such as garments and textiles, metal and wood working, building, and the tobacco industries.[241] In the anthracite region, the first Slavs, mostly young males, were feared and segregated by earlier immigrants who believed they had come to take their jobs. The newcomers, who were made to accept the meanest wages and living conditions, were willing to work long hours at dangerous tasks. The Slavs often tolerated these

---

[238] Aurand, "Strike of 1887-1888," 182; Miller and Sharpless, *Kingdom of Coal*, 218-219.
[239] Miller and Sharpless, *Kingdom of Coal*, 219-220.
[240] Ray Ginger, "Managerial Employees in Anthracite, 1902: A Study in Occupational Mobility," *Journal of Economic History* 14 (1954):156.
[241] Foner, *History of the Labor Movement*, 257.

poor conditions since they viewed their misery as temporary. Unlike the Irish, they sought to save as much money as possible, and then buy homes in their new land or return to their home lands.[242]

Deep-seated fears and prejudices among old and new immigrants prevented effective labor organization and encouraged operators to polarize their workforce by capitalizing upon ethnic differences and loyalties.[243] Many operators made deliberate attempts to segment workers by ethnicity, so as to encourage animosity and prevent cooperation among different groups. Operators manipulated language barriers, along with national and religious animosities, to prevent new immigrants from organizing. Regional pay differences, a result of differing conditions in different fields, also threatened worker solidarity.[244]

Like the Irish, the Slavs established mutual aid and benefit societies for socializing and providing social and economic insurance within their ethnic groups, which often furthered ethnocentrism. All European ethnic groups developed such societies and fraternal organizations, frequently focused upon their ethnic churches. Fundamentally, there was little difference between European ethnic aid and benefit societies and unions. Community organizing was undeniably linked to labor activism, as both involved seeking social and economic protection. By 1900, Slavs were firmly established in the anthracite region; many had started families and become attached to their community churches, lodges, and neighborhoods.

Lattimer

In the early 1890s miners continued the struggle to build an effective union. An 1890 merger of the Miners' National Trade Assembly 135 of the KOL and the American Miners' Federation, successor to the Amalgamated, resulted in the formation of the United Mine Workers Union (UMW). By 1894, forty-four local chapters of the UMW existed within the anthracite region. The UMW suffered from the same weaknesses as many of its predecessors in the region. While the new union was strong in the Schuylkill field, it struggled to organize Slavs and workers in the other fields. As a result, the UMW was too weak to force management to recognize its members.[245]

The UMW recognized that organization of the entire region could not occur until the new immigrants joined the union. This required a shift in the thinking of many union members, who believed that Slavs and Italians were "wage-cheapening laborers easily controlled by management."[246] Slavs and Italians were relegated to low status jobs. While large numbers of these immigrants worked and resided in the anthracite region in the 1880s, few had become contract miners, the elite of the laboring class, by the late 1890s.[247]

---

[242] Miller and Sharpless, *Kingdom of Coal*, 180; Roberts, *Anthracite Coal Communities*, 106.
[243] Aurand, *From the Molly Maguires*, 27-28.
[244] Foner, *History of the Labor Movement*, 265; Miller and Sharpless, *Kingdom of Coal*, 244.
[245] Blatz, *Democratic Miners*, 46; Miller and Sharpless, *Kingdom of Coal*, 220-221.
[246] Miller and Sharpless, *Kingdom of Coal*, 220.
[247] Ginger, "Managerial Employees," 155.

A major turning point in the history of organized labor within the anthracite region occurred in 1897, during another nationwide economic depression. Beginning with the Panic of 1893, the country had experienced massive unemployment and personal suffering. The economic downturn triggered a merciless price war among businesses seeking to raise revenues simply to pay off their creditors. Cartel and pooling arrangements collapsed in this hyper-competitive climate. With the coal market depressed, many workers could find only half-time work. Much of the little income they earned was siphoned back to the operators in the form of deductions for rent and company store bills. Companies ignored a law stating that workers were to be paid bi-weekly and paid workers monthly, forcing many deeply into debt.[248]

It was under these conditions that the Lattimer incident occurred, marking a turning point in the labor history of the anthracite region. The violent confrontation between workers and operator agents that took place near the Lattimer mine in September 1897 initiated the long, slow process of building cooperation between all mine workers. This cooperation led to the development of a solid labor front in the anthracite region, which the UMW nurtured in the late 1890s and early 1900s.

In September 1897, spurred by an incident associated with a strike at the Honey Brook mine in which a superintendent struck a young boy, 350 angry mine workers from Hazleton marched to each of the Lehigh and Wilkes-Barre collieries and shut them down. The incident climaxed on 10 September 1897 when sheriff's deputies and coal and iron police fired into a group of unarmed strikers marching from Hazleton to the Lattimer Colliery. At least nineteen marchers died in the incident and thirty-two were wounded. Virtually all the dead and injured were Polish, Slovak, or Lithuanian.[249]

The Lattimer incident brought together the various immigrant communities within the anthracite region and dispelled old myths that Slavic and Italian workers were docile pawns of management. The new immigrants were recognized as an important force within the region. Fellow miners expressed their shock and outrage over the killings by joining the UMW. Within four months, over fifteen thousand anthracite workers had joined the UMW. Lattimer insured the UMW a future in the region, though it would take several more strikes before the union could take advantage of its new found strength. On a national level, Slavic organizations throughout the United States contributed money to relief efforts for the Lattimer victims and their families, while at the international level, the Austrian-Hungarian ambassador demanded, but did not receive, compensation for the killings from the United States government.[250]

---

[248] Licht, *Industrializing America*, 159-160.
[249] Miller and Sharpless, *Kingdom of Coal*, 221-235.
[250] Ibid., 235-238; Blatz, *Democratic Miners*, 55.

VI. THE UMW AND THE GREAT STRIKE

Mine workers did not create the framework they needed for successful organization until the merger of District Assembly No. 135 of the KOL and the American Miners' Federation in January 1890 formed the United Mine Workers of America (UMW). First successful in the bituminous region, by 1899 the UMW, under the leadership of John Mitchell, began a drive to organize workers in the anthracite region. Mitchell's strategy for organization was summed up by the phrase, "The coal you dig isn't Slavish or Polish or Irish coal, it's coal."[251] UMW leaders canvassed the region, speaking and garnering support in 1899 and 1900. The union experienced early success in organizing locals in the Lehigh and Wyoming-Lackawanna fields. By mid-1900 the UMW had created a new union district in the Schuylkill field.

The union concentrated its efforts upon immigrant workers, seeking to organize those who would fight immediately for better working conditions. Although the Lattimer incident helped alleviate some of the ethnic obstacles to organizing in the region, the union continued to confront mutual distrust among the twenty nationalities working in the coal fields. Memories of former failures and fear of operator reprisals remained stumbling blocks to organization. The UMW recognized the need for solidarity in order to increase wages and address grievances, and eventually appointed Slavs and Italians to top local positions. By 1900, the UMW had a functional framework of organization in place in each field and was prepared to develop forward-thinking strategies, rather than simply reacting to local disputes.[252]

John Mitchell was beloved by coal workers throughout the country, and particularly in the anthracite region, for his role in building the UMW into one of the nation's earliest and most powerful industrial unions. Born in Illinois in 1870, the former coal miner served as international president of the UMW from 1898 until 1908, and as a vice president of the American Federation of Labor (AFL) from 1898 to 1914. During his tenure as president of the UMW, the union increased its membership from 34,000 to 300,000 and its treasury from $12,000 to $900,000. Mitchell was recognized outside the mining industry for his efforts to unite all laborers, regardless of industry, and for his role in helping establish the permanent structure of the modern American labor movement.[253]

Under Mitchell's strong leadership, the UMW eventually provided mine workers with a cohesive organizational framework, the kind of disciplined and solid front that had historically benefited the region's coal operators. This structure helped miners to identify the union with their own interests. As a result, the UMW succeeded in uniting fragmented local organizations and limiting the inter-regional discord and violence that had plagued the region's labor movement in the past.

---

[251] Miller and Sharpless, *Kingdom of Coal*, 249.

[252] Ibid., 244-246; Samuel Yellen, *American Labor Struggles* (New York: S. A. Russell, 1936), 143-144; Blatz, *Democratic Miners*, 78.

[253] Gary M. Fink, ed., *Biographical Dictionary of American Labor* (Westport, CT: Greenwood Press, n.d.), 413; Elsie Gluck, *John Mitchell, Miner: Labor's Bargain with the Gilded Age* (New York: Greenwood Press, 1929), 210; "John Mitchell," *The United Mine Workers Journal* 30, no. 18 (15 September 1919): 3.

1900 Strike

A UMW strike in 1900 set the stage for a nationally significant 1902 strike in the anthracite region and provided Mitchell and his union with lessons on political maneuvering and public relations. The core of the UMW's strength within the anthracite region lay in the Wyoming-Lackawanna field, UMW District 1, where by 1900 approximately 65 percent of the field's workers were UMW members. In the spring of 1900, the leadership of District 1 began to press for a strike in order to secure wage increases equivalent to those recently obtained within the bituminous industry. Mitchell resisted this effort, at least partly because organizing was proceeding at a much slower pace in the other fields. Only 25 percent of the Schuylkill field workers were UMW members, and in the Lehigh field only 15 percent of the work force belonged to the union. Nevertheless, at a convention convened in Hazleton in August 1900 the union issued an invitation to operators to meet to discuss wages and grievances. When the operators failed to respond to the invitation or a list of demands, the convention delegates petitioned the national union for permission to strike.[254]

The UMW leadership knew it was in a weak position and that it did not have the resources to sustain a long strike. Accordingly, the executive board instructed Mitchell to seek a compromise agreement with operators. Simultaneously, Senator Marcus A. Hanna of Ohio, chairman of the Republican National Committee, interceded in an attempt to avoid a strike. Hanna feared the negative public opinion a strike would bring to President William McKinley's re-election campaign. Republicans were campaigning on a platform of prosperity, and a coal strike would disrupt that message. Despite Hanna's political intervention, operators refused to negotiate with Mitchell or to recognize the UMW.[255]

As a result, the union issued a strike call in September 1900 and a majority of the region's work force, approximately 125,000 walked off the job. In the early weeks of the strike, workers marched from colliery to colliery, shutting down operations. Mary Harris "Mother" Jones, a labor militant and widow of a miner, led a number of these "raids." Jones had participated in the Pittsburgh labor riots of 1877, the Chicago Haymarket rally in 1886, and the 1894 American Railway Union Strike in Birmingham.[256]

The UMW, skillfully manipulating public sentiment, publicly implored its members to avoid violence during the strike. Despite a threat from the Lehigh field, the union sustained unity among its members. Mitchell displayed considerable political astuteness in dealing with anthracite coal operators and politicians during the conflict. Aware that the operators wanted to avoid a long strike, which might damage McKinley's re-election, Mitchell correctly predicted that the Republicans would be forced to intervene. In early October 1900, Hanna again pressured the operators to compromise with the union, warning them of the possible defeat of the Republican party in November and the spread of the strike to Pennsylvania's bituminous coal fields. He met

---

[254] Miller and Sharpless, *Kingdom of Coal*, 250-251; Robert J. Cornell, *The Anthracite Coal Strike of 1902* (Washington: Catholic University Press, 1957), 39-53.

[255] Cornell, *The Anthracite Coal Strike of 1902*, 44.

[256] Miller and Sharpless, *Kingdom of Coal*, 251.

with J. P. Morgan, who had significant financial interests in anthracite, and with the presidents of railroads that owned lands in the anthracite fields, urging them to negotiate with the miners. This political maneuvering set a new precedent in labor-management relations with important ramifications for future labor negotiations. The strike ended on 29 October 1900. While coal operators eventually conceded to the union's wage demands, they did not recognize the UMW as the workers' representative.

While the UMW gained national prominence during the 1900 strike and demonstrated that it could unify the entire regional work force, the strike achieved no significant improvement in miners' working conditions. Pay remained low by any standard and frequent layoffs made it difficult for miners to support a family. Poor working conditions in the mines remained the norm, as did the feudal system of the company town. Nevertheless, one year after the conclusion of the strike, organized miners dubbed the anniversary "Mitchell Day," in tribute to their union president's skill in winning them an eight-hour work day in the 1900 strike. Labor advocates and miners across the nation continue to celebrate Mitchell Day in honor of the UMW president's contributions to the American labor movement.[257]

1902 Strike

Operators regarded the concessions made during the 1900 strike as a tactical retreat. They honored the new wage scales, but refused to meet with miners' committees; declaring that they did not represent the employees. Other promised improvements in working conditions were ignored. In response, miners demanded action from the UMW, which sought to exert political pressure upon the operators. Despite these efforts the operators continued to stand firm. The UMW convention of March 1901 authorized a strike if the operators did not recognize the union and negotiate a settlement of grievances. Mitchell resisted, and continued to seek a negotiated solution. These efforts failed, and in March 1902 the UMW convention repeated its strike call. In May 1902 the workers walked off the job.[258]

Operators treated the walkout, later dubbed by laborers "The Great Strike," as another anarchist rebellion by workers against property rights and public order. Their response included bringing in strikebreakers and coal and iron police with a demand for back-up enforcement from the state militia. The UMW, however, demonstrated a solidarity lacking in past struggles that translated into less violence on the part of its members. John Mitchell provided the UMW with politically astute and moderate leadership. He demonstrated that the union was willing to accept arbitration and disapproved of radicalism and violence. The operators, who saw themselves as paternalistic and best equipped to determine the needs of workers, refused to recognize the union, let along negotiate with it. Unlike past strikes, workers remained non-violent and, for the most part,

---

[257] Dulles and Dubofsky, *Labor in America*, 180-181; Miller and Sharpless, *Kingdom of Coal*, 251-254; Rayback, *A History of American Labor*, 210; "Mitchell Day:' President Lewis and Vice-President Murray to Speak," *The United Mine Worker's Journal* (1 November 1922): 8; Elizabeth C. Morris, Mount Vernon, New York, to William Green, Indianapolis, Indiana, 9 September 1920, Transcript in Historical Collections and Labor Archives, Pattee Library, Penn State University, State College, Pennsylvania.

[258] Miller and Sharpless, *Kingdom of Coal*, 255-256.

avoided the mines. The workers had prepared for a long strike and most were determined not to mine coal until their demands were met.[259]

Public support for the strike was divided. Most did not care who won the struggle, as long as it was settled. National pressure mounted to reopen the mines, and President Theodore Roosevelt, previously equivocal on labor issues, sought to avoid the growing possibility of a coal shortage. As summer turned to fall the prospect of a coal shortage loomed large. This represented a serious threat, as anthracite coal remained the country's primary domestic fuel source at that date. Unlike the operators, Roosevelt's goal was not to crush the strike, but to encourage arbitration. In October 1902 he summoned operators and strike leaders to a conference at White House.[260]

Mitchell agreed to accept the findings of an investigative committee appointed by Roosevelt, while George Baer, president of the Reading Company and spokesman for the operators, refused to arbitrate and infuriated the President. Pressure on operators to negotiate with the UMW mounted as winter approached. Confronted by the operators' intransigence, Roosevelt decided to apply more direct governmental pressure. He informed J. P. Morgan that if the operators did not arbitrate, he would send the army to the anthracite coal fields to "dispossess the owners and run the mines as receivers."[261] This threat brought the operators to the table, requesting that the President appoint an arbitration committee. The miners returned to work on 23 October 1902, after five months off the job. Roosevelt's Anthracite Coal Strike Commission began its proceedings on 30 October 1902 with a week-long tour of the anthracite region to view physical conditions and coal mining operations.[262] In November and December 1902 the Commission heard testimony in the Lackawanna County Courthouse in Scranton. John Mitchell, who testified not as president of the UMW but as the "representative of the anthracite mine workers," presented the demands of unionized mine workers to the Commission.[263] Represented by noted labor and criminal attorney, Clarence Darrow, Mitchell was the first and most celebrated witness of the public hearings.

The Strike Commission announced a decision on 21 March 1903, awarding mine workers a 10 percent wage increase and an eight to nine hour working day without pay reduction. The Commission also created a board to settle labor disputes for the three years during which the award was to be in force. The miners reluctantly accepted the award, disappointed that the Commission had not recognized their union.[264]

The 1902 anthracite strike had important national repercussions and marked a fundamental shift in the relations between the federal government and American business. The government response to the crisis marked a major change from past practices, as in 1894 when President Grover Cleveland

---

[259] Dulles and Dubofsky, *Labor in America*, 181-182; Cornell, *The Anthracite Coal Strike of 1902*.
[260] Dulles and Dubofsky, *Labor in America*, 183.
[261] Ibid., 184.
[262] Anthracite Coal Strike Commission, *Report to the President on the Anthracite Coal Strike of May - October, 1902* (Washington: GPO, 1903), 14.
[263] T. E. Dillon, "The Anthracite Mine Strike Commission in session at Scranton, PA, Nov. 17, 1902," photograph, 1902, Lackawanna Historical Society, Scranton, Pennsylvania; Blatz, *Democratic Miners*, 142.
[264] Cornell, *The Anthracite Coal Strike of 1902*, 253-254.

sent federal troops to Chicago to put down the Pullman Strike. In 1902, however, President Theodore Roosevelt enforced arbitration, rather than working to defeat the union. Roosevelt's primary motives were to avoid a national or regional coal shortage, but his actions marked the beginning of the federal government's formal recognition of labor grievances.

Roosevelt's intervention to end the strike served as a precedent for non-violent federal intervention that was nonpartisan in nature and result. His involvement reflected the purpose and nature of the Progressive movement's beliefs that government should protect and uplift those in need. Additionally, it created a precedent for much future federal labor policy and legislation, including President Woodrow Wilson's nationalizing of the railroads and creation of the Tri-Partite War Labor Board during World War I. It served as a prototype for Franklin D. Roosevelt's intervention in labor-management relations with the National Industrial Recovery Act of 1933 and the National Labor Relations Board (Wagner) Act of 1935. This New Deal legislation eventually made true industrial unionism a reality within the United States.

The Great Strike of 1902 was also important as a watershed in the labor history of the anthracite coal region. Prior to this strike, operators wielded unlimited authority in the region and encountered little effective resistance from labor. As a result of the 1902 strike, the UMW gained a firm hold in the anthracite coal mining industry and became an entity that management was forced to take into account. By extending leadership to all coal workers and imparting a sense of dignity to their work, John Mitchell helped the UMW gain a reputation as a responsible labor organization; one of his most significant accomplishments. Workers demonstrated considerable solidarity and a sophisticated approach to public relations, the result of years of labor struggle. The strike demonstrated that the anthracite region's labor movement had evolved from locals and regionals conducting spontaneous, chaotic, and scattered walkouts to a well-organized and disciplined union that represented all the industry's workers.[265]

---

[265] Perry K. Blatz, "What the Workers Wanted: The Grievances of the Anthracite Mine Workers and the Strike of 1902," *Proceedings of the Canal History and Technology Symposium* 4 (1985): 107; Dulles and Dubofsky, *Labor in America*, 184; Blatz, *Democratic Miners*, 4-8; Cornell, *Strike of 1902*, 259.

VII. DECLINE OF THE ANTHRACITE INDUSTRY

Labor peace descended upon the anthracite region in the wake of the Great Strike of 1902. The mine workers had established a union that provided them with a degree of organizational unity they had never previously enjoyed. The UMW was recognized as a major force within the region by even the most reactionary operators. Many operators recognized that the powerful UMW represented a rationalization of the previously chaotic labor situation within the industry.

The benefits of cooperation between management and labor were displayed in the production figures achieved between 1900 and 1917. In 1901 production stood at 67 million tons. It rose steadily to a high of nearly 100 million tons in 1917. Wartime demand spurred even higher levels of production during the ensuing years. In 1918, anthracite generated twice as much energy as it had in 1890. Twenty-five million homes were heated with anthracite in 1918. Employment in the region peaked in 1914 when just over 180,000 men, many located in the Wyoming field, were employed in the anthracite industry.[266]

The coal combination assembled by J. P. Morgan and his associates after 1890 imposed order upon the entire industry. Morgan created a system of seven major railroad companies, linked together by inter-locked boards of directors and tied by means of joint stock ownership to large New York and Philadelphia banking and investment firms. This combination controlled the industry. Indeed, the subsidiary mining companies of the major railroads controlled 70 percent of the industry's output. The coal combination limited production and set prices, totally dominating a market that included millions of households and businesses throughout the Northeast, New England, and portions of the Midwest.

The railroads maintained their hold over the region and the industry without interference until the passage of the Hepburn Act in 1906, which forbid railroads from owning and operating mining companies. Within the anthracite region the Lehigh Valley and Reading Railroads were unaffected by the act's provisions, since they were legally holding companies, not railroads. After considerable litigation the United States Supreme Court upheld the law as constitutional, forcing other anthracite railroads to establish separate coal mining companies. In 1917 the Delaware & Hudson established the Hudson Coal Company as its mining subsidiary. Three years later the Delaware, Lackawanna & Western Railroad turned its coal operations over to the Glen Alden Coal Company.[267]

Despite the industry's apparent prosperity, anthracite's future was in jeopardy. By the end of the first decade of the twentieth century bituminous coal and coke had replaced anthracite as the nation's industrial fuel. Despite the loss of the industrial market, anthracite production was steadied by the expansion of Northeastern cities and their increasing demand for residential and

---

[266] Henry Kreisinger, "Five Ways of Saving Fuel in Heating Homes," *U. S. Bureau of Mines Technical Paper No. 199* (Washington: GPO, 1918): 5; Miller and Sharpless, *Kingdom of Coal*, 286; Powell, "The Pennsylvania Anthracite Industry," 16.

[267] Powell, "The Pennsylvania Anthracite Industry," 22.

commercial heating fuel. Anthracite remained the primary heating fuel for these urban centers throughout the late-nineteenth and early-twentieth-centuries.[268]

During World War I anthracite production failed to keep pace with demand, and many users shifted to alternative fuels. The behavior of the industry's unregulated shippers and operators further alienated consumers, as anthracite prices rose throughout the period. Following the war a series of developments undermined anthracite's position as a domestic heating fuel. Technological improvements allowed increasing use of oil and natural gas as heating fuels. These new industries stressed the safety, convenience, and cleanliness of their products. The adoption of oil, gas, and electricity for domestic heating plants brought about the decline of the anthracite industry after 1920. The decline was amazingly rapid, given the industry's apparent strength and solidity. Between 1919 and 1936 the consumption of anthracite declined by 36 percent. With the decline in consumption came the closure of collieries and the loss of jobs within the anthracite region. By 1934, employment within the industry had declined by 34 percent.[269]

Examination of fuel oil sales for the period from 1926 through 1945 indicates an increasing market share for residential and commercial heating oils. In 1926 residential and commercial heating use comprised only 4 percent of fuel oil sales. By 1945 34 percent of fuel oil sales were for residential or commercial heating uses. These figures reflect the inroads made by the oil industry into the home heating market, a move that necessarily occurred at the expense of anthracite.

The shift to other fuels occurred, in part, as a result of decisions made by the anthracite operators and shippers. The industry's conservative leaders made little effort to innovate or expand their operations when confronted by competition from new fuel sources. They did not attempt to develop alternative uses for anthracite in industry. They did not reduce shipping costs to increase competitiveness. They did not move to counter adverse publicity about their monopolistic practices or to offset the aggressive advertising campaigns of their new competitors. Their actions alienated the public. They offered no concessions to labor, experiencing a series of prolonged strikes during the 1920s that stopped production, providing an opportunity for their competition. The shippers and operators contributed mightily to their own demise, guaranteeing that anthracite would remain a regional fuel in a national and international economy.[270]

Labor Unrest in the 1920s

In the anthracite region, coal operators and shippers grappled with the industry's decline. Production fell dramatically during the economic downturn of 1920-1921. By 1922 the industry's output had declined approximately 40 percent from the previous year. Operators seeking to maintain wartime profit margins sought to cut costs, and immediately looked to slash wages. Work stoppages in 1922, 1923, and 1925 accelerated the industry's decline and marked the

---

[268] Dan Rose, *Energy Transition and the Local Community: A Theory of Society Applied to Hazleton, Pennsylvania* (Philadelphia, University of Pennsylvania Press, 1981), 77; Miller and Sharpless, *Kingdom of Coal*, 287.

[269] Rose, *Energy Transition and the Local Community*, 77, 83; Miller and Sharpless, *Kingdom of Coal*, 287.

[270] Miller and Sharpless, *Kingdom of Coal*, 287-288.

beginning of difficulties within the UMW. The anthracite region became one of the first regions in the United States to experience de-industrialization.[271]

The labor strife of the 1920s hastened the demise of the anthracite industry. Work stoppages interrupted the supply of coal, compelling consumers to switch to other fuels. Because of the initial investment required to install a gas or oil furnace, few of those who switched from anthracite ever returned to the use of coal. As a result, demand and consumption declined, dragging down production. Output dropped nearly 18 percent, from 84 million tons to 69 million tons, between 1926 and 1930. During approximately the same period the number of collieries declined by nearly 12 percent, from 185 in 1923 to 163 in 1929. Within the anthracite region, the Great Depression began nearly a decade earlier than in much of the rest of the country.[272]

The national wave of strikes that took place between 1919 and 1922 was directly tied to government intervention within the work place during World War I, perhaps best exemplified by the work of the War Labor Board. Created in early 1918, the War Labor Board exercised jurisdiction over most fields of production needed for the war effort. The Board, which operated until August 1919, promoted a benevolent attitude toward labor; encouraging wage increases, working hour reductions, and better working conditions. In addition to this government activity, a scarcity of labor and the opportunity for large wartime profits encouraged private industry to raise wages.

The period following World War I was marked by a series of strikes in which unions sought to consolidate and extend their wartime gains and employers sought to reverse the wartime trends. At the height of the 1919-1922 strike wave, 20 percent of the American workforce was off the job, a higher proportion of U.S. workers simultaneously on strike than had ever previously occurred. In addition to coal miners; clothing workers, seamen, workers in the building trades, and railway shop crafts workers all struck in the early 1920s. By 1923, the number of strikes nationwide had declined markedly, a result of government repression, a sharp economic downturn in 1921, and a communism scare that equated labor militancy with foreign radicalism.[273]

1920s Strikes

In April 1922 the UMW, under the direction of new president, John L. Lewis, staged a work stoppage in both the anthracite and bituminous fields, triggering the first joint walkout of anthracite and bituminous workers in American history. Issues included a dispute over the percentage of labor costs in increased coal prices. Labor claimed their wages were too low, while operators asserted that high labor costs contributed to high prices. Though the anthracite strike was relatively

---

[271] W. C. Trapnell, *The Employment Situation in the Pennsylvania Anthracite Region* (Washington: Works Progress Administration, October 1935), 1; Miller and Sharpless, *Kingdom of Coal*, 288; John Bodnar, *Anthracite People, Families, Unions and Work, 1900-1940* (Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1983), 1.

[272] Miller and Sharpless, *Kingdom of Coal*, 288.

[273] Eric Foner and John A. Garraty, eds., *The Reader's Companion to American History* (Boston: Houghton Mifflin Co., 1991), 633; Rayback, *A History of American Labor*, 274-275, 292-293.

non-violent, the Harding administration reluctantly intervened in July 1922, after the media and public, fearful of winter shortages, urged the President to act as Theodore Roosevelt had during the 1902 strike. Harding proposed an arbitration plan identical to that of the operators and called for creation of a Federal Coal Commission to investigate the industry's problems. The issue of arbitration became the primary dispute between the UMW and Harding. The anthracite strike ended in September 1922 with an extension of the workers' former contract. This settlement failed to solve the strike issues and represented an inability and an unwillingness to grapple with the industry's substantive problems.[274]

One concrete achievement of the 1922 strike was the creation, by Congress, of a United States Coal Commission charged with investigating the entire coal industry. Congress ignored the Federal Coal Commission's recommendations to limit government regulation, force operators to submit annual financial reports, and require federal licensing of interstate coal shippers. The long-term results of the strike included an acute coal shortage in the winter of 1922-1923, which forced anthracite users to seek other fuel sources, hastening the industry's downfall. When work stoppages in the anthracite fields depleted coal supplies, other alternative heating sources invaded anthracite's market. The anthracite industry unwittingly accelerated the process, paving the way for more efficient fuels to claim an increasing market share.[275]

Operators and workers appeared ignorant of the ramifications of their lack of cooperation and frequent work stoppages. As a result of numerous work stoppages and price gouging by unregulated coal combinations, oil, gas, and electricity overtook the anthracite coal market by default. The ultimate result was the industry's failure.[276]

The 1930s

John Lewis' method for reaching settlement in a 170-day, 1925 strike, the longest in the anthracite region's history, foretold division between the UMW's leadership and its rank-and-file members. To keep the mines operating, Lewis and operators established a system of private negotiation that effectively excluded participation and decision-making from union members. The private negotiations served both the union's and the operators' needs, and their agreement was carefully worded so that both sides could claim victory. Lewis, who needed support in the anthracite region to stabilize UMW membership nationwide, believed that miners were primarily concerned with returning to work after a prolonged strike. He thought that compromise with operators was necessary to keep the anthracite industry viable and productive. The operators, who believed that the survival of the anthracite industry was at stake in the face of competition from alternative heating sources, wanted only to keep the mines productive.[277]

---

[274] Harold K. Kanarek, "The Pennsylvania Anthracite Strike of 1922," *The Pennsylvania Magazine of History and Biography* 99 (April 1975): 220.

[275] Ibid., 209, 223-224.

[276] Ibid., 225.

[277] Miller and Sharpless, *Kingdom of Coal*, 294; Douglas Keith Monroe, "A Decade of Turmoil: John L. Lewis and the Anthracite Miners, 1926-1936" (Ph.D. diss., Georgetown University, 1977), 35.

While Lewis convinced union members that his actions were in their best interests in 1925, he had more trouble doing so in the following years. As the anthracite industry continued its decline, workers sensed that district and international UMW leaders were indifferent to their economic hardships. In January 1928, when laid-off workers in the Wyoming-Lackawanna field struck in protest of the contract system used by the Pennsylvania Coal Company, Lewis ordered them back to work. Violence erupted and wildcat strikes continued until late summer. While Lewis and the district president eventually managed to calm the insurgent strikers, the labor leaders failed to convince workers that the union was acting in their best interests.

The belief, held by many miners, that the UMW was indifferent to their economic conditions, became more widespread with the advent of the Great Depression. The decline of the anthracite market steadily increased regional unemployment after 1926, both in the mines and the manufacturing sector. Further decline in the 1930s resulted from several factors, including the Great Depression and the continued displacement of anthracite by more convenient and cheaper fuels.[278]

One response to the economic hardtimes proposed by Wyoming and Lackawanna field mine workers was the notion of work equalization. Equalization – the distribution of mining and processing among all the various collieries of a field, rather than the concentration of operations at locations with the lowest costs – was seen by many miners as representing the potential salvation of the industry. Operators opposed work equalization on the basis that it challenged their right to control production and profits, but equalization also led to internal strife within organized labor. Lewis essentially ignored the issue. The notion of labor challenging management's right to control production and to make decisions based solely upon profit motives was considered too radical and explosive for the union's involvement. Lewis, and the UMW leadership, had always focused their efforts upon issues related to wages and working conditions, not the basic right of the laborer to work. Lewis personally believed that the economy would right itself without intervention.[279]

During 1930 contract negotiations, when desperate workers sensed that coal companies and union officials were working together to oppose work equalization, Lewis further angered union members by negotiating privately, as he had in 1926, with operators without addressing union delegates' demands. The 1926 contract terms were extended until 1936, disregarding new and controversial issues such as work equalization. While union members accepted the new contract with resignation, Lewis' apparent friendliness and cooperation with coal companies angered many workers. Worker dissatisfaction with the 1930 contract intensified as the national economic depression rendered it dishonored throughout most of the anthracite region. Companies and union locals began to enact their own arrangements, often resulting in pay cuts and even some production limitations. The UMW, while insisting that the 1930 contract be upheld, basically ignored contract violations and condemned wildcat strikes in the face of desperate economic times.[280]

---

[278] Trapnell, *Employment Situation*, 8, 12.
[279] Miller and Sharpless, *Kingdom of Coal*, 298-300; Monroe, "Decade of Turmoil," 96, 116.
[280] Miller and Sharpless, *Kingdom of Coal*, 303.

Increased labor strife in the anthracite region in the early 1930s forced President Franklin D. Roosevelt's National Recovery Administration (NRA) to hold hearings to establish a code for the anthracite coal industry. While the Roosevelt administration recommended work equalization in the anthracite fields, with the UMW's reluctant support, conditions with the region changed little. Operators strongly opposed work equalization and made little or no effort to implement the NRA's recommendations.[281]

In 1932, primarily in response to a sense that the UMW leadership under John Lewis was working with the operators to oppose work equalization, laborers in the Wyoming and Lackawanna fields broke from the UMW and formed the United Anthracite Miners of Pennsylvania (UAMP). Work equalization was the new union's primary issue. In 1933 the UAMP, under the leadership of miner Thomas Maloney, instigated a strike against the major operators in the Wyoming field. Brawls broke out between strikers, police, and miners attempting to work. Pitched battles took place at several Wyoming field collieries, and the violence spilled over into the surrounding communities. The National Labor Relations Board (NLRB) sent a mediator to the area and initiated a series of investigations. The UAMP leadership determined that this represented a delaying tactic on the part of management and the UMW, and called another general strike in January 1934.[282]

The strike demonstrated that the UAMP had widespread support among the workers. Every colliery in the Wyoming filed was shut down or production disrupted. Maloney ended the strike in February 1934, after receiving assurances that the NLRB would grant a fair hearing to the UAMP. However, in October 1934 the NLRB recognized the UMW as the only legal union in the anthracite fields, and ruled that operators were not required to rehire workers fired during an illegal strike, which meant any strike not called by the UMW. Protected by the NLRB ruling, the operators initiated a campaign of retribution against the UAMP and its members. In January 1935 UAMP members were locked out of the mines.[283]

Maloney called a strike against Glen Alden Coal Company in February 1935. The jailing of Maloney and other UAMP leaders, and the hiring of thousands of strikebreakers, led to the worst outbreak of rioting and violence in the history of the Wyoming field. The operators and the UMW worked together against the insurgent union. The strike ended in the fall of 1935 with both sides exhausted and the UAMP effectively destroyed. Maloney was killed by a package bomb in 1936. The UMW included a statement in support of work equalization in its 1936 anthracite contract, but the union never worked to implement the practice.[284]

The increased violence and division in the anthracite region that accompanied the rise of the UAMP highlighted what was seen by many as the UMW's unresponsiveness to the needs of union members. Many rank-and-file members believed that union officials, particularly John Lewis, forged coalitions with the government and coal companies at the expense of workers. Whether or

---

281 Ibid., 305; Monroe, "Decade of Turmoil," 181; Bodnar, *Anthracite People*, 3-5.
282 Miller and Sharpless, *Kingdom of Coal*, 306-307; Monroe, "Decade of Turmoil," 247-264, 286-290.
283 Miller and Sharpless, *Kingdom of Coal*, 307-308; Monroe, "Decade of Turmoil," 294-304.
284 Bodnar, *Anthracite People*, 2, 15.

not these coalitions came about as a result of personal interests or a strategy designed to preserve the union during desperate economic times, they effectively served to weaken the union within the anthracite region.

Anthracite workers, feeling abandoned by the UMW and the coal companies, eventually relied upon their own and the federal government's resources to overcome the great economic crises of the 1930s. Workers in the region turned to and supported the Roosevelt administration's reform programs. In addition, they developed their own methods of unemployment relief, including the establishment of unemployed councils. Many of these councils were created in the early years of the Great Depression when government-funded public relief measures were unable to deal with massive unemployment and its devastating effects upon the community.[285]

The unemployed councils, whose primary goal was to achieve unemployment insurance, were well established in the region by the mid-1930s. Though the councils' efforts were locally lauded, the federal government was uneasy with the number of communist party members active in these organizations. Many of the councils were indeed organized by communist party members, but local residents soon assumed control. Eventually, as a result of pressure from labor groups nationwide, the goals of the anthracite region's unemployed councils were incorporated into the Roosevelt administration's public employment projects through the Works Progress Administration.[286]

The region's highest unemployment rates occurred between 1926 and 1935 in the Schuylkill field.[287] Unemployed miners in this area, where the coal seams were often located near the surface, turned to bootleg mining. The seams were not large enough to be worked profitably by the coal companies, but a few family members or friends could extract sufficient coal to keep food on the table. Miners were accustomed to taking coal for their own use during periods of unemployment, but bootlegging involved selling this coal, often door-to-door, at discounted prices. By 1935 it was estimated that 20,000 men were engaged in bootlegging coal worth approximately $35 million. The coal companies sought to eliminate this form of competition by dynamiting the illegal holes, strip mining the surface seams, and calling in the state police. None of these efforts proved particularly successful.[288]

The Death of an Industry

As the anthracite industry foundered in the 1930s the long tradition of community and collective action helped sustain the region's residents. By 1938 production had declined to 46 million tons. The industry still employed about 97,000 workers, but payrolls were about half what they had been a decade previous.[289] By this date the anthracite industry was, for all practical purposes, dying.

---

285 Miller and Sharpless, *Kingdom of Coal*, 315.
286 Ibid., 319.
287 Trapnell, *Employment Situation*, 17.
288 Ibid., 18; Miller and Sharpless, *Kingdom of Coal*, 319-320.
289 Monroe, "Decade of Turmoil," 368, 379.

Operators introduced new technologies to try and maintain the industry. Strip mining, longwall mining, culm bank washing, and dredging all represented last-ditch efforts to squeeze coal and profits from the region.[290] Strip mining, which entailed removing coal with machinery from a point on the surface, had been employed as early as the late-nineteenth-century. Stripping became more viable with the development of large machinery that permitted the removal of greater and greater depths of overburden covering the coal seams. Steam and electric shovels and dragline excavators dominated the strip mines.[291] By 1944 strip mining had become widespread throughout the region.

Longwall mining was developed in the bituminous fields. This mining method requires underground passages and tunnels similar to traditional mining, but works the face differently. A longwall machine undercuts and completely removes the coal at the face, unlike the traditional room-and-pillar system, which leaves pillars in place. Particular emphasis was placed on high quality roof supports, made from wood or a combination of wood and rock spoils. Longwall mining assumed that the roof would fall soon after the face was worked. This method was most efficient where the width and pitch of coal seams were more predictable than they were in much of the anthracite region, where the pitched and faulted seams prevented widescale application of this technique.

The other two methods, far less important than the introduction of large-scale strip mining, were related to the culm banks associated with collieries. Washing culm banks and dredging rivers and streams into which coal might have washed were low-capital activities dominated by individuals or small companies. Neither method produced coal in quantities rivaling those of the underground mines or the strips of the large corporations. The markets for coal gathered in this manner were largely local.

By 1945, hard coal generated 4.2 percent of the energy consumed by Americans. Crude oil and natural gas, anthracite's main competitors during the period after World War I, generated nearly 44 percent of the nation's energy, far outstripping anthracite, which had become a minor, regional fuel. The effects of this decreased demand for the principal product of the anthracite region were devastating. Anthracite mining employed over 150,000 men in 1930. By 1950 the industry employed barely 75,000. Throughout the 1950s unemployment in the region never fell below 10 percent.[292]

Following World War II, outmigration from the anthracite region intensified as job opportunities further dissipated. Town populations dropped by more than fifty percent. In 1959, a disaster occurred in the Wyoming Valley that served as a death knell for the anthracite industry. On January 22, 1959, the flooding Susquehanna River broke through rock strata and inundated the workings of the Knox Coal Company, taking the lives of three miners and trapping thirty others. Extreme measures were taken to close the huge hole in the riverbed, including dumping rail cars

---

[290] "Alive to New Production Methods," *Coal Age* 41:2 (February 1936): 50.

[291] Dever C. Ashmead, "Methods of Operation Followed at the Largest Anthracite Stripping," *Coal Age* 18:23 (December 1920): 1127-1128.

[292] Rose, *Energy Transition and the Local Community*, 104, 106.

into the river. Eventually the flood inundated nearly two dozen mines. As a result of the disaster, 7,500 jobs were lost and underground mining in the Wyoming Valley essentially ceased. By the mid-1980s, employment across the region had steadily declined to approximately 3,000 employees and production stood at 6 million tons.[293]

The legacy of anthracite's decline is evident in the region's environment. Mining disturbed nearly 25 percent of the region's 484 square miles. Culm banks dating from the heyday of underground mining continue to dominate the landscape. After the 1920s strip mining tore apart the landscape in search of coal seams. Refuse from underground and strip mine operations altered watercourses and polluted lakes and streams with acidic runoff. Subsidence, a result of underground mining techniques, damages highways and threatens buildings and communities. Underground mine fires have forced the abandonment of entire towns.

The anthracite coal industry is essentially a thing of the past. Its legacy is not solely one of economic decline and environmental damage. Anthracite fueled the industrial revolution in the decades before the Civil War. It provided heat for millions of urban residents in the northeastern United States, facilitating the development of some of the nation's largest cities. It attracted a rich and diverse immigrant culture whose traditions remain vibrant throughout the region. The struggles between labor and management laid the foundation stones for the union movement in the United States. The anthracite industry may no longer dominate the counties of northeastern Pennsylvania. But its influences are felt throughout the region and across the entire nation.

---

[293] Miller and Sharpless, *Kingdom of Coal*, 321,323.

F. ASSOCIATED PROPERTY TYPES

Associated Property Type: Colliery District

The colliery is the central property type associated with the extraction and processing of anthracite coal. The term "colliery" encompasses the entire physical plant where coal was mined, removed from the ground, cleaned, separated by size, and placed in rail cars or trucks to be transported to different markets. A colliery can range in size from a small operation – one mine with only the requisite supporting needs – to an enormous, sprawling plant consisting of miles of rail, huge breakers and power stations with dozens of ancillary buildings, and on-site housing for the miners and their families. A colliery can be as large as a town; indeed many towns exist only because of the presence of single colliery.

Because of the collective nature of a colliery – numerous discrete but inter-related functions working to extract and process coal – it is a broadly defined property type. This broad definition is intended to encompass the full range of buildings that comprise the colliery, conveying the complexity of the plant. Examples of colliery districts include Huber Colliery in Ashley, Luzerne County and St. Nicholas Colliery in St. Nicholas, Schuylkill County.

Significance

A colliery is the principal coal production facility. At a colliery, the disparate functions required to extract and process anthracite coal – such as ventilation, power generation, and sorting – are organized into a single production unit. As the anthracite coal industry matured in the late-nineteenth and early-twentieth-centuries, collieries grew in size, complexity, and capacity. Because the colliery is the central element in the production of market-ready anthracite coal, it is a significant property type within the anthracite region. Colliery districts should be evaluated under Criterion A, initially, for industry, and under Criterion C, secondarily, for architecture and/or engineering.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible for listing on the National Register of Historic Places:

1) Presence of a range of the functions typically found at a colliery.

2) The value of the resource as a colliery district is enhanced when it meets the following conditions:

a) a large percentage of the buildings, structures, or objects historically associated with the colliery are retained.

b) numerous buildings, structures, or objects retain high degrees of individual integrity.

c) the colliery conveys important advances in processing technology.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: fabric remaining at a colliery district should convey its function as a coal processing facility. The property should retain numerous or important buildings, structures, or objects typically associated with the functions of a colliery. It is not required that the property retain every building, structure, or object historically associated with its use as a colliery.

Associated Property Type: Individual Resources Associated with Collieries

Many former collieries no longer retain individual resources historically associated with the colliery, thereby disqualifying the collieries from inclusion on the National Register as colliery districts. It is possible, however, for individual resources formerly associated with a colliery to qualify as eligible for listing in the National Register based upon their individual significance. There remain in the anthracite region many individual resources that possess the significance and retain the integrity needed to qualify for listing in the National Register despite the loss of integrity to the colliery as a whole.

In order for individual resources to convey their significance despite loss of an intact colliery setting, they must retain a high degree of integrity. The test of integrity applied to individual resources related to extraction and processing is more stringent when the colliery setting in which they once functioned no longer retains integrity as a colliery district. Examples of individual colliery resources include: Dorrance Fan Houses, Wilkes-Barre, Luzerne County; Washhouse at #9 Mine, Lansford, Carbon County; Honey Brook Breaker, Audenreid, Carbon County; and Delaware & Hudson Steam Plant, Carbondale, Lackawanna County.

Description and Significance

Mine Shafts, Slopes, Drifts
The workings of the mines themselves are significant as examples of the methods applied to reach the coal seams and remove of freed coal. Mines shafts, slopes, and drifts present challenging problems concerning resource definition, boundaries, and integrity. "National Register Bulletin 42: Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties" provides valuable guidance for addressing subsurface resources.

Conveyors
Conveying systems linked together all aspects of the colliery's functions. Raw coal, processed coal, and waste separated from the product were moved over different types of conveyors. A single colliery might employ numerous types of conveyors for the different stages of processing, or the different material being moved. As colliery operations became more and more centralized in the twentieth-century, conveyors transported coal over longer distances. Conveyors are characterized by their linear nature, moving material along a line from one point to another. They were generally elevated above the ground on metal supports.

Tipples
Coal removed from the mine workings in mine cars was often transferred from the mine car to an intermediate medium, a rail car or conveyor system, before being processed at a breaker. Tipples facilitated this transfer by bringing the mine car to a height and forcing the car to dump coal to this intermediary.

Breakers
Breakers were the defining element of the colliery. Once freed from the face and brought to the surface, coal with its impurities was conveyed to the top of a breaker and gravity-fed through a series of rollers, screens, and other machinery to remove impurities and sort the product by sizes appropriate for different markets. Breakers grew in size from their invention in the 1840s to their maturity in the mid-twentieth-century, when a breaker could be seen and heard from miles around, was steel- or reinforced-concrete-framed, and reached heights of fifteen stories.

Culm Banks
Culm banks, the piles of non-coal, or coal too small to be marketed and removed during the refining process, grew to proportions dwarfing all other man-made features at or near a colliery.

Retail Pockets
As the methods of delivering coal to market changed from exclusively rail to a combination of rail and trucking, a different type of system was required to place finished coal into the trucks. Retail pockets organized the chutes for loading finished coal into trucks, and were housed in buildings near the breaker.

Power Plants
Most functions at the colliery required power in the form of steam, compressed air, or electricity. Power was necessary to drive hoist engines and pumps, turn fans, and crush, shake, and sort coal within the breakers. At earlier colliery operations, the sources of power were more frequently located near the place it was used. As collieries grew larger, and designs matured, power stations became centralized, and the buildings within which power was generated grew to very large proportions.

Hoist Houses
Vital to the mine workings were the hoisting mechanisms that moved men from the surface to the face, and coal from the face to the surface. These mechanisms were often contained in hoist

houses located at or adjacent to the mine head. Hoisting mechanisms were often metal frames located above the shaft with little or no enclosure.

Fan Houses
Contained in fan houses were large fans used to ventilate the mine workings. As mines grew more complex, separate shafts were driven to provide a constant flow of air. Fan houses were sited adjacent to the head of these shafts.

Pump Houses
Force pumps were often located within the mine itself to drive water that collected at the mine sump. On the surface, water was pumped to different locations away from the mine head. As the water bound in the rock was usually highly sulfuric, the pumps and pipes corroded quickly.

Machine Shops
Constant repair of smaller machinery was required. These repairs were made in machine shops located within the colliery district. Facilities for large-scale repair operations were often located off-site.

Wash Houses
Miners emerged from the mine filthy. Located at the wash house were pulleys, hooks, and benches where miners stored their street clothes while they worked below ground, and shower rooms where they cleaned themselves at the end of their shift.

Lamp Houses
Lamp houses were used to collect and store miners' safety lamps after each use. The lamps were typically serviced in this building.

Powder Houses
The explosives used to free coal from the face and to drive tunnels and shafts were stored in a central location, often removed from other buildings to minimize damage in the event of an explosion. A powder house could be located within a hillside, or set behind a high bank of concrete buttresses.

Weigh Houses and Scales
These facilities are related to the introduction of trucks as a means of conveying anthracite to market. The weigh house and scale provided a means for determining the amount of coal in each truckload. Weigh houses were located along an exit road with the scale immediately adjacent to the house.

Warehouses
A colliery often had a warehouse for storage and distribution of equipment used at the mine. It was typically located parallel to the rail siding for loading and unloading purposes.

Offices and Administration Buildings
Systems for tracking the inflow and outflow of coal, miners, and rail cars were required. In fact, sophisticated distribution systems were largely developed specifically for the coal market. One aspect of this was regulated by clerks and other office workers at the colliery itself; these people worked in offices and administration buildings often located near the entrance to the colliery.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible for listing on the National Register of Historic Places are:

1) Direct relation to the functions of the colliery at which the resource is located.

2) The value of the resource as an individual building, structure, or object is enhanced when it meets the following conditions:

a) the resource is the only physical remnant of a particularly significant colliery site that is otherwise unrepresented.

b) the resource is related to an advance in the technology of the function it performed.

c) the resource represents a range of the technologies associated with the function it performed.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimum requirement: an individual colliery resource should retain certain features or distinguishing characteristics which reflect its function at the colliery.

Associated Property Type: Canals and Canal Resources

Canals were built in the anthracite region during the 1820s and 1830s and were the first and primary link between the coal fields and larger markets, such as New York and Philadelphia. The primary anthracite-carrying canals were the Schuylkill Canal, the Lehigh Canal, the Delaware & Hudson Canal, the Delaware Division Canal, the Union Canal, and the North Branch Canal.

The property type includes buildings, structures, districts, and sites. Examples of sub-types related to canals include, but are not limited to, canal corridors, locks, locktender's houses, dams, boatbuilding or repair yards, warehouses, coal yards, and towpaths. Locks consisted of walls of

quarried or rubble stone on a wooden crib of cross timbers with mechanisms for opening and closing gates at each end of the lock. Gate structures were built of wood or iron. Locktenders' houses were originally small, 1-1/2 story, four-room, stone buildings situated adjacent to locks. Later examples were wood-frame and 1-1/2 to 2-1/2 stories. Dams consisted of a series of interlocking, rock-filled square timber cribs, sheathed with boards set at an angle to ensure a smooth flow of water over the top. Boatbuilding or repair yards consisted of sawmills, lumber sheds, dry docks, boiler houses, and blacksmith shops. Coal yards were often combined with hay and grain handling facilities and consisted of a boat basin, offices, concrete cylindrical or wooden rectangular storage bins, wagon sheds, stables, and garages.[1]

Extant examples of canal-related resources are fairly limited within the anthracite region. The emergence of railroads, and later, the automobile obliterated many of the former canal routes. Examples of canal-related resources within the anthracite region include: Lehigh Canal, Weissport, Carbon County; Mill Creek Aqueduct, Wilkes-Barre, Luzerne County; Palo Alto Loading Dock, Port Carbon, Schuylkill County; and Bridgeport Lock, Foster Township, Luzerne County.

Significance

The growth of the anthracite industry depended largely upon the development of an efficient transportation system. The development of canals stimulated demand and, therefore, production in the coal fields. Canals played a seminal role in the development and early expansion of the anthracite industry. Canal and canal-related resources should be evaluated under Criterion A for transportation and Criterion C for engineering.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

   1) Resource must be associated with one of the six anthracite-carrying canals identified above.

   2) The value of a canal-related resource, such as a locktender's house or warehouse, is enhanced if the canal is extant.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

---

[1]Hugh Moore Historical Park and Museums, "Historic Resources Study: Delaware and Lehigh Canal National Heritage Corridor and State Heritage Park" (n.p.:n.p., 1992), 40-41.

1) Minimal requirement: resource should convey its function as a canal-related resource. A site must be associated with a significant aspect of canal activity not represented by an intact building or structure.

Associated Property Type: Railroads and Railroad Resources

The earliest anthracite-related railroads were short feeder, or auxiliary, lines extending between mine workings and canals. Two of the earliest systems were gravity railroads built in the late 1820s: the Summit Hill to Mauch Chunk Gravity Railroad of the Lehigh Coal & Navigation Company; and the Carbondale to Honesdale Gravity Railroad of the Delaware & Hudson Canal Company. Initially, or with later extensions, these systems incorporated inclined planes.

With the maturity of anthracite industry in the 1830s, more auxiliary railroads were developed, especially in the Schuylkill field. The first through line, connecting the mines directly with the large markets of the eastern seaboard, was the Philadelphia & Reading Railroad, completed in 1842. The Reading remained the only through line until the 1850s, when the Lehigh Valley Railroad and the Delaware, Lackawanna, & Western Railroad were established in the Lehigh and Wyoming fields, respectively. These new through lines sought to capture the New York anthracite market, since the Philadelphia market was monopolized by the Reading Railroad, which dominated the Schuylkill field.

Canals remained in competition with railroads through the Civil War. In the decade following the Civil War, railroads surpassed canals and, oftentimes, purchased or leased formerly competing canals. During the late nineteenth century, the railroads focused on expansion and consolidation of smaller lines. Expansion, especially for the railroads of the Lehigh and Wyoming fields, consisted of extending their lines east, across New Jersey to New York, and north and west to Great Lakes' ports. The largest anthracite railroads were also those that procured mining privileges. These included the: Philadelphia & Reading; the Delaware, Lackawanna & Western; the Lehigh Valley; the Central Railroad of New Jersey; and the Delaware & Hudson.

Numerous smaller secondary lines were involved in the transportation of anthracite, including, but not limited to, the: Delaware, Susquehanna, & Schuylkill; the Erie; the Erie & Wyoming Valley; the Lehigh & New England; the New York, Ontario, & Western; the New York, Susquehanna, & Western; the Pennsylvania; and the Pennsylvania Coal Company.

The railroad property type includes buildings, structures, and districts. Examples of sub-types related to railroads include, but are not limited to, railroad corridors, freight depots, passenger stations, roundhouses, rail yards, erection shops, and inclined planes. Freight depots and passenger stations were built of brick or wood, consisting of one or two stories. Station areas may have included coaling stations, water tanks, sand towers, icing stations, and maintenance sheds. Roundhouses consisted of a circular building built of wood or brick with high bays and a turntable in the center. Rail yards usually consisted of trackage, a control tower, engine repair facilities, and a yardmaster's office. The control tower was generally wood and two to five stories tall. Erection

shops were generally built of brick, with high bays, windows, pits below the tracks, and overhead movable cranes. Inclined planes usually consisted of two or more tracks on each plane with an engine house and boiler house at the top to house the raising mechanism and provide power. A pit was located at the bottom of the plane to hold the barney, or pull car.[2]

Railroads were the primary agent in the expansion and development of the anthracite industry and their imprint is very much extant in the seven-county region. Numerous examples exist for most property types. The following is a select list of representative examples for certain property types: Lehigh Valley Railroad Freight Depot, Lehighton, Carbon County; D & H Gravity Railroad, Lackawanna County; Ashley Planes, Ashley Borough, Luzerne County; D, L, & W Train Station, Scranton, Lackawanna County; Packertown Repair Shop, Mahoning Township, Carbon County; Delaware & Hudson Roundhouse, Carbondale, Lackawanna County.

Significance

The railroad revolutionized the anthracite industry by providing coal operators with a transportation system that was faster and more efficient than canals, carried more cargo, and operated throughout the entire year (canals being frozen or drained during the winter). The railroad facilitated the spread of mining throughout the Lehigh, Schuylkill, and Wyoming fields and served as a pacesetter for the growth and expansion of the industry. Railroad and railroad-related resources should be evaluated under Criterion A for transportation and Criterion C for architecture and/or engineering.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that this example of the property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

   1) Resource must be associated with one of the early auxiliary lines or the primary late-nineteenth-century anthracite-carrying railroads identified above.

   2) If the resource is not associated with one of the primary anthracite-carrying railroads, a demonstrable historic connection between the resource and the anthracite industry must be established.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

---

[2] Ibid., 41-42.

1) Minimal requirement: resource should convey its function as a railroad-related resource. A site must be associated with a significant aspect of railroad activity not represented by an intact building or structure.

Associated Property Type: Anthracite Iron Furnaces

During the late 1830s, iron masters in eastern Pennsylvania, augmented by foreign-born iron masters, developed a modern method for producing iron, substituting anthracite coal for charcoal as a fuel source. Anthracite-fueled iron furnaces rapidly became the most important source for domestically produced iron. Iron rails for the rapidly expanding railroad network, were in high demand, and anthracite-fired furnaces were the first and most important sources of these rails during the 1840s and 1850s. Not until the early 1870s, after the long-development of the Bessemer process, did steel production capacity challenge the primacy of iron products made in eastern Pennsylvania. The best example of an anthracite furnace within the anthracite region is the Lackawanna Iron & Coal Company Furnaces in Scranton, Lackawanna County.

Significance

An anthracite iron furnace is the principal property type associated with anthracite iron production in eastern Pennsylvania. Early iron furnaces were modeled closely on the traditional technologies employed by charcoal furnaces, with a single hot-blast furnace producing pig iron. As Pennsylvania iron masters explored the limits of the new fuel source during the late-1840s and through the 1850s, iron furnaces and their supporting facilities grew in size and complexity. Beginning in the 1870s steel production began to outstrip iron production in the United States. Bituminous coal and coke were the preferred fuel of many steelmakers, and the dominance of anthracite-produced iron within the American economy began to decline in the last quarter of the nineteenth century.

Because of the displacement of anthracite iron following the 1870s, anthracite iron furnaces as a property type associated with the anthracite region typically date to the middle of the nineteenth-century. Most anthracite furnaces were located outside the anthracite region, as defined in this study. Anthracite iron furnaces should be evaluated under Criterion A for industry.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible for listing on the National Register of Historic Places:

1) Presence of functions central to an anthracite iron facility.

2) Documented use of anthracite coal as the fuel source for iron production.

3) The value of the resource as an anthracite iron furnace is enhanced when it meets the following conditions:

a) An important individual element retains a high degree of individual integrity.

b) The remaining fabric conveys important advances in iron-making technology, or retains evidence of an early anthracite iron furnace.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirements: fabric remaining at an anthracite iron furnace should convey its function as an iron furnace. The property should retain evidence of important buildings, structures, or objects typically associated with an anthracite iron furnace. It is not required that the property retain all or most of the buildings, structures, or objects formerly associated with the site.

Associated Property Type: Housing

Community development in the anthracite region, including housing, paralleled the development of the mining industry. Housing in the anthracite region is scattered throughout rural areas and concentrated in patch towns, mining towns, and regional centers. Coal companies developed patch towns in isolated locations, primarily in the Schuylkill field (see Associated Property Type: Patch Towns). Mining towns and villages were created in the anthracite region as the industry expanded. These communities contained both independent and company-owned housing associated with mining companies or related industries, such as iron, transportation, and consumer goods. Housing types that developed in the region include company or independently-owned worker housing, company or independently-owned manager housing, and the housing of the local elite who owned and/or operated coal mines and ancillary manufacturing and service industries.

Examples of significant housing in the anthracite region include: Concrete City, Hanover Township, Luzerne County; Morss Mansion, Simpson, Lackawanna County; Joseph Cassese House, Scranton, Lackawanna County; and River Street Historic District, Wilkes-Barre, Luzerne County.

Significance

Housing in the anthracite region is significant for its associations with social history of the region, associations with significant individuals, and for its relationships to the anthracite industry. When viewed as a whole, the variety of housing types in the region represents the various ethnic groups and cultures that resided in the region. Housing should be evaluated under Criterion A, initially,

for social history, and under Criterion B and C, secondarily, for significant individuals and architecture, respectively.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must be a dwelling that was either constructed for or used by individuals associated with anthracite coal mining or with ancillary manufacturing, transportation, or service industries.

2) Resource is more significant if it is part of a district that contains other remnants of a neighborhood or related industry. For example, a district that contains other patch town housing or buildings, a district that contains an industrial complex and associated manager or working housing, or a neighborhood of intact local elite housing.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: resource must retain its physical integrity.

Associated Property Type: Patch Towns

Patch towns developed primarily in the anthracite region's Schuylkill field where coal basins are small and scattered, isolating many collieries from nearby towns. As a result, coal companies developed numerous residential hamlets, known as patch towns, to attract and house miners and laborers. These company-owned villages, which originally contained primarily company housing and a store adjacent to a colliery, existed solely to produce coal for export. Examples of sub-types related to patch towns include, but are not limited to, management housing, worker housing, and company stores, and, if the patch was large enough, a church.

Patch towns are often characterized by a row of shacks and houses along a single, narrow road. Some may contain a few more streets. Mine bosses and supervisors typically resided in larger homes located at the head of streets. Miners houses, usually constructed as duplexes, were located beyond supervisor housing. Laborers and other unskilled workers often resided in shacks at the bottom of the main street or on side streets. A company store and community center, which sometimes served as a school, were often situated in the center of the hamlet. If the patch was large enough, a Presbyterian church might be located near the boss and supervisors' housing, while a Catholic church may have sat at the workers' end of village. Examples of patch towns include Locust Gap, Sugar Notch, and Wanamie.

Significance

Patch towns are significant for their association with the influx of European immigrants to the anthracite region in the last half of the nineteenth century. The isolation of patch towns attracted a concentrated immigration population, which came from similarly dense European working-class communities. Patch towns are also significant as they made efficient production possible in isolated areas. Patch towns should be evaluated under Criterion A, initially, for social history, and under Criterion C, secondarily, for architecture.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must be associated with a former or extant anthracite-producing colliery.

2) The value of a patch town district is enhanced when it meets the following conditions:

a) a large percentage of the buildings, structures, or objects historically associated with the patch town are retained;

b) numerous buildings, structures, or objects retain high degrees of individual integrity;

c) significant buildings, structures, or objects of the patch town's associated colliery remain extant. These might include a nearby coal breaker, railroad tracks, or machine shops.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: resource should retain enough features to be identifiable as a patch town. The district should possess a significant concentration, linkage, or continuity of sites, buildings, structures, or objects typically associated with patch towns. It is not required that the resource retain every building, structure, or object historically associated with its function as a patch town.

Associated Property Type: Resources Associated with Labor History

Due to difficult working conditions in the anthracite mines and the dynamics of the operator/miner working relationship, the anthracite region was the site of numerous labor struggles, organizing activities, and home to important labors leaders in the late nineteenth and early twentieth centuries. Resources related to labor history in the anthracite region, include, but are not limited to, union halls, fraternity halls, rally sites, labor action sites, monuments, and union organizer houses. Examples include the Lattimer massacre site, the Lansford Sport Stadium, the Lackawanna County Courthouse, John Mitchell monument, and Terrence Powderly House in Scranton, and the John Siney House in Schuylkill County.

Significance

Labor history in the anthracite region is significant for its contribution to the development of the late nineteenth and early twentieth century labor movement in the United States. Because anthracite mining is a nationally significant industry, sites associated with the labor movement that developed in the anthracite region assume a national significance. Labor history resources should be evaluated under Criterion A if associated with an event and under Criterion B if associated with an important person.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that this example of the property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must be associated with a significant labor movement event or leader in the anthracite region.

2) If not directly associated with specific event or leader, must be associated with labor trends in the region, such as a union hall or fraternity hall.

3) Resource must demonstrate documentable connection to a significant labor trend or event, such as the Lansford Sport Stadium.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: building or structure must retain its physical integrity. A site must be associated with a significant aspect of the labor movement not represented by an intact building or structure, such as the Lattimer massacre site.

Associated Property Type: Ethnic Public Buildings

In the late-nineteenth century, urban social structure in many towns of the anthracite region was shaped by ethnic division. In the late-nineteenth and early-twentieth centuries, large numbers of Welsh, Irish, Germans, and Eastern Europeans immigrated to the region to work in the anthracite fields. These immigrants settled in ethnically-defined neighborhoods in numerous towns and villages. Their neighborhoods centered upon public buildings constructed by each group for their own use. Churches, fraternal organizations, ethnic societies, and rival volunteer fire companies were organized along ethnic lines.[3] Examples include the Polish-American Fire Company building in Shenandoah, the Emmanuel Slovak Lutheran Church in Mahanoy City, and Ancient Order of Hibernia headquarters throughout the region.

Significance

Ethnic public organizations and their related buildings played an important role in the development of the social structure of the anthracite region. These organizations, which served both spiritual and social functions in their respective communities, contributed to ethnic consciousness and unity in the region by providing each ethnic group with their own centralized public services, including religious activities, social functions, political forums, and charitable activities. Ethnic organizations could promote isolation and lack of cooperation between ethnic groups; the creation of rival fire companies exemplify ethnic distrust and jealousies. Significance for social history under Criterion A should be established. These properties may also be significant under Criterion C for architecture.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of the property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

   1) Resource must demonstrate documentable connection to a historic ethnic group which promoted the lifeways of anthracite communities.

   2) Historic ethnic group must have ties to an anthracite-related industry.

   3) A resource is more significant if it is part of a district that contains other remnants of an ethnic neighborhood, such as other public and residential buildings.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

---

[3] Lawrence M. Newman, "Nine Towns" (M.A. thesis, Harvard University, 1993), 12.

1) Minimal requirement: building or structure must retain its physical integrity. A site must be associated with a significant aspect of an ethnic community not represented by an intact building or structure, such as an ethnic cemetery.

Associated Property Type: Company Offices

In the late nineteenth and early twentieth centuries, coal, railroad, and canal companies constructed local headquarters in the anthracite region. Coal and coal-related companies in the region included the Reading Anthracite Company, the Lehigh Coal and Navigation Company, the Lackawanna Iron and Coal Company, the Hazleton Coal Company, the Glen Alden Company, and the Susquehanna Coal Company, among others. Company offices range in size from modest wood-frame or brick buildings in small mining towns, such as the Susquehanna Coal Company office building in Nanticoke, to large-scale headquarters, such as the Reading Anthracite Company Office Building in Pottsville.

Significance

Coal and coal-related company offices represent the economic and social importance of coal mining and related industries within the region. The anthracite industry dominated the lives of almost every resident of the region, including mine, railroad, and canal workers, their families, and workers in related manufacturing industries. Companies associated with the coal interests dictated laws, hired company police, and owned or controlled land, housing, stores, schools, and churches in many communities. Their local headquarters symbolize the presence and power of these firms. Company offices should be evaluated under Criterion A, initially, for industry, and under Criterion C, secondarily, for architecture.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that this example of the property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must demonstrate documentable connection to a coal-related company in the anthracite region.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: resource should retain its physical integrity.

Associated Property Type: Miners' Hospitals

As a result of numerous mining disasters in the anthracite region, miners' hospitals were constructed throughout the area, beginning with the first in Ashland in 1878. The hospitals range in size from modest facilities originally constructed as dwellings to large-scale brick hospital buildings.

Significance

Prior to the Avondale mine fire in 1869, safety practices in the anthracite mines were implemented at the sole discretion of individual operators. The Avondale disaster eventually resulted in the passage of improved mine safety laws, and, in 1878, miners secured a state hospital for the region. While some operators provided medical care facilities for their workers prior to 1879, most did not. Miners' hospitals are significant under Criterion A for health/medicine because they represent both the dangers of anthracite mining and the hard-won success of miners and their advocates in obtaining medical care facilities for miners and their families.[4]

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must have been constructed as, or converted to, a hospital or medical facility for miners and/or their families.

2) The value of a miners' hospital or medical facility is enhanced when it meets the following conditions:

a) a large percentage of the buildings, structures, or objects historically associated with the hospital are retained.

b) numerous buildings, structures, or objects retain high degrees of individual integrity.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

[4] Donald L. Miller and Richard E. Sharpless, *The Kingdom of Coal: Work, Enterprise, and Ethnic Communities in the Mine Fields* (Philadelphia: University of Pennsylvania Press), 113.

1) Minimal requirement: resource must retain its physical integrity. Many miners' hospitals in the region contain several additions and alterations as a result of the need for modern medical equipment and facilities. In order to retain physical integrity, a substantial portion of the original hospital building must be recognizable as such.

Associated Property Type: Ancillary Industries/Services

As anthracite coal mining became commercially successful, heavy manufacturing and transportation industries emerged in the region's urban centers to service the mining industry. Locally-owned small manufacturers were often located in regional centers such as Scranton and Wilkes-Barre. Because of its close ties with both coal and transportation companies, the iron industry, prominent in Scranton and Pottsville, was one of the largest manufacturing industries in the region. Scranton was also a center for manufacturers of mining-related equipment, such as fans, locomotives (made at companies like the Dickson Manufacturing Company), steam engines, blasting powder, and stoves. Beginning in the late-nineteenth century, manufacturers of consumer goods, including silk, lace, tin, and cigars, began to establish factories that employed the female labor pool concentrated in the region's urban centers.

Ancillary industries and services developed throughout the region. Wilkes-Barre was a center for the silk and lace industries, as well as wire rope production and iron, produced at the Vulcan Iron Works. Carbondale served as a transportation center with its headquarters for the Delaware & Hudson Railroad. Besides iron production, Pottsville was an important transportation center as the head of the Schuylkill Navigation Canal and the Reading Railroad, and housed consumer goods industries, like the Yuengling Brewery. Smaller communities in the region, including Shamokin, Hazleton, and Mount Carmel, also housed a number of industries ancillary to anthracite coal production. In many smaller urban centers these industries included silk and textile mills that employed the wives and daughters of local miners.

Significance

Successful commercial development of the anthracite coal fields served as a catalyst for urbanization in the region. The development of major industries that serviced the anthracite industry provided employment for mine workers' families and contributed to the region's growth. Additionally, ancillary industries in and surrounding the region's urban centers provided a level of economic diversification, and with it, a more heterogeneous class structure. Beginning in the 1930s, as businesses related to the production of anthracite declined, the region's leaders attempted to revitalize the area's economy by encouraging further diversification of local industry in the areas of textiles, building supplies, electrical equipment, and, later, tourism. Ancillary industries/services should be evaluated under Criterion A, initially, for social history, and under Criterion C, secondarily, for architecture.

Registration Requirements

A. Physical characteristics, associative qualities, or information potential that an example of this property type must possess to be determined eligible within the anthracite context for listing in the National Register of Historic Places:

1) Resource must be associated with a manufacturing or transportation-related industry or a service that developed in the region as a result of the commercialization of anthracite coal or as a result of its decline (prior to 1945).

2) Resource is more significant if it is part of a district that contains other remnants of an industrial site, such as an industrial or transportation complex, and/or is associated with worker housing and support facilities.

B. Aspects of integrity and the degree to which these qualities must be present in an example of this property type to convey its associative, artistic, or informational value, and thus meet criteria necessary to qualify for the National Register:

1) Minimal requirement: resource must retain its physical integrity.

G. GEOGRAPHICAL DATA

This multiple property documentation form addresses anthracite-related resources found in the anthracite region of Pennsylvania. The anthracite region is defined as the counties of Carbon, Columbia, Dauphin, Lackawanna, Luzerne, Northumberland, and Schuylkill.

H. METHODOLOGY

Kise Franks & Straw (KFS) was contracted by the Pennsylvania Historical and Museum Commission (PHMC) to produce a Multiple Property Documentation Form (MPDF) for anthracite-related resources in Pennsylvania's anthracite region. This entailed preparation of a historic context that established the national significance of Pennsylvania's anthracite coal industry, identification of property types associated with the industry and the region, and development of registration requirements for these property types. KFS carried out this task in consultation with a management advisory committee and a panel of anthracite historians. In consultation with the committee and panel, the "anthracite region" was defined (see Section G).

KFS commenced preparation of the historic context by undertaking extensive documentary research in both primary and secondary sources. Research topics included the development of the industry, the technological history of mining and processing anthracite coal, the history of the transportation systems that delivered coal to market, the history of the development and expansion of the anthracite iron industry, the urbanization of the anthracite region, and the social and labor history of the region. This research was directed at establishing the national significance of the anthracite coal industry. Research was conducted at the Historical Society of Pennsylvania, the University of Pennsylvania, the Lackawanna County Historical Society, the Hugh Moore Historical Park and Museums, and a number of other local and regional repositories. Upon completion of the research, KFS synthesized the information to determine salient themes and areas of significance.

KFS examined and reviewed historic site survey forms for each county within the defined anthracite region at PHMC. Additional survey forms prepared by local agencies were also reviewed. This work provided information on possible property types and the survival of various anthracite-related resources. In conjunction with this effort, KFS undertook field investigations of anthracite-related resources to further refine the list of property types and to establish registration requirements. Public meetings were held in Pottsville and Scranton to increase public awareness of the project and to solicit information from local experts. Finally, the results of the research and field investigations were organized and synthesized into this MPDF.

I. BIBLIOGRAPHY

Allison, Robert. "Early History of Coal Mining and Mining Machinery in Schuylkill County." *Transactions of the Historical Society of Schuylkill County* 4 (1912): 134-155.

Anthracite Coal Strike Commission. *Report to the President on the Anthracite Coal Strike of May - October, 1902*. Washington: GPO, 1903.

Ashmead, Dever C. "Methods of Operation Followed at the Largest Anthracite Stripping." *Coal Age* 18 (December 1920): 1127-1128.

Aurand, Harold W. "The Anthracite Mine Workers, 1869-1897: A Functional Approach to Labor History." Ph.D. diss., Pennsylvania State University, 1969.

_____. "The Anthracite Miner: An Occupational Analysis." *Pennsylvania Magazine of History and Biography* 104 (1980): 462-473.

_____. "The Anthracite Strike of 1887-1888." *Pennsylvania History* 35 (1968): 169-185.

_____. *From the Molly Maguires to the United Mine Workers: The Social Ecology of an Industrial Union, 1869-1897*. Philadelphia: Temple University Press, 1971.

_____. "Mine Safety and Social Control in the Anthracite Industry." *Pennsylvania History* 52 (October 1985): 227-241.

_____. *Population Change and Social Continuity: Ten Years in a Coal Town*. Selinsgrove, PA: Susquehanna University Press, 1986.

Bakerman, Theodore. "Anthracite Coal: A Study in Advanced Industrial Decline." Ph.D. diss., University of Pennsylvania State, 1956.

Barendse, Michael. *Social Expectations and Perception: The Case of the Slavic Anthracite Workers*. University Park: Penn State University Press, 1981.

Bartholomew, Craig. "Anthracite Iron Making and Industrial Growth in the Lehigh Valley." *Proceedings: Lehigh County Historical Society* 32 (1978): 129-183.

Bartholomew, Craig L. and Lance E. Metz. *The Anthracite Iron Industry of the Lehigh Valley*. Easton, PA: Center for Canal History and Technology, 1988.

Bensman, David and Roberta Lynch. *Rusted Dreams: Hard Times in a Steel Community*. Berkeley: University of California Press, 1988.

Berthoff, Rowland. "The Social Order of the Anthracite Region, 1825-1902." *Pennsylvania Magazine of History and Biography* 89 (July 1965): 261-291.

Billinger, Robert D. *Pennsylvania's Coal Industry*. Gettysburg, PA: Pennsylvania Historical Association, 1954.

Binder, Frederick M. "Anthracite Enters the American Home." *Pennsylvania Magazine of History & Biography* 82 (1959): 82-99.

_____. *Coal Age Empire: Pennsylvania Coal and its Utilization to 1860*. Harrisburg: Pennsylvania Historical and Museum Commission, 1974.

Bining, Arthur C. *Pennsylvania's Iron and Steel Industry*. Gettysburg: Pennsylvania Historical Association, 1954.

Bishop, J. Leander. *A History of American Manufactures From 1608 to 1860*. 2 vols. Philadelphia: Young, 1864.

Blatz, Perry K. "The All-too Youthful Proletarians: Breaker Boys of the Anthracite Coal Region in the Early 1900s." *Pennsylvania Heritage* 7 (Winter 1981): 13-17.

_____. *Democratic Miners: Work and Labor Relations in the Anthracite Coal Industry, 1875-1925*. Albany, NY: State University of New York Press, 1994.

_____. "Ever-Shifting Ground: Work and Labor Relations in the Anthracite Coal Industry, 1868-1903." Ph.D. diss, Princeton University, 1987.

_____. "What the Workers Wanted: The Grievances of the Anthracite Mine Workers and the Strike of 1902." *Canal History and Technology Proceedings* 4 (June 1985): 107-129.

Bluestone, Barry and Bennett Harrison. *The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industry*. New York: 1982.

Bodnar, John. *Anthracite People: Families, Unions and Work 1900-1940*. Harrisburg: Pennsylvania Historical and Museum Commission, 1983.

_____. "Socialization and Adaptation: Immigrant Families in Scranton, 1880-1890." *Pennsylvania History* 43 (1976): 147-163.

Bogen, Jules I. *The Anthracite Railroads: A Study in American Railroad Enterprise*. New York: Ronald Press Co., 1927.

Bowen, Eli. *The Coal Regions of Pennsylvania Being a General, Geological, Historical, and Statistical Review of the Anthracite Coal Districts.* Pottsville, PA: E. N. Carvalho & Co., 1848.

Brewster, F. K. "Buildings and Breaker of the New Loomis Colliery." *Coal Age.* (21 November 1914).

Broehl, Wayne. *The Molly Maguires.* Cambridge, MA: Vintage, 1964.

Chance, H. M. *Mining Methods and Appliances Used in the Anthracite Coal Fields.* Harrisburg: Second Geological Survey of Pennsylvania, 1883.

Chandler, Alfred D., Jr. "Anthracite Coal and the Beginnings of the Industrial Revolution in the United States." *Business History Review* 46 (1972): 141-181.

_____. *The Visible Hand: The Managerial Revolution in American Business.* Cambridge, MA: Harvard University Press, 1977.

Cochran, Thomas C. *Frontiers of Change: Early Industrialism in America.* New York: Oxford University Press, 1981.

Corlsen, Carl. *Buried Black Treasure: The Story of Pennsylvania Anthracite.* Dansville, NY: F. A. Owen Publishing Co., 1954.

Cornell, Robert J. *The Anthracite Coal Strike of 1902.* Washington: Catholic University Press, 1957.

Cumbler, John. *A Social History of Economic Decline: Business, Politics and Work in Trenton.* New Brunswick, NJ: Rutgers University Press, 1989.

Davies, Edward J. *The Anthracite Aristocracy: Leadership and Social Change in the Hard Coal Regions of Northeastern Pennsylvania, 1800-1930.* DeKalb, IL: Northern Illinois University Press, 1985.

DiCiccio, Carmen Peter. "Bituminous Coal and Coke Context of Pennsylvania, 1740-1945." National Register of Historic Places Multiple Property Documentation Form. Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1993.

Dinkelacker, Thomas. "The Construction of the Lehigh Canal and the Early Development of the Lehigh Valley Region." *Wyoming Historical & Geological Society Proceedings* 24 (1984).

Doyle, William S. *Strip Mining of Coal: Environmental Solutions.* Park Ridge, N.J.: Noyes Data Corporation, 1976.

Dubofsky, Melvyn and Warren Van Tine. *John L. Lewis: A Biography*. New York: 1977.

Dudley, Kathryn Marie. *The End of the Line: Lost Jobs, New Lives in Postindustrial America*. Chicago: 1994.

Dulles, Foster Rhea and Dubofsky, Melvyn. *Labor in America, A History*. 4th ed. Arlington Heights, IL: Harlan Davidson, Inc., 1984.

Eavenson, Howard N. *The First Century and a Quarter of the American Coal Industry*. Pittsburgh: Privately printed, 1942.

Eggleston, Jane R. and Edmunds, William E. *Anthracite Basins of Eastern Pennsylvania: Pottsville to Shamokin, Pennsylvania, July 15-16, 1989: Field Trip Guidebook*. Washington: American Geophysical Union, 1989.

Fieldner, A. C., Fisher, P.L. and Brewer, R. E. "Annual Report of Research and Technologic Work on Coal, Fiscal Year 1944." *United States Bureau of Mines Information Circular 7322*. Washington: GPO, 1945.

Fink, Gary M., ed. *Biographical Dictionary of American Labor*. Westport, CT: Greenwood Press, n.d.

Firmstone, William. "Sketch of Early Anthracite Furnaces." *Transactions of the American Institute of Mining Engineers*. 3 (May 1874-February 1875): 152-156.

Folsom, Burton W., Jr. *Urban Capitalists: Entrepreneurs and City Growth in Pennsylvania's Lackawanna and Lehigh Regions, 1800-1920*. Baltimore: MD, Johns Hopkins University Press, 1981.

Foner, Eric and Garraty, John A., eds. *The Reader's Companion to American History*. Boston: Houghton Mifflin Co., 1991.

Foner, Philip S. *History of the Labor Movement in the United States: From Colonial Times to the Founding of the American Federation of Labor*. New York: International Publishers, 1947.

Galuszka, Peter. "1911-1986: Coal's Rise & Fall & Rise." *Coal* (June 1986): 127.

Geological Survey of Pennsylvania. *General Map of the Anthracite Coal Fields of Pennsylvania and Adjoining Counties: Showing the Position of Each Colliery*. Harrisburg, PA: E. K. Meyers, 1890.

Ginger, Ray. "Company-Sponsored Welfare Plans in the Anthracite Industry Before 1900." *Business History Review* 38 (June 1953): 122-120.

_____. "Managerial Employees in Anthracite, 1902: A Study in Occupational Mobility." *Journal of Economic History* 14 (Spring 1954): 146-157.

Gluck, Elsie. *John Mitchell, Miner: Labor's Bargain with the Gilded Age.* New York: Greenwood Press, 1929.

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

_____. "Custom and Consequence: Early Nineteenth-Century Origins of the Environmental and Social Costs of Mining Anthracite." In *Early American Technology: Making & Doing Things From the Colonial Era to 1850*, edited by Judith A. McGaw, 240-277. Chapel Hill: University of North Carolina Press, 1994.

_____. "Industrial Archeology of American Iron and Steel." *IA: The Journal of the Society for Industrial Archeology* 18 (1992): 5-18.

Gordon, Robert B. and Malone, Patrick M. *The Texture of Industry: An Archaeological View of the Industrialization of North America.* New York: Oxford University Press, 1994.

Greene, Victor. *The Slavic Community on Strike: Immigrant Labor in Pennsylvania.* South Bend, IN: University of Notre Dame, 1968.

Gross, Laurence F. *The Course of Industrial Decline: The Boott Cotton Mills of Lowell, Massachusetts, 1835-1955.* Baltimore: Johns Hopkins University Press, 1993.

Haines, Michael. *Fertility and Occupation: Population Patterns in Industrialization.* New York: 1979.

Hindle, Brooke and Lubar, Steven. *Engines of Change: The American Industrial Revolution, 1790-1860.* Washington: Smithsonian Institution Press, 1986.

Historic American Engineering Record (HAER). "Huber Breaker Project, HAER PA-204." Historic American Engineering Record, National Park Service, 1991.

_____. "Dorrance Colliery Fan House Project, HAER PA-61." Historic American Engineering Record, National Park Service, 1983.

Hoffman, John N. "Anthracite in the Lehigh Valley of Pennsylvania, 1825-1845." *Contributions From the Museum of History and Technology, Smithsonian Institution, Bulletin 252.* Washington: Smithsonian Institution, 1968.

_____. *Girard Estate Coal Lands in Pennsylvania, 1801-1884.* Smithsonian Studies in History and Technology No. 15. Washington: Smithsonian Institution Press, 1972.

Hugh Moore Historical Park and Museums. "Historic Resources Study: Delaware and Lehigh Canal National Heritage Corridor and State Heritage Park." n.p.: n.p., 1992.

Hunter, Louis C.. "Heavy Industries Before 1860." In Harold F. Williamson, ed. *The Growth of the American Economy*. (New York: n.p., 1951).

_____. *Steam Power: A History of Industrial Power in the United States, 1780-1930*. Charlottesville: University Press of Virginia, 1985.

Hyde, Charles K. *Technological Change and the British Iron Industry: 1700-1870*. Princeton, NJ: Princeton University Press, 1977.

Janosov, Robert A. "Glen Alden's Huber Breaker: A Marvel of Mechanism." *Canal History and Technology Proceedings* 11 (March 1992): 103-144.

_____. "Model Company Housing for Anthracite Workers in an Age of Industrial Efficiency." *Canal History and Technology Proceedings* 5 (March 1986): 223-241.

Janosov, Robert A. and Bohlin, Nat. *A Preliminary Survey of Wyoming Valley's Historic Anthracite Sites*. n.p.: Historic Preservation Society of Luzerne County, n.p.

"John Mitchell." *The United Mine Workers Journal*. 30, no. 18 (15 September 1919): 3.

Johnson, Walter R. *Notes on the Use of Anthracite in the Manufacture of Iron*. Boston: Little, Brown & Co., 1841.

Jones, Chester Lloyd. *The Economic History of the Anthracite-Tidewater Canals*. Philadelphia: University of Pennsylvania Press, 1908.

Jones, Eliot. *The Anthracite Coal Combination in the United States: With Some Account of the Early Development of the Anthracite Industry*. Cambridge, MA: Harvard University Press, 1914.

Kanarek, Harold. "Disaster for Hard Coal: The Anthracite Strike of 1925-1926." *Labor History* 15 (Winter 1974): 44-62.

_____. "The Pennsylvania Anthracite Strike of 1922." *The Pennsylvania Magazine of History and Biography* 99 (April 1975): 209-224.

Keil, Thomas J. and Wayne M. Usui. "The Family Wage System in Pennsylvania's Anthracite Coal Region: 1850-1900." *Social Forces* 67 (September 1988): 185-207.

Knies, Michael J. "The Development of the Lehigh Coal Field and the Lehigh Coal and Niavigation Company: 1791-1820." M.A. thesis. Pennsylvania State University, 1989.

Korson, George. *Minstrels of the Mine Patch: Songs and Stories of the Anthracite Industry.* Hatboro, PA: 1964.

Kreisinger, Henry. "Five Ways of Saving Fuel in Heating Homes," *U.S. Bureau of Mines Technical Paper No. 199.* Washington: GPO, 1918.

Lewis, W. David. "The Early History of the Lackawanna Iron and Coal Company: A Study in Technological Adaptation." *Pennsylvania Magazine of History and Biography.* 96 (October 1972): 424-468.

_____. *Iron and Steel in America.* Greenville, DE: Eleutherian Mills-Hagley Foundation, 1976.

Licht, Walter. *Industrializing America: The Nineteenth Century.* Baltimore, Johns Hopkins University Press, 1995.

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

Magnusson, L. *Housing by Employers in the United States.* Bureau of Labor Statistics, Bulletin No. 263. Washington: GPO, 1920.

Mead, R. R. "An Analysis of the Decline of the Anthracite Industry Since 1921." unpub. Ph.D. diss, University of Pennsylvania, 1935.

Miller, Donald L. and Sharpless, Richard E. *The Kingdom of Coal: Work, Enterprise, and Ethnic Communities in the Mine Fields.* Philadelphia: University of Pennsylvania Press, 1985.

"'Mitchell Day:' President Lewis and Vice-President Murray to Speak." *The United Mine Worker's Journal* (1 November 1922): 8.

Monroe, Keith. "A Decade of Turmoil: John L. Lewis and the Anthracite Miners, 1926-1936." Ph.D. diss., Georgetown University, 1977.

Munn, Robert F. *The Coal Industry in America: A Bibliography and Guide to Studies.* 2nd ed. Morgantown: West Virginia University Library, 1977.

Nearing, Scott. *Anthracite: An Instance of a Natural Resource Monopoly.* Philadelphia: 1915.

Newcomb, H. T. "The Anthracite-Carrying Railroads." *Review of Reviews* 26 (1902): 66-69.

Newman, Lawrence M. "Nine Towns." MA thesis. Harvard University, 1993.

Novak, Michael. *The Guns of Lattimer: The True Story of a Massacre and a Trial, August 1897-March 1898*. New York: 1978.

Overman, Frederick. *The Manufacture of Iron in All Its Various Branches*. Philadelphia: Baird, 1850.

Palladino, Grace. *Another Civil War: Labor, Capital, and the State in the Anthracite Regions of Pennsylvania, 1840-68*. Urbana: University of Illinois Press, 1990.

Parkinson, George., ed. *Guide to Coal Mining Collections in the United States*. Morgantown, WV: West Virginia University, 1978.

Parton, W. Julian. *The Death of a Great Company: Reflections on the Decline and Fall of the Lehigh Coal and Navigation Company*. Easton, PA: Center for Canal History and Technology, 1986.

Patton, Spiro G. "Anthracite Canals and Urban Development: The Case of Reading." *Canal History and Technology Proceedings* 4 (1985).

Pennsylvania. State Geologist. *Atlas AA [of the Anthracite Fields of Pennsylvania]*. Philadelphia: Pennsylvania Second Geological Survey, 1885.

Perry, Daniel K. *"A Fine Substantial Piece of Masonry:" Scranton's Historic Furnaces*. Harrisburg: Pennsylvania Historical and Museum Commission, 1994.

Petrillo, F. Charles. *Anthracite and Slackwater: The North Branch Canal*. Easton, PA: Center for Canal History and Technology, 1986.

Piore, Michael and Charles Sabel. *The Second Industrial Divide: Possibilities for Prosperity*. New York: 1984.

Powell, H. Benjamin. "Coal, Philadelphia and the Schuylkill." Ph.D. diss. Lehigh University, 1968.

_____. "The Pennsylvania Anthracite Industry, 1769-1976." *Pennsylvania History*. 47 (January 1980): 3-27.

_____. *Philadelphia's First Fuel Crisis: Jacob Cist and the Developing Market for Pennsylvania Anthracite*. University Park: Pennsylvania State University Press, 1978.

_____. "Pioneering the Anthracite Industry: The Case of the Smith Coal Company." *Wyoming Historical & Geological Society Proceedings* 24 (1984): 5-22.

_____. "Schuylkill Coal Trade, 1825-1842." *Historical Review of Berks County* 39 (Winter 1972-1973): 14-17, 30-34.

Rayback, Joseph G. *A History of American Labor.* New York: Free Press, 1966.

Rhone, Rosamond D. "Anthracite Coal Mines and Mining." *Review of Reviews* 26 (1902): 54-63.

Roberts, Peter. *The Anthracite Coal Industry: A Study of Economic Conditions and Relations of the Co-operative Forces in the Development of the Anthracite Coal Industry of Pennsylvania.* New York: The Macmillan Co., 1901.

_____. *Anthracite Coal Communities: A Study of the Demography, the Social, Educational, and Moral Life of the Anthracite Regions.* New York: Macmillan, 1904.

Rogers, Henry Darwin. *The Geology of Pennsylvania.* 2 vols. Philadelphia: J. B. Lippincott & Co., 1858.

Rood, Henry. "A Pennsylvania colliery village." *The Century Illustrated Monthly Magazine* 55 (1897-1898): 809-830.

Rose, Dan. *Energy Transition and the Local Community: A Theory of Society Applied to Hazleton, Pennsylvania.* Philadelphia: University of Pennsylvania Press, 1981.

Salay, David. ed. *Hard Coal, Hard Times: Ethnicity and Labor in the Anthracite Region.* Scranton, PA: 1984.

Sayenga, Donald. "The Untryed Business; An Appreciation of White and Hazard." *Canal History and Technology Proceedings* 2 (1983): 105-129.

Schaefer, Donald Fred. *A Quantitative Description and Analysis of the Growth of the Pennsylvania Anthracite Coal Industry, 1820-1865.* New York: Arno Press, 1977.

Schlegal, Marvin W. *Ruler of the Reading: The Life of Franklin B. Gowen, 1836-1889.* Harrisburg, PA: Archives Publishing Co., 1947.

Seward, Frederick. *The Coal Trade.* New York: Frederick Seward, various years.

Shank, William H. *The Amazing Pennsylvania Canals.* York, PA: American Canal & Transportation Center, 1981.

Society for Industrial Archeology. *A Guide to Industrial Archeological Sites in the Pennsylvania Anthracite Region.* 1979.

Sperry, J. R. "Rebellion Within the Ranks: Pennsylvania Anthracite, John L. Lewis, and the Coal Strikes of 1943." *Pennsylvania History* 40 (July 1973): 293-312.

Stapleton, Darwin H. *The Transfer of Early Industrial Technologies to America.* Philadelphia, PA: American Philosophical Society, 1987.

Steers, Edward. "The Delaware and Hudson Canal Company's Gravity Railroad." *Canal History and Technology Proceedings* 2 (1983): 129-203.

_____. "The Pennsylvania Coal Company's Gravity Railroad." *Canal History and Technology Proceedings* 1 (1982): 158-66.

Stevenson, George E. *Reflections of an Anthracite Engineer.* New York: Hudson Coal Co., 1931.

Stuart, Milton. *Asa Packer, 1805-1879: Captain of Industry; Educator; Citizen.* Princeton, NJ: 1938.

Suffern, Arthur A. *The Coal Miner's Struggle for Industrial Status: A Study of the Evolution of Organized Relations and Industrial Principles in the Coal Industry.* New York: 1926.

Swank, James M. *The American Iron Trade in 1876.* Philadelphia: n.p., 1876.

_____. *History of the Manufacture of Iron in All Ages.* 2nd ed. Philadelphia: American Iron and Steel Association, 1891.

_____. *Introduction to a History of Ironmaking and Coal Mining in Pennsylvania.* Philadelphia: James M. Swank, 1878.

Tabor, T. T. *The Delaware, Lackawanna & Western Railroad in the Twentieth Century, 1899-1960.* Williamsport, PA: Lycoming Printing Co., 1980.

Taylor, George Rogers. *The Transportation Revolution: 1815-1860.* vol. 4 of *The Economic History of the United States.* New York: Holt, Rinehart & Winston, 1951.

Taylor, Richard C. *Statistics of Coal.* Philadelphia: Moore, 1848.

Teaford, John C. *Cities of the Heartland: The Rise and Fall of the Industrial Midwest.* Bloomington, IN: 1993.

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

_____. "Steam and Water Power in the Early Nineteenth Century." *Journal of Economic History* 26 (1966):

Thomas, Samuel. "Reminiscences of the Early Anthracite-Iron Industry." *Transactions of the American Institute of Mining Engineers* 29 (1899): 901-928.

Trachtenberg, Alexander. *The History of Legislation for the Protection of Coal Miners in Pennsylvania, 1824-1915*. New York: International Publishers, 1942.

Trapnell, W. C. *The Employment Situation in the Pennsylvania Anthracite Region, October 1935*. Washington: Works Progress Administration, 1935.

Trotter, Joe William, Jr. *Coal, Class, and Color: Blacks in Southern West Virginia, 1915-1932*. Urbana: University of Illinois Press, 1990.

U.S. Bureau of the Census. *Historical Statistics of the United States, Colonial Times to 1970*. 2 vols. Washington: GPO, 1975.

U.S. Bureau of the Census. 13th Census, 1910. vol. 11. *Mines and Quarries, 1909*. Washington: GPO, 1913.

U.S. Congress, House of Representatives. Executive Document No. 308. *Documents Relative to Manufactures in the United States, Collected by the Secretary of Treasury* [Louis McLane]. 22nd Cong., 1st sess. (Washington 1833).

U.S. Congress, Senate. *Report on Condition of Women and Child Wage-Earners in the United States, Vol. IV: The Silk Industry*. Washington: GPO, 1911.

Wallace, Anthony F. C. *St. Clair: A Nineteenth-Century Coal Town's Experience with a Disaster-Prone Industry*. New York: Alfred A. Knopf, 1987.

Wiebe, Robert. "The Anthracite Strike of 1902: A Record of Confusion." *Mississippi Valley Historical Review* 48 (September 1961): 229-251.

Williams, William Henry. "Anthracite Development and Railway Progress." *Journal of the American Irish Historical Society* 22 (1923): 86-96.

Winpenny, Thomas R. "Hard Data on Hard Coal: Reflections on Chandler's Anthracite Thesis." *Business History Review* 53 (1979): 247-258.

Yates, W. Ross. "Discovery of the Process for Making Anthracite Iron." *Pennsylvania Magazine of History and Biography* 98 (1974): 206-223.

Yearly, Clifton K. Jr. *Enterprise and Anthracite: Economics and Democracy in Schuylkill County, 1820-1875*. Baltimore, MD: Johns Hopkins Press, 1961.

Yellen, Samuel. *American Labor Struggles*. New York: S. A. Russell, 1936.

Zimmerman, Albright. "Problems of a State-Owned Delaware Division Canal." *Canal History and Technology Proceedings* 10 (1991): 115-148.